

**Jefferson County School District No. R-1  
Support Services**

**TECHNICAL GUIDELINES 2007**

**DIVISION 32 – Exterior Improvements  
May 16, 2008**

**Jefferson County School District, R-1 TECHNICAL GUIDELINES 2007**  
**Division 32 – Exterior Improvements**

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

**32 05 00 Common Work Results for Exterior Improvements – December 1, 2007**

- Creosote-containing materials are categorically prohibited.
- Wood walking surfaces, steps are prohibited.

END SECTION 32 05 00

**32 06 00 Schedules for Exterior Improvements – December 1, 2007**

- Flexible Pavement (Asphalt) Schedule

Minimum thickness in inches

LOCATION	BASE	ASPHALT	TOTAL	ALTERNATE DEEP STRENGTH SINGLE-LIFT ASPHALT
Bus and truck parking and drives	8	5	13	8
Automobile-only parking and drives	6	4	10	6
Play/Tennis courts, bicycles, trails	4	4	8	4

END SECTION 32 06 00

**32 10 00 Bases, Ballasts, and Paving – December 1, 2007**

- Work in this section is open to any product or material
- General
  1. Work in this section is for pavement on Jefferson County School District R-1 property.
  2. For pavement in rights-of-way, comply with standards, details and specifications of the appropriate governmental entity.
  3. Snowplow access is required to all paved vehicle, pedestrian, and recreational areas except playcourts.
  4. Concrete paving is required at the following locations:
    - a. Trash pick-up areas/dumpster pads
    - b. Entrance walks
    - c. Curbs, gutters, or edge strip for asphalt pavement
  5. Concrete paving is preferred at the following locations:
    - a. Bus traffic/parking areas
    - b. Service vehicle/loading dock areas
    - c. Play pads
    - d. Tennis Courts
- Restrictions:
  1. Limit use of unit pavers, subject to review and acceptance by the Owner.

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- In the absence of other information, standards of the following organizations apply:
  1. Colorado Ready Mix Concrete Association (CRMCA)
  2. Portland Cement Association (PCA)
  3. American Association of State Highway and Transportation Officials (AASHTO)
  4. State of Colorado Department of Transportation (CDOT) Standard Specification for Roads and Bridges
- Submittals
  1. Mix Design Data:
    - a. Required
  2. Test Reports:
    - a. Required
  3. Closeout:
    - a. All submittals listed above, updated to record status.
    - b. Bituminous (Asphalt) Pavement Warranty:
      - (1) One year labor and material warranty covering creeping, shoring, cracking, settling, and ponding.
- Base Course(s):
  1. No Requirements
- Gravel drainage fill:
  1. Per Geotechnical Engineer
- Flexible (Asphaltic Concrete) Pavement
  1. Fifteen-year life cycle design Type X or EX
  2. Gravel Base:
    - a. Per Geotechnical report and
    - b. Flexible Pavement Schedule (32 06 00)
  3. Base Course:
    - a. Per Geotechnical report and
    - b. Flexible Pavement Schedule (32 06 00)
  4. Wearing Course:
    - a. Per Geotechnical report and
    - b. Flexible Pavement Schedule (32 06 00)
  5. Reinforcing Mesh:
    - a. Geofabric is required at bus/truck areas and preferred elsewhere.
    - b. Install with 2 inch minimum overlay.
  6. Asphalt recycling is preferred for pavement reconstruction.
- Concrete Paving reinforcing options:
  1. Fibrous reinforcement admixture preferred
  2. Non-woven polypropylene
  3. Wire fabric is not recommended.
    - a. When engineered, use galvanized or stainless steel.
    - b. At expansive soils, use flat wire mesh on chairs 1/3 to 1/2 slab thickness from top of slab
- Concrete flatwork for vehicle areas:
  1. Cement:
    - a. Conform to latest revised ASTM C150 Standard for Portland Cement.
    - b. Minimum cement content = 560 pounds per cubic yard.

