STANDARD SPECIFICATIONS

JANUARY 2022

City of Napa Public Works Director
(Per City Resolution R2018-122)
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1 - GENERAL PROVISIONS

1.01 GENERAL

All infrastructure improvements that are subject to the review and approval authority of the City of Napa shall conform to the design criteria set forth in these City Standard Specifications, as well as the City Standard Plans (which are hereby incorporated by reference into these City Standard Specifications).

1.02 PLANS AND SPECIFICATIONS

All construction work shall be done in accordance with the Standard Specifications of the State of California Department of Transportation, latest edition, Standard Plans of the State of California Department of Transportation, latest edition, the City of Napa Standard Specifications, latest edition, and the City of Napa Standard Plans, latest edition. In case of conflict between the Standard Specifications of the State of California Department of Transportation or the Standard Plans of the State of California Department of Transportation and the City of Napa Standard Specifications or the City of Napa Standard Plans, the City of Napa Standard Specifications and the City of Napa Standard Plans shall take precedence over and be used in lieu of such conflicting portions.

1.03 PURPOSE AND DEFINITIONS

When in the Standard Specifications of the State of California Department of Transportation or the Standard Plans of the State of California Department of Transportation (Standard Specifications), or in any documents or instruments where the Standard Specifications govern, or in the City Standard Plans and City Standard Specifications the following terms or nouns are used, the intent and meaning shall be interpreted as follows:

**Caltrans** – California Department of Transportation.

**City Engineer** – The Director of Public Works of the City of Napa, California, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

**City Manager** – The person/s appointed to that position by the City Council.


**Contractor** – The person or persons, firm, partnership, corporation, or combination thereof, private or public, who are performing construction work on private developments that are regulated by the City, or on City streets or other City-owned property.

**Department or Department of Transportation** – Department of Public Works of the City of Napa, California.

**Developer** – The person or persons, firm, partnership, corporation, or combination thereof, private or public, who are responsible for work performed on private developments that are regulated by the City, or on City streets or other City-owned property.
Director – Director of Public Works of the City of Napa, State of California, acting either directly or through properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Laboratory – The established laboratory authorized by the Engineer to test materials and work involved in the contract.

State or Owner – The City of Napa, California, a legal entity organized and existing in the County of Napa, State of California.

Standard Plans – The latest edition of the Standard Plans of the State of California, Department of Transportation. Any reference therein to the State of California or a State agency, Office, or officer shall be interpreted to refer to the City or its corresponding agency, office, or officer.

Standard Specifications – The latest edition of the Standard Specifications of the State of California, Department of Transportation. Any reference therein to the State of California or a State agency, Office, or officer shall be interpreted to refer to the City or its corresponding agency, office, or officer acting under this contract.

Transportation Building – Sacramento – City Hall, City of Napa, State of California.

Utilities Department – The City of Napa’s Water and Solid Waste Recycling Divisions. Utilities office located at 1700 Second Street, Suite 100.

Water Division Engineer – Engineer from the Utilities Department or properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Water Division Inspector – Inspector from the Utilities Department or properly authorized agents, such agents acting within the scope of the particular duties entrusted to them.

Water Distribution System – The water system owned and operated by the City of Napa including, but not limited to, distribution pipelines, transmission pipelines, and all appurtenances.

1.04 CONSTRUCTION PLANS

Complete construction plans and specifications for all proposed and required improvements, including any necessary dedications and easements, shall be submitted to the City Engineer for review and approval and must be approved prior to the start of construction. The plans and specifications are to be prepared by a Registered Civil Engineer. Additional information may be required including, but not limited to, drainage calculations, geotechnical report, material tests, and right-of-way descriptions.

If alterations or revisions to the plans are required, they shall be properly designed and shown on the plans by the engineer. The plans shall not be considered approved until the City Engineer has signed the approval block on the plans. All construction shall be based on approved plans. There shall be no changes made to a set of approved plans unless such changes or additions are resubmitted to the City Engineer for approval.

In approving a set of plans the City Engineer is approving only those features that do not conflict with State Law, the Napa Municipal Code, these Standard Specifications, conditions of approval of the project, and accepted good engineering practice. It is the design engineer’s responsibility to ensure that the plans meet all of the above criteria. The City Engineer is not obligated to review the plans before approval but does have the authority to do so. Errors, omissions or conflicts which may have been overlooked by the City during plan check are subject to correction and redesign by the design engineer at any time they are discovered prior to acceptance of the
completed work or release of bond by the City.

1.05 GENERAL CONSTRUCTION NOTES

The following notes are required on all plans for public improvements. Additional site-specific notes may be added as necessary.

**City of Napa General Construction Notes**

1. All workmanship and materials for both on-site and off-site improvements shall conform to the most recent edition of the City of Napa Public Works Department (Public Works) Standard Specifications and addendums, and/or the 2015 edition (or most recent) of the State of California (Caltrans) Standard Specifications, Standard Plans, and the geotechnical report and all the notes shown. The contractor shall have a copy of all documents available at the job site at all times. All on site improvements shall be inspected and certified by the Engineer of Record. Improvements in the public right of way shall be inspected by Public Works.

2. The developer/contractor shall contact the Construction Division at 707-257-9520 to schedule a preconstruction meeting prior to the commencement of any and all work. During the duration of the project, rolling 3-week lookahead schedules will be required to be submitted weekly.

3. The contractor and all subcontractors must call underground service alert (USA north 811 or 1-800-227-2600) prior to the start of any work on the project site. Each contractor shall submit a copy of their USA tag to the City for verification. The contractor shall also call any company or agency for service locations who are not a member of underground service alert. Contractor shall be responsible for the verification of all existing utilities in the field. Locations of utilities and underground facilities shown are approximate and for general information only. The contractor is responsible for removing USA markings after the completion of construction from the public right of way.

4. The developer/contractor shall coordinate all necessary utility inspections, scheduling and relocations with the appropriate utility companies.

5. All work shall be in accordance with the prevailing governing agency. For discrepancies between these plans and those agencies’ regulations and Standard Plans, agency requirements shall prevail.

6. The developer/contractor shall provide a minimum of two – 24 hour a day emergency telephone numbers of the person(s) who can respond to the project.

7. All materials shall be furnished and installed by the developer/contractor unless otherwise noted on the plans.

8. Developer/contractor shall conform to existing streets, surrounding landscape and other improvements with a smooth transition in paving, curbs, gutters, sidewalks, grading, etc., and to avoid any abrupt or apparent changes in grades or cross slopes, low spots or hazardous conditions.
9. For all construction activities including but not limited to: grading, fencing, retaining walls, tree trimming, storm drainage, or any other type of work, that occur on adjacent property, the developer/contractor shall provide the City a right-of-entry/temporary construction easement signed by the owner of record of the affected/adjacent property prior to start of construction.

10. The contractor shall notify all customers of service interruptions 48 hours in advance with door hung notices. Interruption scheduling shall be authorized in writing by Water Division Engineer.

11. Construction activities throughout the entire duration of the project shall be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Friday. There shall be no startup of machines nor equipment prior to 8:00 a.m., Monday through Friday; no delivery of materials nor equipment prior to 7:30 a.m. nor past 5:00 p.m., Monday through Friday; no cleaning of machines nor equipment past 6:00 p.m., Monday through Friday; no servicing of equipment past 6:45 p.m., Monday through Friday; and construction on weekends or legal holidays shall be limited to the hours of 8:00 a.m. to 4:00 p.m., unless the contractor submits a written request and that request is approved by the City Manager, or their designee, pursuant to section 8.08.025 & 8.08.050 of the City Municipal Code. If the request to work outside of the designated hours is approved, the Contractor may be required to pay the cost of providing inspection services for the work being performed. If inspection services are not available for the requested change, the City Engineer may deny the request. The City Manager, or designee, shall grant such permit:

   A. For emergency work;
   B. Other work, if work and equipment will not create noise that may be unreasonably offensive to neighbors as to constitute a nuisance; or
   C. If necessary to protect the public health, safety, and welfare.

All muffler systems on construction equipment shall be properly maintained. All construction equipment shall not be placed adjacent to developed areas unless said equipment is provided with acoustical shielding. All construction and grading equipment shall be shut down when not actively in use.

If an inspector is required to be onsite for work outside of the Monday through Friday work hours, the contractor shall request from the City, in writing, 72 hours prior to the work, for approval. If prior written notice is not provided, the request will be denied, and construction work may not be performed. Additional fees may be charged for work outside of the Monday through Friday work hours. The City reserves the right to deny all work outside of the Monday through Friday work hours.

Developer/contractors will be given one (1) warning for work starting prior to or after the work hours stated above. After the first warning is given, any violations of time will result in an automatic five (5) working day shutdown of the entire project.

No staging or deliveries in the public right of way unless approved per written request.

The City Engineer, Planning Commission or City Council may impose additional limitations on working hours and noise based on the special circumstances that may
be associated with a particular project. In which case, the more stringent limitations shall apply.

12. The Contractor shall be responsible for the protection of all existing survey monuments and control points. All monuments destroyed during construction shall be resurveyed and replaced by the contractor and at the contractor's expense as outlined in the business and professions code, section 8771.

13. The Contractor shall provide the City submittal(s) for all material to be installed within the public right of way on the project. Construction shall not start prior to submittals being approved. Prior to being submitted to the City, the designer of record shall review and approve such right of way submittal.

14. Site security, perimeter controls, and site safety are the responsibility of the developer/contractor and shall be installed and maintained during all phases of construction. Temporary 6ft chain link fencing with opaque screening shall be used for site security unless another method is submitted and approved for use by the City.

**Project Acceptance Notes**

1. Prior to project acceptance, the Engineer of Record, the Surveyor of Record, and the Geotechnical Engineer of Record shall submit an engineer's stamped certification letter to the City.

2. Prior to project acceptance all items on the deficiency list shall be corrected and signed off by all divisions.

3. Geotechnical Engineer of Record shall submit a final report and summary of tests of all testing and design changes prior to acceptance.

4. Prior to project acceptance, mylars and CAD files of accurate "record drawings" shall be submitted to the City, stamped and signed with the following:
**Record Drawing**

| Date of completion: | ____________________________ |
| Contractor:         | ____________________________ |
| Engineer:           | ____________________________ |
| Surveyor:           | ____________________________ |
| Geotechnical:       | ____________________________ |
| Engineer of Record  | ____________________________ |
| Stamped and signed by: | ____________________________ |

**General Traffic Notes**

1. All traffic control required for construction activities shall conform to the requirements of the latest edition of the California Manual on Uniform Traffic Control Devices (CA MUTCD). For full street closures, a written explanation detailing the need for full closure shall be accompanied with a traffic control plan and submitted to the City Engineer for review and approval. For all lane and sidewalk closures and detours, a traffic control plan shall be submitted to the City Engineer for review and approval at least ten working days before the scheduled closure. Construction will not be allowed to start prior to the approval of the traffic control plan.

2. All traffic control plans shall be a CAD drawing format plan with complete details and tables. Aerial photos, hand drawn plans, and notes are not acceptable.