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2. Aggregate:
  - a. Maximum coarse aggregate dimension may not exceed  $\frac{1}{4}$  of slab thickness.
  - b. Free of ferrous material which could leach onto surface
3. Water:
  - a. Potable
4. Water-cement ratio:
  - a. Not to exceed 0.45
5. 4000 psi 28 day strength
6. Air entrainment:
  - a. Not less than 4.5% and not more than 7.5% by volume
7. Curing and anti-spalling compound is required for all exterior flatwork.
8. Slump:
  - a. 3.5 inches maximum
9. Base:
  - a. None
  - b. Uniform density subgrade at optimum moisture content should be adequate.
10. Deposit concrete within 90 minutes from the time water is added.
11. Minimum slab thickness for vehicle traffic = 5 inches
12. Control joints:
  - a.  $\frac{1}{4}$  of slab thickness
  - b. 2'-0" maximum joint separation per inch of slab thickness (5 inch slab = 10'-0" joint spacing.
  - c. Pattern:
    - (1) Perpendicular and equidistant (square)
  - d. Include control joint around obstructions such as manholes.
13. Concrete finish:
  - a. Astroturf drag or equivalent
  - b. Perpendicular to main traffic flow
14. Curb Cuts:
  - a. Integral vertical curb type
  - b. Warped planes are prohibited
- Paving Specialties
  1. Pavement marking materials:
    - a. Yellow color alkyd traffic paint meeting requirements of Section 708.05, "Pavement Marking Paint" of the Colorado Department of Highways Standard Specifications for Road and Bridge Construction.
    - b. Blue and white color alkyd traffic paint for ADA compliance
- Unit Pavers:
  1. 100% compacted sand base is mandatory.
- Asphalt Emulsion Pavement Sealer
  1. Application-ready cold-applied homogeneous emulsified asphalt binder with fillers and non-asbestos fibers conforming to the following:
    - a. Density: 10.5 to 11.5 lbs./gallon
    - b. Non-volatiles: 15% minimum; 30% maximum
    - c. Water dilution: None
    - d. Asbestos content: None
    - e. Specific gravity: 1.25 minimum

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- Coal Tar Emulsion Pavement Sealer
  1. Pre-mixed, rubberized, high-solids, cold-applied, homogeneous coal tar pitch emulsion containing no asbestos and conforming to the following:

COMPONENT	MAXIMUM	MINIMUM
Water %	54	-
Non-Volatiles %	54	47
Ash of Non-volatiles %	38	30
Solubility of Non-volatiles %	44	20
Specific Gravity	-	1.20
Asbestos Content:	None	

2. Include manufacturer's standard industrial-grade latex emulsion modifier/admixture with each coat.
- Chip Seal:
    1. Requires Jefferson County School District authorization
  - Edge detail is mandatory for all pavement:
    1. Curb: Vertical profile with full cut at drives and ramps, or
    2. Curb and Gutter, or
    3. 12 inch wide reinforced concrete x depth of pavement
    4. Post-pavement keyed curb system is permitted.
  - Drain Pans:
    1. Same material as pavement field
    2. Concrete drain pans within asphalt pavement are not recommended (cracks develop between dissimilar materials).
  - Soil Sterilant
    1. Organic compound, minimum lateral leaching type
    2. Apply herbicide to areas under asphalt pavement where cut is 18 inches or less and imported fill areas except: within 20 feet of drip line of existing trees/shrubs to remain
  - Sequence of Operation:
    1. Complete work in this section before installing exterior improvements accessories such as game posts, sleeves.
  - Site Tolerances:
    1. Using a 10 foot long tested straightedge in any position
    2. Deviations on the surface of the finished pavement may not exceed 3/8 inch from designed elevations/ slopes.
  - Field Quality Control
    1. Laser leveling is required for tennis courts
    2. Notification is required at least 24 hours in advance of the following:
      - a. Starts of excavation, backfilling and compacting operations
      - b. Staking of grades/elevations
      - c. Subgrade placement
      - d. Base course placement
      - e. Prime coat
      - f. Wearing surface placement
    3. No vehicle traffic for 100 hours minimum

END SECTION 32 10 00

**32 17 00 Paving Specialties – May 16, 2008**

- Work in this section is open to any product or material
- Parking Bumpers (Wheel Stops)
  1. Not recommended due to interference with snow removal operations
    - a. Substitute a combination of striping and curbs
  2. When used, limit to perimeter applications and anchor at each end with 18 inch #4 rebar or with manufacturer approved pins.
  3. Preformed plastic or recycled composite (yellow)
  4. Precast concrete is prohibited.

END SECTION 32 17 00

**32 18 00 Athletic and Recreational Surfacing – May 16, 2008**

- Running Track:
  1. Open to any product or material meeting the requirements of this Technical Guideline.
  2. Scoria mixed with clay to comply with published standards of Colorado High School Activities Association.
- All Weather Running Track
  1. Restricted to specific products of specific manufacturers that have been previously approved by Jefferson County School District, R-1.
    - a. General Acrylics Inc.
    - b. Renner Sports Surfaces
    - c. Defarge Sports Surfaces
    - d. California Track and Engineering
  2. Quality Assurance
    - a. Provide Level II Certification from a Professional Engineer or Licensed Land Surveyor, as defined by the American Sports Builders Association's "Guideline for Running Track Certification".
    - b. Include certification on striping and slopes for NFHA standards.
    - c. Verification of slopes shall occur prior to the application of surface, so that non-compliant areas can be addressed.
    - d. Final certification of the slopes and striping shall occur after the surface is installed, and the track is striped.
- Playground safety surface
  1. Open to any product or material meeting the requirements of this Technical Guideline.
  2. Approved materials
    - a. Engineered wood fiber
    - b. Latex
    - c. Polyurethane
    - d. Silicone
- Tennis Court