3. Traffic control shall be per CA MUTCD, Section 6 (Section 5 is not allowed).

4. “NO PARKING” signs shall be placed 48 hours prior to the work to be completed within an area of designated public parking. No parking signs shall be filled in with all pertinent information of the exact time the work is to take place. Signs shall be clear as to when the public may park in the area outside of the construction time. If work is staged or delayed, then all “NO PARKING” signs shall be removed and new no parking signs shall be placed 48 hours prior to when work is ready to resume. Signs shall be placed approximately every 50 feet apart.

5. Pedestrian and bike access through and/or adjacent to the project site shall remain unobstructed during the project construction or an escort shall be established as approved by the City.

6. The contractor is required to maintain all traffic control equipment in-place during work activities and shall remove all traffic control that is not needed and return accessible travel for the public during non-work hours or days.
7. The City reserves the right to stop all work being performed for lack of traffic control or traffic control that is not per the approved traffic control plan.

8. The contractor is required to maintain all temporary pavement delineation until the permanent pavement delineation is placed. All permanent traffic striping shall be laid out and cat-tracked. The City shall have a minimum of ten working days to approve the striping layout and cat-tracking.

9. Traffic striping shall be thermoplastic with reflector unless otherwise specified.

10. Contrast striping shall be placed on all concrete roadway surfaces.

11. Prior to the street opening after HMA is placed, there shall be temporary paint, tape, or reflective makers placed per City Engineer’s approval. Contractor to wait a minimum of 5 days and a maximum of 10 days after HMA is placed before permanent striping is placed.

12. Bike Lane legends shall be helmeted cyclist with arrow.

13. Green-backed dashed bike lanes shall be placed at Conflict Zones.

14. All median noses shall be painted to match the road striping leading to the nose.

15. Type Q markers shall be placed one foot (1’) back from all median noses.

16. Median noses shall be signed at intersections and at the start of a median chain.

17. All traffic signs (excluding temporary construction signs) shall have 3M diamond cubed retro-reflective or equivalent base and 3M 1160 protective overlay film or equivalent.
Solid Waste and Recycling Notes

1. All plans for non-residential and/or multi-family development with common prescribed collection areas shall comply with the solid waste and recycling enclosure standards prescribed by City Council resolution R2008-185 or as it may be updated by subsequent council action. Current enclosure standards can be found at www.cityofnapa.org/832/ENCLOSURE-STANDARDS-UPDATE.

2. During the construction & demolition period of the project, the contractor shall comply with all provisions of the City of Napa’s Construction & Demolition Debris (C&DD) recycling ordinance contained in chapter 15.32 of Napa Municipal Code. The C&DD recycling ordinance requires site separation and recycling (or composting) for designated recyclable materials such as clean wood, concrete, metal, yard waste and other salvageable materials, and requires that all projects exceeding 5000 square feet or $100,000 in project valuation achieve a minimum level of 50% diversion from landfill disposal. All qualifying project applicants must submit a waste reduction and recycling plan (WRRP) and have the WRRP approved by the City before a City building or demolition permit is issued. Also, the City will determine compliance or non-compliance with approved WRRP and City’s C&DD ordinance before a certificate of occupancy or temporary certificate of occupancy is issued by the City. A City determination of non-compliance for a given project may result in a fine as prescribed in the City’s C&DD ordinance. Details on the City’s C&DD ordinance, including a frequently asked questions (FAQ) summary, can be found at www.cityofnapa.org/709/CONSTRUCTION-AND-DEMOLITION-DEBRIS-RECYC.

Electrical Construction Notes

1. All City electrical & communications conduits installed, to include trenching, and conduit placement shall be inspected by the City of Napa Electrical Division prior to backfill, conduits shall be minimum 24-inches deep in the clear from finished grade.

2. 12mm wide, polyester fiber detectable pulling tape, with printed markings sequentially every foot, along with one, 22 awg detectable solid copper wire attached shall be required in all empty conduits.

3. Exact locations of all streetlight and traffic signal standards, pedestals and cabinets shall be determined by City of Napa Public Works/Electrical Division prior to installation. Signal and lighting standards shall be at least 3 feet from face of curb unless otherwise specified.

4. Pull boxes shall be placed in sidewalk areas or other locations to be determined by City of Napa Electrical Division. Pull boxes shall not be placed in driveway approaches, vehicle traffic lanes, or in sidewalk handicapped ramp areas.

5. All traffic signal heads shall be 12-inches and have a louvered backplate and tunnel visors.
6. All cobra head luminaires shall be supplied with a twist lock photocell receptacle unless otherwise specified.

7. Streetlight and traffic signal related equipment and components shall be per the 2015 Caltrans Standard Specifications unless otherwise noted on the improvement plans which will also list equipment and components specific to City of Napa standards.

8. All lighting, to include traffic signal heads and streetlights shall be L.E.D. as approved by the City.

9. All materials required to be removed & salvaged, shall be delivered to City of Napa Corporation Yard at 770 Jackson Street without damage.

10. Contact City of Napa Electrical Division at 707-257-9588, 48 hrs in advance for all inspections and/or delivery of equipment.

Street Section and Sidewalk Construction Notes

1. Areas to be developed shall be cleared of vegetation, trees, tree roots, debris and any remnants of foundations or abandoned utilities. The area shall be stripped of the upper soils containing organic matter. All contaminated material shall be disposed of according to the guidelines of the Environmental Protection Agency (EPA).

2. All Class II aggregate base shall be sampled and tested for sieve analysis, r-value, sand equivalent and maximum density within 10 days of submitting the submittal to the City Engineer for approval. The City shall receive the submittal a minimum of five working days prior to scheduled use.

3. Job mix formula (JMF) for all hot mix asphalt (HMA) to be used (except for miscellaneous areas and dikes) shall be submitted to the City Engineer for approval. The JMF documents the testing data developed by the mix design laboratory and shall be submitted on Caltrans form CEM-3152 and dated within 12 months of planned pavement work. Hot mix asphalt shall be sampled and tested in accordance with Caltrans Construction Manual, Chapter 4 ‘Construction Details’ 4-3930D (5) ‘Sampling and Testing Hot Mix Asphalt’. Obtain split samples of HMA from the mat behind the paver or other location approved by the Inspector.

4. All trench backfill shall be tested per ASTM D1557 by the geotechnical engineer for compaction. If the trench backfill is more than 12-inches deep, compaction testing shall be completed as each lift of fill is placed and compacted. Each lift of material shall not exceed 12-inches in depth. Prior to paving, all trenches shall be tested, and all test results shall be submitted to the City. All test results, both passing and failing shall be shown and provided to the City. The City reserves the right to request additional field testing to be performed.

5. The subgrade shall be scarified, processed and compacted to a minimum of 95% relative compaction per ASTM D1557/ASTM D6938, and shall be firm and unyielding. Proof-rolling of the finished subgrade shall be performed by the contractor using a fully loaded 3-axle water truck and reviewed and approved by the City Inspector prior to placement of additional materials. Proof-rolling shall be observed by the
contractor’s licensed geotechnical engineer and the City Inspector. The developer's/contractor's licensed geotechnical engineer shall provide in writing an appropriate method to stabilize the areas of deflection. Attention is directed to City Standard Specification Section 1.10.10, “Earthwork” for “Yielding Subgrade” approval. All compactions shall be tested with a nuclear gage.

6. The Class II aggregate base structural section shall be moisture conditioned and compacted to a minimum of 95% relative compaction per ASTM D1557/ASTM D6938 and shall be firm and unyielding. Proof-rolling of the finished aggregate section shall be performed by the contractor using a fully loaded 3-axle water truck and reviewed and approved by the City Inspector prior to placement of asphalt concrete. Proof-rolling shall be observed by the contractor’s licensed geotechnical engineer and the City Inspector. The developer’s/contractor’s licensed geotechnical engineer shall provide in writing an appropriate method to stabilize the areas of deflection. All aggregate base compaction shall be tested with a nuclear gage.

7. HMA shall be tested for compaction per Caltrans Cal 375 test, minimum 95% compaction required.

8. The project shall comply with the geotechnical report recommendations and the approved plans. The geotechnical report shall be onsite and available to reference.

9. The improvement plans shall show an appropriate ‘Pavement Design Chart’ with columns for street names; stationing limits for different pavement sections, if used; traffic index; ‘R’-Value; AC thickness; AB thickness; and AS thickness (if used); etc. The street names and station limits shall be shown with the traffic index, which shall be subject to the city’s approval. The ‘R’-Value and section thickness shall be left blank. A note shall state that the thicknesses will be entered after ‘R’-Value testing. The street structural section shall be determined by the registered geotechnical engineer of record and shall be shown in the “Pavement Design Chart” on the approved improvement plans. The improvement plans sheet on which the competed pavement design chart appears shall be submitted to the city as an official, dated, clouded revision, and the work shall not be performed until the city has approved the revision.

10. Street restoration limits on existing street pavement whenever a street is cut (either by a longitudinal or transverse cut) for utility or other improvement installations, regardless of limits of overlay shown on the improvement plans, shall be per the City’s Pavement Restoration Limits Table. The resurfacing shall extend a sufficient distance beyond any cut to ensure a smooth transition and shall consist of a full 2-inch-deep grind for the entire area and a 2-inch asphalt concrete overlay. Street resurfacing will be required for all cuts resulting from improvements that include but are not limited to pavement widening, curb and gutter, storm drain, water, sewer, signal, lighting, and other utilities for the project. The limits of the overlay may be extended beyond the project frontage of the parcel and/or 10 feet on either side of the trench to cover all the utility trench cuts at the discretion of the City after all underground infrastructure has been installed.
11. All manhole and boxes shall be lowered prior to performing any street grinding and overlay.

12. All manholes and boxes shall be raised to grade after all paving is competed. The asphalt concrete shall be circle cut to full depth of the asphalt concrete for all manholes and boxes. Jack hammering asphalt to raise iron will not be allowed. Use of sack mix shall not be allowed.

13. All new concrete shall be doweled to existing concrete; minimum 18-inches spacing on sidewalk and 24-inches spacing on curb and gutter; with #4 rebar embedded 6-inches deep. If concrete is placed in sections or phases, the new concrete shall be doweled together.

14. Any PCC curb placed on top of existing or new asphalt concrete shall be epoxy-dowelled on 4 feet centers and glued down to the surface.

15. Any concrete placed that becomes tagged, defaced, cracked or damaged shall be replaced prior to project acceptance. Spot patching repairs of concrete is not allowed. Any permanent reference point marks made into concrete is not allowed. If done, entire section of concrete from joint to joint shall be removed and replaced.

16. All survey monument(s) shall be installed prior to final sign-off of the project as shown on the improvement plans or final map.

**Landscape, Irrigation and Tree Notes**

1. All trees within the public right-of-way must be protected from construction damage. A tree protection plan for said protection must be submitted and approved by the City via authorized signature, before work begins. Plans shall incorporate ANSI A300 (part 5) – 2012 Best Practices as well as companion publication: Managing Trees During Construction, second edition. It is recommended a professional arborist be retained for this purpose. Monitoring of plans pre-construction, during construction and post construction phases is necessary.