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1. Restricted to specific products of specific manufacturers that have been previously approved by Jefferson County School District Facilities Services Department.
  - a. LER
  - b. Hellas Construction
2. Latex acrylic
3. For reconstruction, use Slipsheet system “D”.
- Synthetic Turf
  1. Restricted to specific products of specific manufacturers that have been previously approved by Jefferson County School District Facilities Services Department.
    - a. FieldTurf, “Prestige”
    - b. Desso
    - c. Tiger Turf
    - d. SportExe
    - e. Sprint Turf
  2. Polypropylene systems are categorically prohibited
  3. Submittals
    - a. Samples
    - b. Test Reports for sieve analysis, compaction, infiltration
    - c. 8 year maintenance contract terms and conditions
  4. Design and Configuration:
    - a. Crowned subgrade (1/2% minimum)
    - b. Liner per geotechnical report
    - c. Chevron or herringbone pattern underdrain
    - d. 6 inch gravel sub-base/drainage layer
    - e. Perimeter drainage system and curb
    - f. Laser grade and slope control
    - g. Sand/recycled rubber infill, in correct proportion for type of sport played on field.
    - h. Synthetic turf
  5. Construction
    - a. Year round
      - (1) Turf seams glued when air temperature is 50 degrees or higher.

END SECTION 32 18 00

**32 31 00 Fences and Gates – December 1, 2007**

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Jefferson County School District, R-1 Board Policy applies to work in this section
- Specified requirements apply equally to temporary and permanent construction.
- Alternate types of fencing in lieu of chain link fencing may be considered, particularly at the elementary level, in order to satisfy local, unique conditions.
  1. Carefully evaluate options to assure long-term durability, low maintenance, ease of maintenance, proper control and comparable life cycle cost to chain link fence.
  2. Fences not meeting these criteria may be installed if adjacent property owners agree to maintain the fence and contribute toward the excess costs of the alternate fence type.
- In the absence of other information, standards of the following organizations apply:

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1. International Fence Industry Association Inc.
- Submittals
  1. Shop Drawing:
    - a. Required
  2. Closeout:
    - a. All submittals listed above, updated to record status
- Wind Screen:
  1. Tennis courts only
  2. Need is determined by site microclimate and exposure conditions.
- Decorative Fences:
  1. Limit to protect or highlight ornamental areas only.
    - a. Estate fence
    - b. Split rail fence
- Chain Link Fence:
  1. Fabric:
    - a. 9 gauge galvanized wire up to 12'-0" single height
    - b. 1-<sup>3</sup>/<sub>4</sub> inch mesh at tennis courts and baseball/softball backstops
    - c. 2 inch mesh at all other locations
    - d. Knuckle both selvages
    - e. Plastic clad fabric is not recommended.
    - f. Place fabric on Jefferson County School District R-1 side of post.
    - g. Maintain 2 inch clearance to grade.
  2. Posts:
    - a. Schedule 40 galvanized or SS40..
    - b. Line Posts: 2 inch nominal (2.375 inches o.d.)
    - c. Terminal, corner, and pull posts: 2½ inch nominal (2.875 inches o.d.)
    - d. Single gate up to 6'-0" posts: 2½ inch nominal (2.875 inches o.d.)
    - e. Double gate posts and single over 6'-0": 3 inch nominal (3.5 inches o.d.)
    - f. Set property line fence post centerline 6 inches inside property line.
    - g. Excavate 9 inch diameter x 30 inch minimum depth.
    - h. 10'-0" o.c. maximum spacing, regardless of fence height
    - i. Set plumb and aligned in concrete terminating at finish grade
    - j. Backfill
  3. Top Rail:
    - a. 1-5/8 inch nominal (1.660 inches o.d.)
    - b. Longest lengths available
    - c. 6 inch expansion couplings with 3 inch overlap
  4. Center and Bottom Rail:
    - a. 1-¼ inch nominal (1.66 inch o.d.)
    - b. Required for fences over 6'-0" high
    - c. Welded connection to posts is preferred.
    - d. Bottom Rail:
      - (1) Required at PE and athletic field fences
  5. Truss Rods:
    - a. 3/8-inch diameter with anchor and turnbuckle
    - b. Install diagonally from top of all terminal posts to bottom of nearest line post and diagonally each way in gates.