2. Prior to any other site work, protective fencing shall be installed a minimum of one foot beyond the canopy drip line of any tree to be saved. The fence should be sturdy, highly visible and solidly anchored to the ground. The fencing shall remain in place continuously during all phases of construction. This tree protection zone (TPZ) shall be posted with warning signs in English and Spanish to alert equipment operators and contractors about the protected status of the TPZ. Signs should contain contact information for the contractor.

3. Activities within the TPZ that compact the soil or physically damage the tree shall be avoided or mitigated.

4. Removal or pruning of any protected native tree, significant tree or tree within the public right-of-way requires a permit from the City of Napa Parks and Recreation Services Department unless it is approved via authorized signature on the development plans. Trees removed shall be completely removed and cut to grade.
Trees to be removed shall be posted 3 days prior indicating that it will be removed, and the removal has been approved as part of an approved development project.

5. Street trees shall be planted within the street right-of-way per City Standard Plan T-1, T-2, T-4, and T-5 at developer’s expense. Any street tree spacing shown on the plan is approximate. Contractor shall contact the City’s Parks and Recreation Services Department 707-257-9529, after all driveways and utilities are installed. City tree division staff shall mark locations of trees required. A list of tree varieties approved for planting is available at the Parks and Recreation Services Department Office or on the City website.

**Stormwater Notes**

1. Contractor shall meet the requirements of discharging to a public storm drainage system as required to ensure compliance by the City with all state and federal laws and regulations related to storm water as stipulated in the Clean Water Act. Contractor shall meet the requirements of the National Pollutant Discharge Elimination System (NPDES) permit in effect prior to completion of project construction for storm water discharges from the Municipal Stormwater System operated by the City of Napa. Contractor shall comply with the Stormwater Pollution Prevention Plan (SWPPP) (project > 1 acre) and/or Erosion and Sediment Control Plan (ESCP) (projects <1 acre) and the Stormwater Control Plan (SCP) submitted by developer as part of its application as (modified and) approved by the director of Public Works or City Engineer.

**Storm Drainage Notes**

1. All storm drains within the City right of way shall be designed using rubber gasket reinforced concrete pipe (RCP). All RCP shall be Class III, unless the depth of the pipe requires a stronger pipe.

2. All connections made to intersecting storm drain lines shall be made at a manhole or drain inlet. Direct connections to storm drain lines are not allowed.

3. If, by special design, plastic pipe is approved for installation of storm drainage systems, water stops shall be installed.

4. Storm drain lines shall not be installed exceeding the maximum deflection of each joint. In no case, shall the rubber gaskets be exposed. If the deflection exceeds the allowable limit per the pipe manufacture, a manhole or junction box must be installed.

5. A 60-inch manhole shall be used for all storm drain lines larger than 24-inches or where more than two storm drain pipes enter the manhole.

6. All storm drain systems shall be videotaped at the completion of subgrade or prior to placement of HMA.

7. Provide stormwater conveyance system stenciling and signage for both private development and public right of way.
A. Provide concrete stamping, or equivalent, of all stormwater conveyance system inlets and catch basins within the project area with prohibitive language (e.g. “no dumping drains to Napa River”).

B. Post signs and prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks with the project area, trailheads, parks, building entrances, and bioretention facilities.

**Fire Department Notes**

1. The City of Napa Fire Department requires that a fire hydrant be in service within 250 feet of the furthest point of construction prior to the stockpiling of combustible materials or the beginning of construction.

2. If the streets or access roads in a development are not paved from October 15th through April 15th, the City requires that a temporary all access weather access road be provided.

3. In accordance with the City of Napa Standard Specifications and Standard Plans, Section 3.04.02 “Fire Access Requirements (for Building Construction)” temporary all weather construction phase Fire Department access route structural sections shall consist of a minimum of 12-inches of base rock material over either: (1) a lime treated subgrade, or (2) a subgrade covered with fabric in accordance with the following design criteria:

   A. Subgrade is defined as the native soil at the bottom of the access route structural section, excavated to the lines and grades shown on the project grading plan, and provided with a discharge for the collected storm water runoff, as approved by the City Engineer.

   B. Base rock shall be Class II aggregate base compacted to at least 95% relative compaction.

   C. Base rock shall be placed only on a firm and unyielding (compacted to at least 95% relative compaction) excavated and drained subgrade.

   D. Lime treated subgrades shall be designed in accordance with the recommendations of a geotechnical engineer and compacted to at least 95% relative compaction.

   E. Fabric shall be a ground stabilization fabric such as Mirafi 600X or equivalent.

   F. Fire Department access shall be a minimum 20 feet in width and provided so that a 150-foot length of hose can be extended from the parked fire vehicle to all points along the exterior perimeter of all structures.

   G. Alternate all weather access road sections may be proposed by a geotechnical engineer and submitted to the Public Works director for approval. Approval of the Public Works director and fire marshal is required for alternate all weather access roads.
Sewer Notes

1. All sanitary sewer improvements shall be constructed per the current version of Napa Sanitation Districts (NSD) sanitary sewer and recycled water standards.

Water Notes


2. Water-sewer separation: Water-sewer (or water-recycled water) separation shall comply with all State Water Resources Control Board requirements. Parallel construction: 10 feet of horizontal separation. Perpendicular construction: water mains at least 1 foot above sewer and recycled water lines.

3. Existing water facilities: Contractor shall locate by excavation all existing water facilities prior to any construction activities. If conflicts arise, an alternate design must be submitted to the City for approval.

4. Obstructions: Trees, foundations, or other permanent structures shall not be installed within 10 feet of any water facility. No obstructions (signpost, mailbox, wall, fence, etc.) shall be installed within 3 feet of any water facility. See Standard Plan W-18 for additional requirements.

5. Construction water: Water supplied from the City of Napa system shall be taken through a metered service or fire hydrant meter. Fire hydrant meters shall be obtained by applying at the revenue/collections division in City Hall at 955 School Street, Napa, (707-257-9508). A form is available online at: www.cityofnapa.com/newdevelopment under the section, Construction Water/Hydrant Meters.

6. Inspection: Public water facilities up to and including the water meter shall be inspected by the Water Division Inspector (contact 707-257-9521 to schedule inspection). All water facilities between the water meter up to and including the backflow device shall be inspected by the Water Division Backflow Prevention Specialist (contact 707-257-9544 to schedule inspection). All new water facilities shall be tested and inspected prior to activation.

7. Water service interruption: Contractor shall be responsible for notifying affected water customers a minimum of 48 hours (2 business days) in advance. All valves shall be operated by City personnel. Contractor shall schedule all water service interruptions by calling 707-257-9544.

8. Joint deflection: Maximum deflection at pipe joints shall not exceed 3° with a maximum offset of 10-inches per 18-foot length (minimum radius = 345 feet) or as set forth by manufacturer specifications or installation procedures.

9. Corrosion protection: Ductile iron pipe shall be cathodically protected in accordance with the City of Napa Standard Specifications, Plans and the City of Napa’s water distribution system provisions. All bolts, studs washers, nuts, etc., shall be stainless steel minimum grade 304SS with teflon coated nuts or City approved equal.
10. **Valves:** Valves shall be installed as shown in the approved plans and comply with City of Napa Standard Plan W-9. All water service valves shall be placed immediately after the tee or hot tap.

11. **Fire hydrants:** Fire hydrant installations shall comply with City of Napa Standard Plan W-8. Fire hydrant(s) not in service shall be completely covered.

12. **Services:** Water service installations shall comply with applicable City of Napa Standard Plans. Fire service meters shall be installed on all fire services with private fire hydrants. All hot-taps to existing mains shall be conducted by the City at the contractor's expense. A water system shutdown shall be required in all cases where the proposed water service is the same size as the existing pipeline supplying the proposed water service(s).

13. **Backflow devices:** Backflow prevention devices shall be installed on all new services and comply with City of Napa Standard Plans W-5 (A, B, C, & D) and W-7 (A, B, C & D). Approved backflow prevention devices shall be installed and tested, and water meters (if applicable) shall be set, prior to any use of water service. Water meters (if applicable) shall be installed in the locked position until passing test results are received by the City of Napa. Use of jumpers, hose bibs, or other devices shall not be permitted.

14. **Backfill:** Water main trench backfill shall comply with City of Napa Standard Plan W-13A.

15. **Tie-ins:** New tie-ins to existing City water mains shall be conducted under City inspection only after pressure testing, chlorination, and bacteriological testing is complete. All hot-taps to existing mains shall be conducted by the City at the contractor's expense. Water system cut-in connections shall be performed by the contractor under Water Division supervision. Valves are to be operated by city staff only. A water system shutdown shall be required in all cases where new pipeline tie-ins are the same size or greater (i.e. size-on-size).

16. **Meter installation(s) and water service activation:** Meter installation(s) shall occur upon receipt of the parcel address(es) and responsible billing party. All pressurized services shall be considered active and billable.

17. **Pressure:** Contractor shall install pressure regulators on all water service connections (property owner's side) where pressures exceed 80 pounds per square inch (psi).

18. **Documentation and record drawing:** All new water system installations shall be GPS surveyed within 5 business days of installation and before backfill. Contractor shall schedule all surveys by calling (707) 257-9521. Record drawings shall be submitted within 20 business days after water system activation.

### 1.06 AGREEMENTS AND BONDS

The Developer shall enter into an agreement with the City for constructing on-site and off-site improvements, in accordance with approved plans and profiles. The agreement shall be secured by a faithful performance bond or cash deposit in an amount equal to one hundred percent (100%) of the contract price, and a bond to guarantee payment of all claims for labor and material furnished, in an amount equal to fifty percent (50%) of the contract price. Agreement bonds shall
be on the City of Napa forms available at the Public Works Department, or on a substantially similar form as approved by the City Attorney.

In conjunction with the submittal of bonds, the Developer shall furnish the following information: (a) the original, or a certified copy, of the unrevoked appointment, power of attorney, bylaws, or other instrument entitling or authorizing the person who executed the bonds to do so; (b) a certified copy of the certificate of authority of the insurer issued by the Insurance Commissioner of the State of California; and (c) a certificate pursuant to CCP 995.640(a) from the clerk of Napa County that the certificate of authority of the insurer has not been surrendered, revoked, canceled, annulled, or suspended, or, in the event that it has, that renewed authority has been granted.

The agreement shall specify that the proposed improvements will be completed within a certain time limit and if the proposed improvements are not satisfactorily completed within the time limit, the City shall complete the improvements and the faithful performance or cash bond shall be forfeited.

The final acceptance of the work will be contingent upon your guaranty which may be either an extension of the original Faithful Performance Bond or a separate Maintenance Bond in the amount of ten percent (10%) of the final Contract price in favor of the City. Should you not file said bond as required herein, the City may retain the remaining five percent (5%) of the final Contract price as a cash bond for said one (1) year period.

1.07 CONTROL OF WORK

1.07.01 SANITATION FACILITIES

The Contractor shall conform to the requirements of Section 13.16.070 of the Napa Municipal Code, requiring the maintenance of not less than one chemical toilet, approved by the Health Officer, on the premises, for each twenty (20) employees or fractional part thereof working at a construction job site, unless specifically exempt from this requirement by the City Engineer. Alternate sanitary facilities if suitably located and adequately available may be substituted for the facilities required by Section 13.16.070, subject to approval of the City Engineer.