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6. Tension Bars:
  - a. ¼ inch x ¾ inch (minimum) single piece lengths equal to fabric height
7. Tension Clamps:
  - a. 14 gauge x 1 inch
  - b. Install at 15 inches o.c. maximum
8. Tension wire:
  - a. 9 gauge
  - b. Required where no bottom rail is installed
  - c. Weave continuous strand between terminal posts for entire lengths of bottom edge and 24 inches above bottom edge of fabric.
  - d. Secure to fabric with clamp rings at 24 inches o.c. and tie to each post.
  - e. Twist 2 turns and bend to prevent hazard.
9. Fence Fasteners:
  - a. 12-gauge wire
  - b. Space at 12 inches o.c. on line posts and 24 inches o.c. on rails and braces.
10. Post Caps:
  - a. Rounded, weather-tight closure
  - b. Same material and diameter as post
  - c. Install one per post.
11. Gate frames:
  - a. 1-1/2 inch nominal (1.9 inches o.d.)
  - b. Limiters are required at sport court gates (tennis, multipurpose courts).
  - c. Welded construction only
12. Hinges:
  - a. Malleable iron
  - b. Non-lift-off type
  - c. 180 degree swing
  - d. 1 pair up to 6'-0" height
  - e. 1-½ pair up to 8'-0"
13. Latches:
  - a. Integral padlock eye
  - b. Operable from either side
  - c. Fork type for single gate
  - d. Plunger bar for double gates
  - e. Set double gate plunger bar strike in concrete.
14. Wind Screen:
  - a. #18 vinyl fabric windscreen
15. Barrier Post:
  - a. 3 inches (min.) steel post x 48 inches (min.) with full concrete fill
16. Standard property line fence height = 6'-0".
17. Mow strip:
  - a. 12 inches wide concrete centered on fence line
  - b. Required at property line fence and preferred elsewhere
- Backstops:
  1. Welded construction only
  2. Continuous top and bottom rails
  3. 2 x 12 wolmanized wood baseboard
    - a. Single piece between posts

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- b. Trex boards acceptable
- 4. Remainder of construction is to be consistent with requirements for Chain Link Fences
- Execute fencing only after finish grading is complete.
- Site Tolerances:
  - 1. To facilitate snow removal, set fence line 8'-0" (minimum) away from vehicle pavement.

END SECTION 32 31 00

**32 32 00 Retaining Walls – December 1, 2007**

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Retaining walls are generally not recommended.
  - 1. Embankments are preferred for safety reasons.
- Wood timbers / railroad ties:
  - 1. Prohibited
- Masonry construction:
  - 1. Prohibited except for interlocking systems

END SECTION 32 32 00

**32 34 00 Fabricated Bridges – December 1, 2007**

- Work in this section is open to any product or material
- Footbridges: 5'-0" maximum clear width

END SECTION 32 34 00

**32 70 00 Wetlands – December 1, 2007**

- Comply with Federal, State, and jurisdictional requirements

END SECTION 32 70 00

**32 80 00 Irrigation – December 1, 2007**

- Work in this section is restricted to specific products of specific manufacturers that have been previously approved by Jefferson County School District, R-1 Facilities Services Department.
- To the greatest extent feasible, Jefferson County School District, R-1 school sites should be designed and landscaped to minimize the need for artificial irrigation.
- Automatic irrigation system is required for all landscaped and non-native sodded/seeded areas of the site
  - 1. EXCEPT: Elementary school playfields above 7000 feet elevation
- Quick-coupler irrigation is prohibited except at native grass and natural landscaping

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- Xeriscape unpaved areas within 10 feet of building perimeter
- Storm water systems should be integrated into the landscaping and irrigation site design
- Coordinate installation of electrical power to controller.
- Submittals
  1. Product Data: Required
  2. Shop Drawing: System layout including wiring; wiring schematic; controller chart
  3. Design Data, Test Reports, Certificates, Manufacturer Instructions, Manufacturer Field Reports
    - a. Written certification of backflow prevention test
  4. Closeout:
    - a. All submittals listed above, updated to record status.
    - b. O & M manual and DVD demonstration of operation
    - c. 3 copies of zone chart; laminated
    - d. Reproducible as-built system CAD file and drawings
    - e. One year system operation warranty
- Quality Assurance
  1. Design to operate a maximum of 9 hours x 5 days per week for peak irrigation.
  2. Verify available water pressure prior to design.
  3. Design should avoid or minimize sprinkler heads (or quick coupler valves) in the following locations:
    - a. High activity areas of the site, such as playfields
    - b. Near building surfaces/foundations
    - c. Near paved pedestrian and vehicle areas
- Extra Materials:
  1. One head of each type
  2. Controller keys, valve keys, quick coupler keys
  3. Hose swivels for quick couplers
- Maintenance Issues
  1. Space valves in manifolds to allow access for repairs.
    - a. 24 inch separation preferred
  2. Blowout and initial start up per Jefferson County School District, No. R-1 personnel.
- Valve boxes are prohibited within the boundaries of playfields and athletic fields.
- Pumps (as required):
  1. Centrifugal type activated by flow switch and controller relay.
- Backflow preventer:
  1. Reduced Pressure Principle Vacuum Breaker
  2. Locate in main building or heated, secure structure.
- Mainline pipe:
  1. PVC, ASTM D2241 or Commercial Standard CS256 Type I, normal impact Class 200 (SDR 21) with continuous permanent marking identifying manufacturer and grade
  2. 2-1/2 inch or larger diameter bell end are prohibited.
- Copper pipe:
  1. Type K is required between meter and backflow preventer.

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- Branch line pipe (intermittent pressure):
  1. PVC:
    - a. ASTM D2241
    - b. Normal impact class 200 (SDR 21) Commercial Standard CS256, Type I
  2. Polyethylene is prohibited.
  3. 2-1/2 inch or larger diameter bell end are prohibited.
- Risers:
  1. Rotary head or Quick-coupler valve:
    - a. PVC schedule 80 nipple adjustable double swing joint riser
  2. Lawn spray head:
    - a. Same as above or soft plastic "cutoff" nipple
  3. Flexible pipe may be used with spiral fittings for 3/4 inch and smaller diameter.
- Main line fittings:
  1. PVC Schedule 40 molded
  2. Solvent weld type
- Gasket fitting type is prohibited.
- Branch line joints:
  1. Suitable for solvent weld
- Branch line fittings: PVC: ASTM D2241, Type 1, with appropriate pressure rating.
- Gate Valves:
  1. Cast iron or bronze
    - a. Rated to 150 psi (minimum)
  2. Resilient wedge
    - a. Waterway equal to full nominal diameter of valve.
  3. Activation:
    - a. Square nut at sleeves
    - b. Wheel handle at manhole or open areas
  4. Open = counterclockwise
- Manual and Semi automatic valves:
  1. Bronze, angle type, 200 lb. class with cross type operating handles
- Automatic control valves:
  1. Rainbird Type EFA-CP Automatic Controller Valve
  2. Cast brass body and bonnet globe-type
  3. Ball valve of plastic or brass installed in-line upstream
  4. Normally closed, integrally-molded, single-seat, diaphragm-operated, 2-way, 24-volt solenoid activated with manual bleed plug and flow adjustment.
  5. Atmosphere-vented and 3 way solenoid valves are prohibited.
- Quick-coupler valves:
  1. 2 piece, 150 psi rated cast brass with rubber lid
- Sprinkler heads:
  1. Rainbird Series 50 Pop Up Gear Driven Heads
  2. Hunter Popup Gear Driven Heads
  3. Heavy-duty plastic gear-driven, with interchangeable nozzles serviceable from top
  4. Plastic body spray-type heads with retraction springs and filtering screen and bubblers may be used in small ornamental areas.
  5. Protective rubber covers are required at all areas except ornamental landscape.
  6. Purple color rotor top is required to signify non-potable water.

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- Wiring: Type UF with 4/64 inch U.L. listed insulation for underground burial for class II circuits.
  1. Common: White coded wire; 12 gauge; 14 gauge permitted for runs up to 1000 lineal feet.
  2. Multi strand wire is prohibited
- Solenoid:
  1. Single color coded 14 gauge wire to each solenoid.
- Remote Control Hydrometer
  1. Separate master valve and flow meter wired to controller
  2. Combination turbine type water meter and diaphragm actuated solenoid control valve mounted in a single globe style valve body
  3. Meter should power a gear mechanism, which activates a reed switch that transmits a pulse at a pre-determined flow rate.
  4. Unit should include integral flow guides to eliminate the need for straight pipe allowances before and after the valve.
  5. Main valve should fully open and close drip-tight in response to electrical signal
  6. Automatic station shut off during overflow conditions and complete shut down when mainline breaks are detected
  7. Compatible with pump station operation, built-in pump start relay, UL listed reset circuit breakers
  8. Valve and meter should be maintainable without removing valve body from the line.
- Rain gauge:
  1. Adjustable setting type
  2. Glen-Hilton Products, Inc. Mini Klik II Rain Sensor
  3. No substitutions
- Solvent and Glue:
  1. Per pipe manufacturer
- Dielectric connectors:
  1. Mandatory at all joints between dissimilar metals
- Valve Boxes:
  1. 10 or 12 inch bright color polyiron with locking cover and extensions to adjust to grade level
- Automatic Controller
  1. Irritrol McPlus Series
    - a. No Substitutions
  2. General
    - a. Hard wired (not plug-in) with integral surge protection
    - b. 48 station capacity
    - c. Security code access
    - d. Weather proof enclosure
    - e. 24 volt, stepped down immediately before the timer
    - f. Solid state microprocessor type with digital readout.
  3. Display on front panel of control unit and through an EIA standard RS-232-C port for on site or remote downloading of:
    - a. Current Moisture level
    - b. 31 day history reporting
      - (1) Program parameters