1.07.02 CLEANLINESS OF STREET

Attention is directed to Section 12.16.100 of the Napa Municipal Code which reads:

Vehicles Spilling Loads: It is unlawful for any person to use any vehicle for the conveyance or removal of dirt, gravel, rock or other material without having the same so constructed and loaded as to prevent contents thereof from being scattered or deposited upon the streets over which said vehicles may be driven.

The Contractor may be directed by the City Engineer to use commercial street-sweepers for cleanliness of streets and frequency.

1.07.03 PROJECT APPEARANCE

The Contractor shall maintain a neat appearance of work. In areas visible to the public, the following shall apply:

1. When practicable, broken concrete and debris developed during clearing and grubbing shall be disposed of concurrently with its removal. If stockpiling is necessary, a written
request shall be provided by the Contractor or Developer to the City and the material shall be removed or disposed of within a time frame approved by the City Engineer.

2. Contractor shall furnish trash bins for debris from structure construction. Debris shall be placed in trash bins daily. Contractor shall secure City’s approval of trash bin location prior to placement of trash bins. The City does not guarantee that a trash bin can be located within the project limits.

3. Forms or falsework that are to be re-used shall be stacked neatly concurrently with their removal. Forms and falsework that are not to be re-used shall be disposed of concurrently with their removal.

1.07.04 AREAS FOR CONTRACTOR USE

Attention is directed to Section 5-1.32, "Areas of Use," of the Standard Specifications and these City Standard Specifications.

Overnight storage and staging of materials within the right of way will not be allowed unless approved in writing by the City Engineer. Any staging areas used by the Contractor shall be subject to the provisions of “Water Pollution Control”, of these City Standard Specifications. Use of the Contractor’s staging areas shall be at the Contractor’s own risk and the City shall not be held liable for any damage or loss of materials or equipment located within such areas.

The highway right of way shall be used only for purposes that are necessary to perform the required work. The Contractor shall not occupy the right of way, or allow others to occupy the right of way, for purposes which are not necessary to perform the required work.

Temporary storage of equipment and materials on the parcels adjacent to the right of way will be subject to the approval of the City Engineer on a parcel-by-parcel basis. The Contractor shall fence each of the parcels approved for construction use with 6’ high temporary chain link fencing completely covered with opaque black mesh screening. The Contractor shall maintain the fencing continuously. Use of the Contractor’s work areas and other City-owned property shall be at the Contractor’s own risk, and the City shall not be held liable for any damage to or loss of materials or equipment located within such areas.

1.07.05 WORK SAFETY

The Contractor shall assume sole and complete responsibility for job site conditions for the duration of the project including, but not limited to, the safety and health conditions on the work site. This requirement shall apply continuously and shall not be limited to normal working hours. Contractor shall comply with all applicable provisions of law including the standards, rules, regulations and orders established by the California Division of Industrial Safety. Contractor shall furnish and use safety devices and safeguards and shall adopt and use practices, means, methods, operations, and processes which are reasonably adequate to render the work site safe and healthful. Contractor shall take all steps necessary to ensure that any hazardous condition is corrected promptly either by the Contractor or by assigning such responsibility to the appropriate subcontractor and ensuring that the corrections are completed. The City, design engineer, construction manager and the officers, agents or employees, shall not have charge of or responsibility for construction or safety means, methods, techniques, procedures, as these are solely the responsibility of Contractor.
1.07.06  CONFINED SPACES

For any work that is to take place in a confined space, the Contractor shall comply with all CAL/OSHA regulations concerning entry into confined spaces. Confined space for the purpose of this Article shall mean the interior of storm drains, sewers, vaults, utility pipelines, manholes, reservoirs, and any other such structure which is similarly surrounded by confining surfaces so as to permit the accumulation of dangerous gases or vapors.

Tests for the presence of combustible or dangerous gases shall be made with an approved device immediately prior to a worker entering a confined space and at intervals frequent enough to ensure a safe atmosphere during the time a worker is in such a structure. A record of such tests shall be kept at the job site.

Sources of ignition, including smoking, shall be prohibited in any confined space until after the atmosphere within the confined space has been tested and found safe.

No employee shall be permitted to enter or remain within a confined space until such confined space is free of concentrations of harmful gases, and lack of oxygen, unless the employee is wearing suitable and approved respiratory equipment.

Confined spaces that contain or that have last been used as containers of toxic gases, light oils, hydrogen sulfide, corrosives, or poisonous substances, shall, in every case, be tested by means of approved devices or chemical analysis before being entered without wearing approved respiratory equipment.

Reservoirs, vessels, or other confined spaces having openings or manholes in the side as well as in the top shall be entered from the side openings or manholes when practicable.

1.07.07  RECORD DRAWINGS

Using colored ink, the Contractor shall make changes on a set of clean prints of the project plans and submit to the City Engineer for review. Indicate all changes and revisions to the original design that affect the permanent structures/facilities. Reference underground utilities to semi-permanent or permanent physical objects. Reference water, sewer, telephone, and electrical lines to corners of buildings and survey markers.

Prior to acceptance of the work, based on the Contractor’s record drawings described above, the Developer shall submit to the City Engineer one (1) set of printed As-Built drawings and one (1) set of As-Built Drawings in an electronic format approved by the City Engineer.

1.07.08  SOUND CONTROL REQUIREMENTS

Sound control shall conform to the provisions in Section 14-8, "Noise and Vibration," of the Standard Specifications and these City Standard Specifications.

The noise level from the Contractor’s operations, between the hours of 9:00 p.m. and 6:00 a.m., shall not exceed 86 dBA at a distance of 50 feet. This requirement shall not relieve the Contractor from responsibility for complying with local ordinances regulating noise level.

The noise level requirement shall apply to the equipment on the job or related to the job, including but not limited to trucks, transit mixers or transient equipment that may or may not be owned by the Contractor. The use of loud sound signals shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.
1.08 CONTROL OF MATERIALS

1.08.01 DISPOSAL OF MATERIAL

Disposal of material shall conform to Section 5-1.20B(4) “Contractor-Property Owner Agreement” of the Standard Specifications and these City Standard Specifications.

The Contractor shall make arrangements for disposing of materials outside the street right-of-way. Disposable material shall not be stockpiled in the street beyond the normal working hours. Material shall not be disposed of in any of the following areas:

1. Within the floodway of the City of Napa or the County of Napa.
2. Within the normal channel of any river, creek, stream, ditch, canal, swale or other water course and within the portions of the adjacent flood plain of same as are required to efficiently carry the flood flow, as determined by the Engineer.

Prior to any disposal of material, the Contractor shall obtain written permission from the owner of the proposed disposal site and provide a copy of said written permission to the City.

Whenever any material disposal location is visible from a public street, the disposal area shall be left in a neat and uniform manner to the satisfaction of the Engineer.

If the disposal site is within the City of Napa city limits, Contractor shall submit to the Engineer an approved grading permit and plan prior to disposing of the material. Grading permits are issued by the City of Napa, Building Inspection Division.

If the disposal site is located outside of the city limits, a grading permit from the affected agency as well as written permission from the owner of the disposal site shall be provided to the Public Works Department prior to commencement of the work.

1.08.02 COMPACTION AND TESTING

Attention is directed to Section 6-2, "Quality Assurance", of the Standard Specifications. Compaction of all earthwork materials shall be in accordance with Section 19-5, "Compaction," of the Standard Specifications and these City Standard Specifications.

A geotechnical firm shall be employed by Developers to observe the grading, trench backfill, and placement of aggregate base. A sufficient number of compaction tests shall be performed to ensure that the subgrade, trench backfill, aggregate base rock and asphalt concrete is installed and compacted in accordance with City Specifications. A summary report of the work performed, and the test results shall be submitted to the City. Proof roll to be accepted by the Engineer confirming firm and unyielding soils/materials.

If accepted aggregate base becomes saturated and/or disturbed, the subgrade must again be proof-rolled and testing soils and AB may be required.

All tests shall be per ASTM D1557 methodology. AC density testing per California Test 375 as required by the latest version of the Caltrans Standard Specifications, 95% minimum compaction.

1.08.03 INSPECTION AND ACCEPTANCE OF WORK

The City Engineer, or a duly authorized representative, shall at all times have access to the work during its construction. All completed work, and all materials furnished within the public
right-of-way shall be subject to inspection and approval by the City Engineer, or a duly authorized representative. Work and materials not meeting the requirements of the approved plans and specifications shall be made good, and unsuitable work or materials may be rejected. All work which has been rejected shall be remedied or removed and replaced in an acceptable manner. When the work has been completed, the City Engineer will make a final inspection.

All work performed outside of an existing or future public right-of-way shall be inspected and certified by the Engineer of Record that all work completed meets the requirements of the approved plans and specifications.

The Public Works Department is responsible for the overall coordination of the inspection process and is the primary inspector for certain portions of private developments. The Parks and Recreation Department is responsible for inspecting landscaping and irrigation projects that will be maintained by the City. The Community Development Department, Planning Division is responsible for inspecting landscaping and irrigation projects that will be maintained by private property owners and homeowners or similar associations.

When the City has made the final inspection and determined that the work has been completed in all respects in accordance with the plans and specifications, and the Engineer of Record has certified that all work under their review has been completed in all respects and in accordance with the plans and specifications, the City Engineer will formally accept the improvements. The Developer (for private projects) or the contractor (for City of Napa capital improvement projects) shall then guarantee all materials and workmanship against defects for a period of one year from the date of final acceptance of all work performed.

1.09 LEGAL RELATIONSHIPS AND RESPONSIBILITIES

1.09.01 INSURANCE

Section 7-1.06 “Insurance” of the Standard Specifications is amended to read as follows:

The Developer shall provide and or maintain insurance in accordance with the most current requirements of the City of Napa Risk Manager.

1.09.02 INDEMNIFICATION

Section 7-1.05 “Indemnification” of the Standard Specifications is amended to read as follows:

Hold Harmless: The Developer shall be solely responsible and save City harmless for all matters relating to the payment of Developer employees and agents, including compliance with social security, withholding and all other regulations governing such matters.

Indemnification: Developer hereby warrants that the design and construction of required improvements will not adversely affect any portion of adjacent properties and that all work will be performed in a proper manner and in accordance with all applicable laws and regulations. To the full extent permitted by law, Developer agrees to indemnify, defend, release and save harmless City, its officers and employees from and against any and all claims, suits, liabilities, actions, damages, penalties or causes of actions by any person including Developer, owner, their employees and agents for (a) any personal injury, death, or damage to property from any cause whatsoever in whole or in part arising out of or in connection with this Agreement or the actions and obligations hereunder or approval of Developer’s project, and (b) any failure to comply with all applicable laws and regulations,
including, without limitations, any requirement regarding payment of prevailing wages. This indemnification shall extend, without limitation, to injuries to persons and damages or taking of property resulting from the design or construction of the subdivision or its improvements and to adjacent property owners as a consequence of diversion of waters or design or construction of public drainage systems, streets or other public projects. Developer shall so indemnify City regardless of City’s passive negligence, City’s approval of plans or City’s inspection, approval or acceptance of the improvements and notwithstanding any limitation on the amount or type of damages or compensation payable by or for Developer under Workers’ Compensation, disability, or other employee benefit acts, the acceptance of insurance certificates required under this Agreement, or the terms, applicability, or limitations of any insurance held by Developer. The provisions of this paragraph shall continue to bind the parties after acceptance/approval of the works of improvement by City and release of all security.