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- (2) Moisture levels
- (3) Watering activity in both time and volume
- (4) Error log
- c. Bookkeeping feature including a log of up to 100 of the last manual input events (program changes, moisture setting changes, etc.)
- 4. Capable of stand-alone, remote, or network operation as follows:
  - a. Scan each station and use moisture sensor data as its primary water application criterion.
  - b. Provide, without additional wiring, an application of irrigation water to a follower station each time its assigned leader station has an application of irrigation water.
  - c. Through peripherals, monitor electrical, flow, and sensor problems in the field and react appropriately
  - d. Capable of operating without respect to sensor reading from input at the control unit and without additional wiring
  - e. System networking option that allows control and data transfer (in either IBM or Macintosh format) with a central computer and networking of multiple automatic controllers using commercially available communications software through non-dedicated telephone lines.
  - f. Immediate repeat cycle option
  - g. Automatic start at any hour capability
  - h. Accurate incremental station timing from 2 to 60 minutes
  - i. Capable of manual shutdown, advance, or start any or all stations without affecting programming
  - j. Built-in pump start circuit relay (if necessary), U.L. listed reset circuit breakers.
- 5. Programming
  - a. Four standard automatic programs that allow use of couplers without triggering a flow error or require operation of master valves and with the following capabilities:
    - (1) Up to 23 hour 59 minute watering window
    - (2) Independent window open and close times
    - (3) Allow continuous scanning of active stations during the watering window
    - (4) Option to use or not use moisture sensor input
    - (5) 3 optional exception periods during the watering window that will disallow watering during the exception period and resume program operation when the exemption period is over
    - (6) Allow simultaneous and overlapping program operation
  - b. Syringe program with the following capabilities:
    - (1) Independent start time
    - (2) Variable station run times that apply individually to each station in the syringe program
    - (3) Duration time equal to the sum of run times of the stations in the program
    - (4) Water each station in the program once, in any sequence
  - c. Quick coupler program with the following capabilities:
    - (1) No stations assigned
    - (2) Independent calendar for legal watering days
    - (3) Independent start and stop times
    - (4) Independent allowable flow value

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- d. User programmable for simultaneous operation of 1 to 3 stations and the following independent station settings:
  - (1) Assignment to none, one, or more programs
  - (2) High and low moisture levels
  - (3) High and low flow values
  - (4) Run time
  - (5) Minimum soak time
  - (6) Total station watering time per window
- e. Controller adjustable moisture settings for leader stations without a third wire to sensor
  - (1) High value above which the station will not water
  - (2) Low value that the station must reach before it will allow further watering
  - (3) Convey bypassed watering cycle information to central computer
- 6. Identification of and response to special situations as follows:
  - a. Electrical problems such as wiring breaks, shorts, or bad solenoids
  - b. Sensor malfunction
  - c. Excessive or inadequate water flow during active irrigation cycle
  - d. Unauthorized water flow during inactive cycle
- 7. Control:
  - a. Peripheral equipment of other manufacturers
  - b. Permit economical retrofit of existing automatic systems to central control
  - c. Control either normally open or normally closed 24-volt master valves
  - d. Interface to monitor water flow readings from an appropriate electronic pulsing flow meter.
  - e. Ability to control an auxiliary irrigation water pump through a 24 volt control or dry contact switch with an independent power supply
- Execution Summary
  - 1. Trenching:
    - a. Uniform and straight with firm and uniform bottom.
    - b. 24 inch (min.) 36 inch (max.) ground cover to top of pipe for mainline
    - c. 16 inches for rotary heads
    - d. 10 inches for spray heads
    - e. Trenching is optional for pipe 1¼ inches or less which may be "pulled."
  - 2. Setting:
    - a. Uniform firm bearing for the entire length of line.
    - b. Wedging or blocking are prohibited.
  - 3. Thrust Blocking:
    - a. Required
  - 4. Heads:
    - a. Set to precise elevations 1½ inches above finish grade and 1 inch above seeded areas, ¼ inch below and 6 inches away from adjacent pavement and 12 inches away from building.
    - b. Set swing joint angles between 20 and 45 degrees.
  - 5. Compaction:
    - a. Match original density and grade.
    - b. Crown for future settlement if original density cannot be achieved.
  - 6. Pipe, valves, fittings:
    - a. Thoroughly clean and maintain clear and unobstructed.

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7. Sleeves:
  - a. Required at all sub-pavement irrigation lines and where line changes direction
  - b. Use at least 2 nominal pipe sizes larger than irrigation pipe.
  - c. Cut squarely with tubing cutter, hand saw or hack saw and remove burrs.
8. Valves: Mount in line with threaded connections (to be removable).
  - a. Install Remote Control Hydrometer directly after backflow preventer
  - b. Isolation valves:
    - (1) Required to permit maintenance without complete shutdown of system.
  - c. Remote control valves:
    - (1) Separate valve box required for each valve
9. Wiring:
  - a. Run adjacent to pipe in same trench.
  - b. Run at least one additional wire along main line for each 8 automatic valves in the system.
  - c. Identify additional wires on "as-built" documents.
  - d. Locate electrical connections at valve boxes with sealant in watertight connectors
10. Valve boxes:
  - a. Inconspicuous locations only
  - b. Provide vertical separation to prevent contact with main line.
  - c. Spacing between remote control valves = 2' - 0" minimum
11. Locate above-ground assemblies and components in secure, insulated, and heated structures
12. Locate controller within the grounds storage room or building with a view toward irrigated areas to the greatest extent possible.
13. Locate rain gauge to prevent vandalism.
14. Pumps
  - a. Leave unencumbered copper pipe downstream of backflow device to accommodate future retrofit to central control.
    - (1) 2' - 0" horizontal
    - (2) 1' – 6" sides and overhead
- Field Quality Control
  1. Do not stack pipes in trench.
  2. Do not run main lines and laterals parallel with storm drainage flows and other areas subject to erosion
  3. Do not mix head types within a zone.
  4. Buried wire splices are prohibited.
  5. Pressurize completed mainline for 2 hours at normal pressure (120 lbs. for 1 hour on pump systems).
  6. Test heads in each valve zone for 10 minutes minimum.
  7. Operate controller through 2 complete cycles or each zone for 2 minutes minimum.
  8. Repair leaks and repeat above tests.
  9. Flush entire system for 2 minutes at normal operational pressure immediately before installing heads, nozzles, or plugs.
    - a. Removable nozzle heads may be installed prior to flushing.
  10. System acceptance requirements:
    - a. No leaks during any test procedure
    - b. Pattern coverage per design.
  11. Complete all of the above before commencing sod or seeding operations

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- Adjusting/Cleaning
  1. Clean up daily.
    - a. Remove all scrap pipe, debris, and surplus materials from trenches and work site.
  2. Tighten pop-up nozzles.
  3. Adjust radius and gallonage settings on heads with adjustable stems.
  4. Perform final adjustment of head levels and coverages during turf establishment.
- Demonstration
  1. Demonstrate and test system operation and performance in the presence of system designer, construction project manager, operations personnel, and facility manager.
    - a. Use of controller
    - b. Flow/coverage
    - c. Rain gauge
    - d. System startup (spring)
    - e. System shutdown and winterization (fall)

END SECTION 32 80 00

**32 90 00 Planting – December 1, 2007**

- Work in this section is open to any product or material meeting the requirements of this Technical Guideline.
- Source of imported topsoil is subject to the review and approval of Jefferson County School District, R-1
- Topsoil
  1. Thoroughly disc and rototill topsoil to a depth of 8 to 12 inches before installation of irrigation system and landscaping
  2. Add and till other amendments according to soils analysis before seeding or sodding
  3. After installation of irrigation system and completion of grading, distribute 3 cubic yards of topsoil per 1000 square feet (130 cubic yards per acre) of area to receive non-native grass
  4. Minimum topsoil depth:
    - a. 8 inch depth at athletic (football, soccer) fields
    - b. 4 inch depth elsewhere
  5. Import material requires prior approval by Jefferson County School District, R-1
  6. Amended Topsoil (As determined by soils analysis):
    - a. Rocks over 1-1/2 inch diameter are prohibited
    - b. 50% wood byproduct screened to 5/8 inch minimum dimension
    - c. 50% cow or bull manure
      - (1) Composted at 130°F for 72 hours minimum
      - (2) Weed free
      - (3) pH = 7.1 to 8.1
  7. Mulch:
    - a. Wood and bark are prohibited
- Work in this section is to be complete upon building occupancy.
- Work in this section includes protection of existing landscaping from construction activities, including indirect damage such as erosion.