1.09.03 PUBLIC SAFETY

The Contractor shall provide for the safety of traffic and the public in conformance with the provisions in Section 7-1.04, "Public Safety," of the Standard Specifications and these City Standard Specifications.

The Contractor shall install temporary railing (Type K) or water barrier between a lane open to public traffic and an excavation, obstacle or storage area when the following conditions exist:

A. Excavations

The near edge of the excavation is fifteen (15) feet or less from the edge of the lane, except:

1. Excavations covered with sheet steel or concrete covers of adequate thickness to prevent accidental entry by traffic or the public.
2. Excavations less than one (1) foot deep.
3. Trenches less than one (1) foot wide for irrigation pipe or electrical conduit, or excavations less than one foot in diameter.
4. Excavations parallel to the lane for the purpose of pavement widening or reconstruction.
5. Excavations in side slopes, where the slope is flatter than 1:4 (vertical : horizontal).
6. Excavations protected by existing barrier or railing.

B. Temporarily Unprotected Permanent Obstacles

The work includes the installation of a fixed obstacle together with a protective system, such as a sign structure together with protective railing, and the Contractor elects to install the obstacle prior to installing the protective system; or the Contractor, for the Contractor’s convenience and with permission of the City Engineer, removes a portion of an existing protective railing at an obstacle and does not replace such railing complete in place during the same day.
C. Storage Areas

Material or equipment is stored within 15 feet of the lane and the storage is not otherwise prohibited by the provisions of the Standard Specifications and these City Standard Specifications.

The approach end of temporary railing (Type K), installed in conformance with the provisions in this section "Public Safety" and in Section 7-1.04, "Public Safety," of the Standard Specifications, shall be offset a minimum of 15 feet from the edge of the traffic lane open to public traffic. The temporary railing shall be installed on a skew toward the edge of the traffic lane of not more than one foot transversely to 10 feet longitudinally with respect to the edge of the traffic lane. If the 15-foot minimum offset cannot be achieved, the temporary railing shall be installed on the 10 to 1 skew to obtain the maximum available offset between the approach end of the railing and the edge of the traffic lane, and an array of temporary crash cushion modules shall be installed at the approach end of the temporary railing.

Temporary railing (Type K) shall conform to the provisions in Section 12-3, "Temporary Traffic Control Devices," of the Standard Specifications. Temporary railing (Type K), conforming to the details shown on Standard Plan T3A and T3B, may be used.

Temporary crash cushion modules shall conform to the provisions in Section 12-3.22 "Temporary Crash Cushion Module" of the Standard Specifications.

Except for installing, maintaining and removing traffic control devices, whenever work is performed or equipment is operated in the following work areas, the Contractor shall close the adjacent traffic lane:

<table>
<thead>
<tr>
<th>Approach Speed of Public Traffic (Posted Limit)</th>
<th>Work Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 45 Miles Per Hour</td>
<td>Within 6 feet of a traffic lane</td>
</tr>
<tr>
<td>35 to 45 Miles Per Hour</td>
<td>Within 3 feet of a traffic lane</td>
</tr>
</tbody>
</table>

The lane closure provisions of this section shall not apply if the work area is protected by permanent or temporary railing or barrier.

When traffic cones or delineators are used to delineate a temporary edge of a traffic lane, the line of cones or delineators shall be considered to be the edge of the traffic lane, however, the Contractor shall not reduce the width of an existing lane to less than 10 feet without written approval from the City Engineer.

When work is not in progress on a trench or other excavation that required closure of an adjacent lane, the traffic cones or portable delineators used for the lane closure shall be placed off of and adjacent to the edge of the traveled way. The spacing of the cones or delineators shall be not more than the spacing used for the lane closure.

Suspended loads or equipment shall not be moved nor positioned over public traffic or pedestrians.

1.09.04 PRESERVATION OF PROPERTY

Attention is directed to Section 5-1.36, "Property and Facility Preservation," of the Standard Specifications and these City Standard Specifications.
D. Plants

Existing trees, plants, shrubs, lawns, other landscaping, irrigation equipment, and other private property that are not shown on the plans as to be removed and are injured or damaged by reason of the Contractor's operations, shall be replaced by the Contractor. The minimum size of tree replacement shall be 24-inch box and the minimum size of shrub replacement shall be 15-gallon container. Replacement ground cover plants shall be from flats and shall be planted 12 inches on center. Replacement of Carpobrotus ground cover plants shall be from cuttings and shall be planted 12 inches on center. Replacement planting shall conform to the requirements in Section 20-3.01C(4), "Replacement Plants," of the Standard Specifications. The Contractor shall water replacement plants in conformance with the provisions in Section 20-3.01C(3), "Watering," of the Standard Specifications.

Damaged or injured plants shall be removed and disposed of outside the highway right of way in conformance with the provisions in Section 20-3.01C(4), “Replacement Plants,” of the Standard Specifications. At the option of the Contractor, removed trees and shrubs may be reduced to chips.

Replacement planting of injured or damaged trees, shrubs and other plants shall be completed prior to acceptance of the work and shall conform to the provisions in Section 20-3.02, “Planting Plants,” of the Standard Specifications.

E. Monuments

The Contractor shall be responsible for the protection of all existing survey monuments and control points. All monuments destroyed during construction shall be resurveyed and replaced at the Contractor’s expense as outlined in the Business and Professions Code, Section 8771.

In the event the Contractor’s operations destroy any of the Engineer’s survey control points, the Contractor shall replace such control points at their expense, subject to verification by the City Engineer. The cost of any such verification of the Engineer’s survey control points will be deducted from any moneys due or to become due the Contractor.

1.09.05 PERMITS AND LICENSES

Attention is directed to Section 5-1.20B “Permits, Licenses, Agreements and Certification” of the Standard Specifications and these City Standard Specifications.

The Contractor shall provide any and all licenses and permits required by the Work. The Contractor shall abide by any and all Federal, State, County and City Laws and Rules affecting the work and shall maintain all required protection for property, employees and the public and insurance in connection with same, for all of which the Contractor shall bear necessary expense.

1.09.06 WORKING DAYS AND HOURS OF WORK

Attention is directed to Section 8-1.05 “Time” of the Standard Specifications.

Section 1-1.07 “Definitions” of the Standard Specifications defines a working day. Construction activities throughout the entire duration of the project shall be limited to the hours of 7:00 a.m. to 7:00 p.m., Monday through Friday. There shall be no startup of machines nor equipment prior to 8:00 a.m., Monday through Friday; no delivery of materials nor equipment
prior to 7:30 a.m. nor past 5:00 p.m., Monday through Friday; no cleaning of machines nor equipment past 6:00 p.m., Monday through Friday; no servicing of equipment past 6:45 p.m., Monday through Friday; and construction on weekends or legal holidays shall be limited to the hours of 8:00 a.m. to 4:00 p.m., unless the contractor submits a written request and that request is approved by the City Manager, or their designee, pursuant to section 8.08.025 & 8.08.050 of the City Municipal Code. If the request to work outside of the designated hours is approved, the Contractor may be required to pay the cost of providing inspection services for the work being performed. If inspection services are not available for the requested change, the City Engineer may deny the request.

All muffler systems on construction equipment shall be properly maintained.

All construction equipment shall not be placed adjacent to developed areas unless said equipment is provided with acoustical shielding.

All construction and grading equipment shall be shut down when not actively in use.

The City Engineer, Planning Commission or City Council may impose additional limitations on working hours and noise based on the special circumstances that may be associated with a particular project. In which case, the more stringent limitations shall apply.

1.09.07 FLOOD EVACUATION

Contractor shall be prepared to evacuate the construction site during a Flood Watch issued by the National Weather Service. The Contractor shall, upon 10 hours notification by the City Engineer that the National Weather Service has issued a Flood Warning for the Napa River or Napa Creek, evacuate the construction site. Evacuation shall include removal of all vehicles, equipment, tools, materials, personnel, stockpiled material (including earthwork), trash, etc. Removal shall mean relocation to an area outside the limits of the flood plain, or to an onsite area acceptable to the City Engineer, if such an area exists above expected flood elevations. Bridge falsework and constructed permanent improvements only may remain in place. In no event shall the Contractor allow any manmade object or substance to enter or contaminate the floodwaters.

The Contractor shall conduct such a flood evacuation whenever so notified by the City Engineer, and as many times as requested prior to final acceptance of the project.

1.10 CONSTRUCTION DETAILS

1.10.01 ORDER OF WORK

Order of work shall conform to the provisions in Section 4, "Scope of Work," and Section 5 "Control of Work" of the Standard Specifications and these City Standard Specifications.

Prior to beginning any excavation, the Contractor shall pothole all buried utilities and other man-made objects throughout the proposed area of work, check for conflicts, and provide the pothole data and written notice of any suspected conflicts between existing and proposed facilities to the City Engineer. Said pothole data and written notice shall be provided not less than fourteen (14) days prior to beginning any such excavation. For longer facilities such as buried pipelines, the Contractor shall pothole at an adequate number of locations, as approved by the City Engineer, to determine or verify the type, profile, size, and material of the facility.

Prior to saw cutting of existing curb, gutter, sidewalk, and/or driveway for removal and up to the time the new improvements are opened to the public, the Contractor shall erect and
maintain necessary signs and barricades as required in the sections titled “Maintaining Traffic" and “Public Safety,” of these City Standard Specifications.

1.10.02 WATER POLLUTION CONTROL

Water pollution control work shall conform to the provisions in the Napa Municipal Code, Chapter 8.36, "Stormwater Quality Control," and these City Standard Specifications.

The goal of these requirements is to prevent the pollution of storm water runoff from construction projects by keeping pollution out of storm drains, reducing the exposure and discharge of materials and wastes to storm water, and by reducing erosion and sedimentation. Storm drains discharge runoff directly to creeks and the river without treatment.

The following requirements shall be met on all projects within the City of Napa:

A. General

1. Non-hazardous Material / Waste Management
   (a) Designated Area
      The Contractor shall propose designated areas of the project site and any staging areas, for approval by the City Engineer, suitable for material delivery, storage, and waste collection that, to the maximum extent practicable, are near construction entrances and away from catch basins, gutters, drainage courses and creeks.
   (b) Granular Material
      The Contractor shall store granular material at least ten feet away from catch basin and curb returns.
      The Contractor shall not allow granular material to enter the storm drains or creeks.
      When rain is forecast within 24 hours or during wet weather, the City Engineer may require the Contractor to cover granular material with a tarpaulin and to surround the material with sandbags.
   (c) Dust Control
      The Contractor shall use reclaimed water to control dust on a daily basis or as directed by the City Engineer.
   (d) Street Sweeping
      At the end of each working day or as directed by the City Engineer, the Contractor shall clean, and sweep roadways and on-site paved areas of all materials attributed to or involved in the work. The Contractor shall not use water to flush down streets in place of street sweeping.
   (e) Recycling
      The Contractor shall recycle aggregate base material, asphalt concrete, and Portland cement concrete.
      In addition, to the maximum extent practicable, the Contractor shall reuse or recycle any useful construction materials generated during the project providing the material complies with State and Federal regulations.
(f) Disposal
At the end of each working day, the Contractor shall collect all scrap, debris, and waste material, and dispose of such materials properly.

The Contractor shall inspect dumpsters for leaks and contact trash hauling contractors to replace or repair dumpsters that leak.

The Contractor shall not discharge water on-site from cleaning dumpsters.

The Contractor shall arrange for regular waste collection before dumpsters overflow.

2. Hazardous Material / Waste Management

(a) Storage
The Contractor shall label and store all hazardous materials, such as pesticides, paints, thinners, solvents, and fuels; and all hazardous wastes, such as waste oil and antifreeze; in accordance with the City of Napa Hazardous Materials Storage Ordinance and all applicable State and Federal regulations.

The Contractor shall store all hazardous materials and all hazardous wastes in accordance with secondary containment regulations, and it is recommended that these materials and wastes be covered, as needed to avoid potential management of collected rainwater as a hazardous waste.

The Contractor shall keep an accurate, up-to-date inventory, including Material Safety Data Sheets (MSDSs), of hazardous materials and hazardous wastes stored on-site, to assist emergency response personnel in the event of a hazardous materials incident.

(b) Usage
When rain is forecast within 24 hours or during wet weather, the City Engineer may prevent the Contractor from applying chemicals in outside areas.

The Contractor shall not over-apply pesticides or fertilizers and shall follow material manufacturer’s instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals. Over-application of a pesticide constitutes a “label violation” subject to an enforcement action by the Napa County Agriculture Department.

(c) Disposal
The Contractor shall arrange for regular hazardous waste collection to comply with time limits on storage of hazardous wastes.

The Contractor shall dispose of hazardous waste only at authorized and permitted Treatment, Storage, and Disposal Facilities, and use only licensed hazardous waste haulers to remove the waste off-site, unless quantities to be transported are below applicable threshold limits for transportation specified in State and Federal regulations.

3. Spill Prevention and Control
The Contractor shall keep a stockpile of spill cleanup materials, such as rags or absorbents, readily accessible on-site.
The Contractor shall immediately contain and prevent leaks and spills from entering storm drains, and properly clean up and dispose of the waste and cleanup materials. If the waste is hazardous, the Contractor shall handle the waste as described in section A.2.c above.

The Contractor shall not wash any spilled material into streets, gutters, storm drains, or creeks and shall not bury spilled hazardous materials.

The Contractor shall report any hazardous materials spill to City of Napa Dispatch at (707) 257-9223.

4. Vehicle / Equipment Cleaning

The Contractor shall not perform vehicle or equipment cleaning on-site, in any staging area or in the street using soaps, solvents, degreasers, steam cleaning equipment, or equivalent methods.

The Contractor shall perform vehicle or equipment cleaning, with water only, in a designated, bermed area that will not allow rinse water to run off-site or into streets, gutters, storm drains, or creeks.

5. Vehicle / Equipment Maintenance and Fueling

The Contractor shall perform maintenance and fueling of vehicles or equipment in a designated, bermed area or over a drip pan that will not allow run-on of storm water or runoff of spills.

The Contractor shall use secondary containment, such as a drip pan, to catch leaks or spills any time that vehicle or equipment fluids are dispensed, changed, or poured.

The Contractor shall keep a stockpile of spill cleanup materials, such as rags or absorbents, readily accessible on-site.

The Contractor shall clean up leaks and spills of vehicle or equipment fluids immediately and dispose of the waste and cleanup materials as hazardous waste, as described herein.

The Contractor shall not wash any spilled material into streets, gutters, storm drains, or creeks and shall not bury spilled hazardous materials.

The Contractor shall inspect vehicles and equipment arriving on-site for leaking fluids and shall promptly repair leaking vehicles and equipment. Drip pans shall be used to catch leaks until repairs are made.

The Contractor shall recycle waste oil and antifreeze, to the maximum extent practicable.

The Contractor shall comply with Federal, State, and City requirements for aboveground storage tanks.

6. Contractor Training and Awareness

The Contractor shall train all employees/subcontractors on the storm water pollution prevention requirements contained in these Specifications.

The Contractor shall inform subcontractors of the storm water pollution prevention contract requirements and include appropriate subcontract provisions to ensure that these requirements are met.
The Contractor shall post warning signs in areas treated with chemicals.

B. Activity-Specific Requirements

The following requirements shall be met on all projects within the City of Napa that include the listed activities.

7. Dewatering Operations
   (a) Sediment Control
       The Contractor shall route water through a control measure, such as a sediment trap, sediment basin, or Baker tank to remove settleable solids prior to discharge to the storm drain system. Approval of the control measure shall be obtained in advance from the City Engineer.
       Filtration of the water following the control measure may be required on a case-by-case basis
       If the City Engineer determines that the dewatering operation would not generate an appreciable amount of settleable solids, the control measure requirement in (1) above may be waived.
       The Contractor shall reuse water for other needs, such as dust control or irrigation, to the maximum extent practicable.
   (b) Contaminated Groundwater
       If the project is within an area of known groundwater contamination, then water from dewatering operations shall be tested prior to discharge. If the water quality meets Regional Water Quality Control Board (RWQCB) standards, then it may be discharged to the storm drain. If the water quality meets City of Napa Municipal Code section 8.36, then it may be discharged to the sanitary sewer with prior approval from the Napa Sanitation District. Otherwise, the water shall be treated or hauled off-site for proper disposal.
       If the project is not within an area of known groundwater contamination, then monitoring shall only be required if directed by the City Engineer.
       If the project is found to be within an area of groundwater contamination not identified by the City in the project specifications, a change order shall be negotiated to cover additional work performed by the Contractor pursuant to 4-1.03D “Extra Work” of the Standard Specifications.

8. Paving Operations
   (a) Project Site Management
       When rain is forecast within 24 hours or during wet weather, the City Engineer may prevent the Contractor from paving.
       The City Engineer may direct the Contractor to protect drainage courses by using control measures, such as earth dike, straw waddles, and sandbag, to divert runoff or trap and filter sediment.
       The Contractor shall place drip pans or absorbent material under paving equipment when not in use.
The Contractor shall cover catch basins and manholes when paving or applying seal coat, tack coat, slurry seal, or fog seal.

(b) Paving Waste Management

The Contractor shall not sweep or wash down excess sand placed as part of a sand seal or to absorb excess oil into gutters, storm drains, or creeks. Instead, the Contractor shall either, collect the sand and return it to the stockpile, or dispose of it in a trash container. The Contractor shall not use water to wash down fresh asphalt concrete pavement.

9. Saw Cutting

During saw cutting, the Contractor shall cover or barricade catch basins using control measures, such as filter fabric, straw bales, sand bags, and fine gravel bags, to keep slurry out of the storm drain system. When protecting a catch basin, the Contractor shall ensure that the entire opening is covered.

The Contractor shall shovel, absorb, or vacuum saw cut slurry and pick up the waste prior to moving to the next location or at the end of each working day, whichever is sooner.

If saw cut slurry enters catch basins, the Contractor shall remove the slurry from the storm drain system immediately.

10. Contaminated Soil Management

On all projects involving grading or excavation, the Contractor shall look for contaminated soil as evidenced by site history, discoloration, odor, differences in soil properties, abandoned underground tanks or pipes, or buried debris. If the project is not within an area of known soil contamination and no evidence of soil contamination is found, then testing of the soil shall only be required if directed by the City Engineer. The Contractor shall follow points 4.b and 4.c below if contamination is found.

If the project is within an area of known soil contamination or evidence of soil contamination is found, then soil from grading or excavation operations shall be tested. The soil shall be managed as required by the Napa County Environmental Health Department or other agency.

If the project is found to be within an area of soil contamination not identified by the City in the project specifications, a change order shall be negotiated to cover additional work performed by the Contractor pursuant to 4-1.05A “Extra Work” of the Standard Specifications.

11. Concrete, Grout, and Mortar Waste Management

(a) Material Management

The Contractor shall store concrete, grout, and mortar away from drainage areas and ensure that these materials do not enter the storm drain system.

(b) Concrete Truck/Equipment Wash Out

The Contractor shall not wash out concrete trucks or equipment into streets, gutters, storm drains, or creeks.

The Contractor shall perform washout of concrete trucks or equipment off-site or in a designated area on-site where the water will flow onto dirt or into a temporary pit in a dirt area per Caltrans Standard Detail T-59. The Contractor shall not let the water percolate into the soil but allow it to evaporate or dispose.
of it per 1.10.02 “Activity-Specific Requirements” 1.A. (1) and dispose of the hardened concrete in a trash container.

12. Earthwork

The Contractor shall maximize the control of erosion and sediment by using the BMPs for erosion and sedimentation in the California Storm Water Best Management Practice Handbook – Construction Activity.

1.10.03 PRE-CONSTRUCTION MEETING

A Pre-Construction Meeting shall be held prior to the commencement of work. The City Engineer will designate the time and place. The Prime Contractor (and major sub-contractors as required) must attend the meeting. The Contractor’s representative at this conference shall include all major superintendents for the work and may include major subcontractors.

At, or prior to, this meeting the Prime Contractor must submit:

1. A copy of their City of Napa business license.
2. A letter or memorandum designating the authorized representative who shall have authority to represent and act for the Contractor during the entire work period.
3. A letter or memorandum designating two 24-hour emergency contact persons and their telephone numbers.
4. A project schedule.
5. A Traffic Control Plan per the City of Napa “Traffic Control Plan Preparation Guidelines for Contractors”.

1.10.04 OBSTRUCTIONS

Attention is directed to Section 5-1.36C, "Non-Highway Facilities," and Section 15, "Existing Facilities," of the Standard Specifications and these City Standard Specifications.

A traffic control plan, prepared in accordance with the California Supplement of the Manual of Uniform Traffic Control Devices Section 6 (Section 5 is not allowed), shall be submitted as part of the improvement plan set.

Flagging, signs, and all other traffic control devices furnished, installed, maintained, and removed when no longer required shall conform to the provisions in Section 12, “Temporary Traffic Control,” of the Standard Specifications and these general provisions.

Type II retroreflective sheeting shall not be used on construction area sign panels.

The Contractor shall notify the appropriate regional notification center for operators of subsurface installations at least 2 working days, but not more than 14 calendar days, prior to commencing excavation for construction area sign posts. The regional notification centers include, but are not limited to, the following:

<table>
<thead>
<tr>
<th>Notification Center</th>
<th>Telephone Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underground Service Alert-Northern California (USA)</td>
<td>811</td>
</tr>
</tbody>
</table>
Excavations required to install construction area signs shall be performed by hand methods without the use of power equipment, except that power equipment may be used if it is determined there are no utility facilities in the area of the proposed post holes.

Sign substrates for stationary mounted construction area signs shall be fabricated from materials that are approved by the City Engineer.

The Contractor may be required to cover certain signs during the progress of the work. Signs that are no longer required or that convey inaccurate information to the public shall be immediately covered or removed, or the information shall be corrected. Covers for construction area signs shall be of sufficient size and density to completely block out the complete face of the signs. The retroreflective face of the covered signs shall not be visible either during the day or at night. Covers shall be fastened securely so that the signs remain covered during inclement weather. Covers shall be replaced when they no longer cover the signs properly.