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- Every effort should be made to schedule lawns, grass, and sod work to permit 2 full growing seasons before occupancy.
- Warranty
  1. Lawns, grass, sod, shrub, trees, groundcover:
    - a. One-year warranty with supplemental one year warranty for each warranty replacement item.
- Restrictions
  1. For elementary schools above 7500 feet elevation, limit sod to decorative, building perimeter areas.
  2. Fruit-bearing trees are categorically prohibited.
  3. Minimum distance separation to building/foundation:
    - a. Sod: 5'-0"
    - b. Shrub: 5'-0"
    - c. Tree: 10'-0"
- Recommended minimum sizes:
  1. Deciduous trees: 2 inch caliper
  2. Evergreen trees: 6 feet tall
- Mixes
  1. Grass:
    - a. Activity and decorative areas: Sod required:  
(1) 4 variety bluegrass blend including 1 part Elite drought tolerant + 1 part Elite shade tolerant, 1 part aggressive, + 1 part dense.
    - b. Other areas: Native grass species
    - c. Embankments: Sod or seed
- Approved Tree and Plant Species
  1. Shade Trees:
    - a. Ash, Summit
    - b. Ash, Pathmore (*Fraxinus pennsylvanica* 'Patmore')
    - c. Ash, Autumn Purple (*Fraxinus pennsylvanica* 'Autumn Purple')
    - d. Ash, Marshall Seedless (*Fraxinus pennsylvanica* 'Marshall's Seedless')
    - e. Hackberry
    - f. Honeylocust, Imperial (*Gleditsia triacanthos inermis* 'Imperial')
    - g. Honeylocust, Shademaster (*Gleditsia triacanthos inermis* 'Shademaster')
    - h. Honeylocust, Skyline (*Gleditsia triacanthos inermis* 'Sunburst')
    - i. Maple, Emerald Queen or Norway (*Acer platanoides* 'Emerald Queen')
    - j. Maple, Walsach
    - k. Maple, Schwedler (*Acer platanoides* 'Schwedler')
    - l. Maple, Sugar (*Acer saccharinum*)
  2. Ornamental Trees
    - a. Alder, Native
    - b. Alder, Thinleaf (*Alnus tenuifolia*)
    - c. Ash, European Mountain (*Sorbus Aucuparia*)
    - d. Aspen, Quaking (*Populus tremuloides*)
    - e. Crabapple, Spring Snow Fruitless
    - f. Maple, Ginnala (*Acer ginnala*)
  3. Evergreen Trees
    - a. Fir, Douglas (*Pseudotsuga menziesii* var. *glauca*)
    - b. Juniper, Colorado Green (*Juniperus scopulorum* 'Cologreen')

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- c. Pine, Ponderosa (*Pinus ponderosa*)
- d. Pine, Foxtail or Bristlecone (*Pinus aristata*)
- e. Pine, Austrian (*Pinus nigra*)
- f. Spruce, Colorado Blue (*Picea gungens glauca*)
- 4. Dwarf Shrubs 3 - 5 feet high
  - a. Dwarf Rabbit Brush Kelsey
  - b. Apache Plume
  - c. Alpine Current
  - d. Dwarf Artic Blue Willow
  - e. Goldflame Spirea
  - f. Miss Kim Lilac
  - g. Bearberry Cotoneaster
- 5. Medium Shrubs 6 - 8 feet high
  - a. Variegated Dogwood
  - b. Rabbitbrush
  - c. Purple-leaf Sand Cherry
  - d. Three Leaf Sumac
  - e. Golden Current
  - f. Common Purple Lilac
  - g. Common White Lilac
  - h. Fern Bush
  - i. True-leaf Mountain Mahogany
- 6. Ground Covers
  - a. Border Jewel
  - b. Whiplash Daisy
  - c. Snow in Summer
  - d. Periwinkle
  - e. Creeping Phlox
- 7. Vines
  - a. Silver Lace Ivy
  - b. Englemann Ivy
- 8. Spreading and Creeping Evergreens
  - a. Prince of Wales Juniper
  - b. Blue Rug Juniper
  - c. Blue Chip Juniper
  - d. Broadmoor Juniper
  - e. Buffalo Juniper
  - f. Scandia Juniper
  - g. Salt brush (native)
  - h. Emerald Mound Honeysuckle
  - i. Arnolds Dwarf Forsythia
  - j. Dwarf Lead Plant low-dense
  - k. Privet
  - l. Potentilla
- 9. Large Shrubs 10-15 feet high
  - a. Common Purple Lilac
  - b. Little Leaf Mockorange
  - c. Curl-leaf Mountain Mahogany

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- d. Buffalo Berry
- e. New Mexican Privet
- f. Burning Bush
- 10. Upright Evergreens
  - a. Wichita Juniper
  - b. Colorado Green Juniper
- 11. Mounding Evergreens
  - a. Mugo Pine
- 12. Broadleaf Evergreens
  - a. Euonymus Manhattan
  - b. Green Daphne
  - c. Oregon Grapeholly
  - d. Yuccas
- 13. Ornamental Grasses
  - a. Miscanthus
  - b. Blue Fescue
  - c. Blue Avena
- 14. Perennials
  - a. Columbine
  - b. Aster
  - c. Coreopsis
  - d. Dianthus
  - e. Veronica
  - f. Penstemon
  - g. Day Lily

END SECTION 32 90 00