The Contractor shall notify residents and property owners in writing forty-eight (48) hours (excluding weekends and holidays) prior to performing any work at the site. The notification form to be provided to residents and property owners shall be submitted to the City for review and approval. Street parking may be restricted as necessary to facilitate construction activity. “No Parking” signs, as required, shall be placed by the Contractor forty-eight (48) hours in advance of the parking restriction. “No Parking” signs shall have the following information:

- “Tow Away, No Parking”
- Date of Restriction
- Time of Restriction
- “Construction Zone”
- “Vehicles in Violation Subject to Tow at Owner’s Expense”
- “Napa Police Department: 707-257-9223”
- CVC 22658 (1); CVC 22651 (L)

“No Parking” signs shall have red letters on a white background. “No Parking” signs shall be spaced no more than thirty (30) feet apart.

In-lieu of provisions to the contrary in the Standard Specifications, the following provisions shall apply:

*The cost of furnishing, installing, maintaining and removing signs, sign covers, lights, flares, temporary railing, barricades, flagmen, guards and all construction area traffic control devises shall be borne by the Contractor.*

**1.10.05 UTILITIES**

Developers are required to determine all utilities that exist within the project-area and to contact all agencies to determine the requirements applicable to their development. The following is a list of the typical utility systems and the respective owners, there may be other utilities not listed:

1. The sanitary system is owned and operated by the Napa Sanitation District.
2. The gas and electricity distribution systems are owned and operated by the Pacific Gas and Electric Company.
3. The telephone system is owned and operated by AT&T.
4. The cable television system is owned and operated by Comcast.
5. The water system is owned and operated by the City of Napa Utilities Department – Water Division.
6. The street lighting system is owned and operated by the City of Napa.

The Contractor shall limit construction operations to a maximum of 500 linear feet, including excavation, pipe laying and compacting backfill unless otherwise approved by the City Engineer. A trench which has been backfilled and has a surface of temporary paving shall not be counted in this footage. The work area shall be kept in a neat and orderly condition throughout the life of the project and material shall not be stored or placed near intersections for traffic safety.

The Contractor shall exercise care to avoid any damage to utilities during construction.

The Contractor shall contact the City of Napa Utilities Department - Water Division (707-257-9521) and Electrical Division (707-257-9588), Comcast, Napa Sanitation District, Pacific Gas and Electric Company, AT&T, and Underground Service Alert (USA) (811 or 1-800-227-2600), (and any other potentially impacted public or private utility companies) a minimum of 48 hours before underground construction is performed, to ascertain the location of the existing underground utilities within the project area unless City Encroachment Permit specifies otherwise. Contractor is responsible for blacking out U.S.A. markings after the completion of construction.

Any damage to underground utility lines or laterals will be Contractor’s responsibility to repair, or to pay for the repairs if the utilities decide to make the repairs with their own forces.

1.10.06 MAINTAINING TRAFFIC

Attention is directed to Sections 7-1.03, "Public Convenience," 7-1.04, "Public Safety," and 12, "Temporary Traffic Control," of the Standard Specifications and to the provisions in "Public Safety" of these City Standard Specifications. Nothing in these City Standard Specifications shall be construed as relieving the Contractor from the responsibilities specified in Section 7-1.04 of the Standard Specifications.

Lane closures shall conform to the provisions in section "Traffic Control System for Lane Closure" of these City Standard Specifications.

The Contractor shall provide for the safe and orderly movement of traffic at all times during construction. On all streets, one lane in each direction shall be maintained at all times. Temporary street closures or providing only one lane for both directions may be approved by the City Engineer provided adequate circulation is maintained and/or adequate flagmen and signage satisfactory to the City Engineer is provided. Any lane closures shall be limited to the hours of 9:00 AM to 3:00 PM unless approved by the City Engineer.

No street closures will be allowed unless directed by the City Engineer. If the Contractor desires a street closure, the Contractor shall submit a written request, accompanied with a traffic control plan, to the City Engineer for review and approval. The request shall state the reason, locations, and times for the closure, and shall be submitted a minimum of ten (10) working days prior to the scheduled work.

The City Engineer shall approve or deny the request within three (3) working days after the receipt of the request. If approved, the Contractor shall notify the Police and Fire Department of the City, the Division of Forestry and Fire Protection (CalFire), local ambulance services,
the V.I.N.E. Bus Service, Napa Recycling and Waste Services, Napa Valley Unified School District Transportation Department and the U.S. Post Office in writing, forty-eight (48) hours in advance of all street closures and keep the Fire Department posted at all times regarding available access to the streets. The Contractor shall also notify United Parcel Service (UPS), Federal Express and other mail delivery services of planned street closures and the current schedule.

Overnight street closures are allowed only with director’s approval.

The Contractor shall furnish, install, maintain, and remove barricades, lights and signs as required, and shall provide flagmen and other facilities to safeguard adequately the general public (including vehicles, bicycles and pedestrians) and the work as may be deemed necessary by the City Engineer.

The Contractor shall take extra care to minimize disruption to the adjacent residences/businesses during the progress of work. The Contractor shall provide access to all residences and/or businesses at all times during the progress of the work. The Contractor shall phase the work to ensure that access to each residence and business is provided at all times. Commercial driveways shall be provided with at least ten (10) feet wide of unobstructed opening at all times.

Subject to the coordination with and approval of property owners and approved in advance by the City Engineer in writing, temporary closure of driveways may be allowed. However, in no case shall a driveway remain closed for more than six hours unless otherwise authorized by the City Engineer. Prior to closure of driveways, the Contractor shall coordinate and notify the property owner or resident at least twice of such closure. Closure notices shall be given to the property owner or resident twenty-four (24) hours and one (1) hour prior to each closure. A copy of the closure notice shall be furnished to the City Engineer for review and approval prior to each closure.

The Contractor shall file, with the City Engineer and Police Department, the name and telephone number of their representative (provide minimum two contacts) to be notified after normal working hours and on weekends, in case of emergency. This information shall be provided at the Preconstruction Meeting. If a preconstruction meeting is not held, it shall be provided to the City prior to the start of work.

The Contractor shall submit, at least ten (10) days prior to the initial on-site work, a traffic control plan which conforms to all requirements of these City Standard Specifications and Standard Specifications. This plan shall include all lane closures, construction area signs, detours, and parking prohibitions. Traffic control plans shall conform to the most current edition of the “California Manual on Uniform Traffic Control Devices”. No work shall commence prior to the submittal and approval of a satisfactory traffic control plan. A traffic control plan shall not be deemed satisfactory unless it conforms to the requirements of the aforementioned manual and has been reviewed and approved by the City Engineer.

At the end of each working day, if a difference in excess of 0.15-foot exists between the elevation of the existing pavement and the elevation of any excavation within 8 feet of the traveled way, material shall be placed and compacted against the vertical cuts adjacent to the traveled way. During excavation operations, native material may be used for this purpose. The material shall be placed to the level of the elevation of the top of the existing pavement and tapered at a slope of 4:1 or flatter to the bottom of the excavation. In the case of PCC curb ramps, there must be no difference between the elevation of the existing bottom of ramp and the elevation of the existing pavement; ADA compliance must be maintained for areas open to the public.
1.10.07 FINISHING WORK

Finishing Work shall conform to the requirements of Section 22, “Finish Roadway,” of the Standard Specifications and these City Standard Specifications.

Filling and grading, with soil backfill, between the curb and sidewalk and filling, grading, and shaping behind the curb and sidewalk, and within the project area shall be considered as part of this section.

Cleanup of the roadway of all construction debris at the end of each workday shall be included as part of this section.

1.10.08 DUST CONTROL

Attention is directed to Section 10-5 “Dust Control,” Section 14-11.04 “Dust Control,” and Section 18 “Dust Palliatives,” of the Standard Specifications and these City Standard Specifications.

The Contractor shall be familiar with and comply with all monitoring, reporting, notifications, and control requirements of agencies having jurisdiction over air quality.

The Contractor shall prevent the formation of an airborne dust nuisance by watering work areas as required until the project is completed and accepted. The amount of water used shall not be excessive to cause soil and/or water run-off outside the boundaries of the working area. If soil run-off occurs, the Contractor shall immediately notify the City Engineer and identify the area where run-off occurred. The Contractor shall provide polyethylene sheeting to place underneath and over any stockpiled soil. The stockpile shall be covered daily after completion of work or as required by the City’s Municipal Stormwater requirements for construction. The sheeting shall be adequately weighted or secured to keep the sheeting in place during non-work periods. The Public Works Director may require work to be suspended if dust control is inadequate.

1.10.09 CLEARING AND GRUBBING

Clearing and grubbing shall conform to the provisions in Section 17-2, "Clearing and Grubbing," of the Standard Specifications and these City Standard Specifications.

Vegetation shall be cleared and grubbed only within the excavation and embankment slope lines.

At locations where there is no grading adjacent to a bridge or other structure, clearing and grubbing of vegetation shall be limited to 5 feet outside the physical limits of the bridge or structure.

Existing vegetation outside the areas to be cleared and grubbed shall be protected from injury or damage resulting from the Contractor’s operations.

Activities controlled by the Contractor, except cleanup or other required work, shall be confined within the graded areas of the roadway.

Nothing herein shall be construed as relieving the Contractor of the Contractor’s responsibility for final cleanup of the highway as provided in Section 4-1.13, "Cleanup," of the Standard Specifications.
Vegetable growth from clearing and grubbing operations may be disposed of in embankments in conformance with the provisions in "Earthwork" of these City Standard Specifications.

1.10.10 EARTHWORK

Earthwork shall conform to the provisions in Section 19, "Earthwork," of the Standard Specifications and these City Standard Specifications.

Amend Section 19-5.03B “Relative Compaction (95 Percent)” by adding the following:

In addition, contractor shall obtain complete stabilization of subgrade material with no rolling or deflection of the subgrade. This proof-rolling is determined by passing a loaded 3 axle water truck, cement truck or similar vehicle over the completed subgrade without the material rolling, deflecting more than ¼” or cracking perpendicular to the path of travel. Proof-rolling shall be observed by a City Inspector.

Compaction testing shall conform to ASTM D1557.

If accepted subgrade becomes saturated and/or disturbed or more than five working days pass between acceptance of the material and placement of the upper layer, the subgrade must again be proof-rolled and retesting will be required. The cost of the retesting shall be borne by the Contractor.

Upon City Engineer’s approval of the subgrade, placement of the aggregate base material may proceed.

Surplus excavated material shall become the property of the Contractor and shall be disposed of in conformance with these standards and the provisions in Section 5-1.20B(4), "Contractor-Property Owner Agreement," of the Standard Specifications.

If the Contractor elects to dispose of materials at locations other than those where arrangements have been made by the Department, or, if material is to be disposed of and the Department has not made arrangements for disposal of the material, the Contractor shall make arrangements for disposing of the materials outside the highway right of way and shall pay all costs involved.

Before disposing of any material outside the highway right of way, the Contractor shall furnish to the City Engineer satisfactory evidence that the Contractor has entered into agreements with the property owners of the site involved and has obtained the permits, licenses and clearances.

When any material is to be disposed of outside the highway right of way, and the Department has not made arrangements for disposal of the material, the Contractor shall first obtain written authorization from the property owner on whose property the disposal is to be made and the Contractor shall file with the City Engineer the authorization or a certified copy thereof together with a written release from the property owner absolving the State from any and all responsibility in connection with the disposal of material on the property.

Before any material is disposed of on the property, the Contractor shall obtain written permission from the City Engineer to dispose of the material at the location designated in the authorization.

Where a portion of the existing paved or concrete surfacing is to be removed, the outline of the area to be removed shall be cut on a neat line with a power-driven saw to a minimum depth of 0.20 foot before removing the surfacing.
Yielding Subgrade:

“Yielding Subgrade” is defined as subgrade that exhibits potential failure. Determination of a yielding subgrade shall be determined by the City Engineer on-site. When yielding subgrade is encountered the Contractor shall over-excavate 12” below finish sub grade. Place Mirafi 2XT Geogrid (or approved equivalent) on over-excavated subgrade. Install 12” of 1 ½” class 2 aggregate base at 95% compaction. Install layer of Mirafi 500x (or approved equivalent) at top of 1 ½” class 2 AB. Install ¾” class 2 aggregate base section per plan.

1.10.11 GRADING PERMITS

A grading permit shall not be issued for grading work on any property prior to a project application, or while a project application for the property is under consideration by the City.

Following project approval by the City, as defined herein, and final approval of the grading plan(s) by the Public Works Director, upon request of the applicant, a separate grading permit may be issued by the Chief Building Official prior to issuance of a building permit or approval of the Final Subdivision Map/Parcel Map.

- For subdivisions, project approval is final approval by the City Council of the Tentative Subdivision Map.
- For projects requiring use permits, project approval is expiration of the statutory appeal period with no appeal having been filed, or final approval of the use permit by the City Council.

Upon a finding of no significance by the Public Works Director, a grading permit may be issued for minor work, the first two paragraphs of this section notwithstanding.

For all grading permits that include the off-haul of more than 50 cubic yards of material, the contractor is to provide a written description of the disposal concept and a copy of any permits issued to allow the placement of that material at the destination site.
2 - DRAINAGE STANDARDS

2.01 GENERAL

These standards are intended to ensure that watercourse and surface water laws are complied with and that runoff from storms up to the 100-year return frequency are conveyed through storm facilities and disposed of in a manner that protects public and private improvements from flood hazards. Storm drainage improvements shall be designed to serve the ultimate development level as defined in the current City General Plan and the current Storm Drainage Master Plan. Improvements shall comply with California drainage law by not causing damage to other property from construction, diversion, or inducing flooding.

The diversion of natural drainage will be allowed only within the limits of a proposed improvement. All-natural drainage must leave the improved area at its original horizontal location and elevation unless a special agreement, approved by the Public Works Director or their designee, has been executed with the affected downstream property owners.

Although these standards are intended to apply to physical development within the City, the standards may not apply for all situations. Compliance with these standards does not relieve the design Engineer of the responsibility to apply conservative and sound professional judgment. These are minimum standards and are intended to assist, but not substitute for competent work by design professionals. The City may, at its sole discretion due to special conditions and/or environmental constraints, require more stringent requirements than would normally be required under these standards.

A drainage system, which includes unreasonable and intensive maintenance or operational requirements as determined by the City, shall be rejected in favor of a drainage system which does not place undue burdens on the owner/operators of such system.

The Applicant may propose a deviation from the Standards. A non-standard system may take longer to review. The Applicant acknowledges these risks when submitting a non-standard system for review.

The City’s decision to grant, deny, or modify the proposed deviation shall be based upon evidence that the deviation request meets all of the following criteria:

1. The proposed system will achieve the intended result through a comparable or even superior design.
2. The proposed system will not adversely affect safety and/or operation.
3. The proposed system will not adversely affect maintainability.
4. The proposed system can reasonably be expected to provide equal or better protection to neighbors from flooding
5. The proposed system will not adversely affect water quality

2.02 DESIGN CRITERIA

All storm drainage facilities shall be designed to provide connections to future upstream facilities that may be constructed. No development shall discharge at a rate that exceeds the capacity of any portion of the existing downstream system. Calculations for storm drainage design within the development as well as calculations for runoff generated by upstream areas within the contributing watershed shall be submitted to the City for review and approval. Drainage facilities
shall be designed to carry a storm flow rate having the appropriate recurrence interval under ultimate anticipated development of the entire watershed maintaining the following conditions:

1. The water level in the drainage inlet boxes shall not exceed an elevation of 0.5 foot below gutter elevation, and the elevation in manholes or junction boxes shall not exceed an elevation 1 foot below street grade.

2. The allowable spread of water from the curb from 10-year storm runoff is limited by the requirement to maintain two-10-foot moving lanes of traffic for collector streets. One clear lane shall be maintained on sub collectors.

3. The 100-year return runoff (1% chance per year) shall be directed towards and contained within the street right of way unless a design exception is granted by the Public Works Director or their designee.

4. Flood waters shall be confined to streets or other approved rights-of-way by grading, levees or alternative means acceptable to the Director of Public Works.

The City Public Works Department has hydraulic data for most storm drains over 30 inches in diameter available in the City of Napa Storm Drain Master Plan.

Table 2.1 shows the recommended method and return period design criteria to estimate discharge.

### TABLE 2.1 – RECOMMENDED CRITERIA AND METHODS TO ESTIMATE DISCHARGE

<table>
<thead>
<tr>
<th>FACILITY</th>
<th>DESIGN CRITERIA</th>
<th>METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>STORM DRAINS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential under 40 Acres</td>
<td>10-Year with 100-Year overland release analysis</td>
<td>Rational Method or Napa Charts</td>
</tr>
<tr>
<td>Residential, over 40 Acres</td>
<td>25-Year with 100-Year overland release analysis</td>
<td>Rational Method or Napa Charts</td>
</tr>
<tr>
<td>Commercial and High Value Districts</td>
<td>25-Year with 100-Year overland release analysis</td>
<td>Rational Method or Napa Charts</td>
</tr>
<tr>
<td>Flood Control</td>
<td>100-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
<tr>
<td>All bridges and roads with traffic index of 6 or greater</td>
<td>100-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
<tr>
<td><strong>OPEN CHANNELS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-Year and 100-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
<tr>
<td><strong>WATERSHEDS WITH ADDITIONAL ANALYSIS REQUIREMENT</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>10-Year and/or 100-Year</td>
<td>HEC-1* unless otherwise provided by the PW Director</td>
</tr>
<tr>
<td><strong>DEVELOPING AREAS UPSTREAM OF EXISTING FACILITIES</strong></td>
<td>Varies, based on downstream capacity</td>
<td>Varies</td>
</tr>
<tr>
<td><strong>WATERWAYS</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major waterways - drainage area of 4 square miles or more</td>
<td>100-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
<tr>
<td>Secondary waterways - having a drainage area of between 1 and 4 square miles</td>
<td>50-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
</tbody>
</table>
Minor waterways - drainage area from 40 acres to 1 square mile

Tributaries - having a drainage area of 40 acres or less

<table>
<thead>
<tr>
<th>FACILITY</th>
<th>DESIGN CRITERIA</th>
<th>METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor waterways - drainage area from 40 acres to 1 square mile</td>
<td>25-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
<tr>
<td>Tributaries - having a drainage area of 40 acres or less</td>
<td>10-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
<tr>
<td>BRIDGES</td>
<td>100-Year</td>
<td>Napa Charts or HEC-1* unless otherwise provided by the PW Director</td>
</tr>
</tbody>
</table>

A Diversion or Detention

In some instances, the economic consequences of drainage system failure will be such that the City shall require a higher than minimum recurrence interval to be used in the design. This determination will be made at the time of project or Tentative Map approval.

In areas where the natural relief of the ground does not preclude the possibility of the backwater elevation exceeding existing or future building floor elevations, the capacity of the drainage system shall be sufficient to ensure that the backwater resulting from a 100-year return storm will not exceed the elevation of existing building floor elevations and be a minimum of one foot below all proposed finish floor elevations.

2.03 DRAINAGE ANALYSIS AND CALCULATIONS

2.03.01 STORM DRAINAGE ANALYSIS

Engineering calculations shall be submitted to establish the basis for the design of the drainage system. The engineering analysis shall be based on the following requirements:

1. The entire drainage basin in acres including any sub-areas, the location of the project within the drainage basin in the drainage calculations. For projects less than one acre, only local drainage analysis is required.

2. The grading plans provided by the Developer for review shall include the existing topography shown with contour lines labeled at one-foot intervals and extending a sufficient distance beyond the limits of the project site to indicate impacts on adjacent properties.

3. The minimum pipe size for publicly maintained drainage systems shall be 18 inches in diameter.

4. At intersections of pipes, the downstream pipe shall have a crown elevation that is equal to the crowns of all upstream connecting pipes unless otherwise approved by the Public Works Director or their designee.

5. Pipe diameters shall not decrease in the downstream direction.

6. Drainage inlets shall be located so that the maximum distance that water flows in the gutter does not exceed 500 feet.

7. All catch basins shall be Type D-2, unless otherwise approved by the Public Works Director or their designee and shall be placed at the low points of the gutter on grades of less than one percent. The capacity of a D-2 catch basin is approximately one cubic foot per second per linear foot of inlet width. Where the street grade exceeds five
percent or velocity exceeds five (5) fps, gallery extensions shall be required to intercept the higher velocity and/or increased gutter flow. The Caltrans Type GO catch basin shall be used only with the approval of the Public Works Director or their designee.

8. GO inlets spaced 50 feet apart, centered on the low point, shall be placed at the low point of vertical sag curve locations on arterial and collector streets where there is more than 1 cfs of gutter flow at the crosswalk.

9. All storm conveyance structures, unless otherwise approved by the Public Works Director or their designee, shall be designed to function without surcharging for the purposes of determining hydraulic capacity.

10. Minimum velocity in pipe shall be three (3) fps and of a self-cleaning design.

11. Storm drainpipe curvature shall not exceed 80% of the manufacturer's recommendation.

12. Drain inlets shall be located on tangents upstream from crosswalks and access ramps in the direction of the greater gutter flow. In certain cases, two drain inlets may be required on a corner.

13. Either a manhole or a drainage inlet shall be provided every 400 feet, at angle points, and at beginning and end of horizontal curves to maintain accessibility to the underground drainage facilities.

14. Minimum horizontal separation from a storm drain facility to a water line or sewer line shall be 5 feet from the outside of each pipe except at pipe crossings. Horizontal separation from other utilities shall be a minimum of four feet clear.

15. Storm drainpipes, which terminate in a creek or river, will be required to have a rip rap or concrete headwall constructed in accordance with Public Works Standard Detail D-6 shown in the City of Napa Standard Plans. Flap gates are required when a storm drain pipe discharges into the Napa River/Napa Creek Flood Protection Project limits (Napa River from Imola Avenue to Trancas Street; Napa Creek from Jefferson Street to Napa River) or in other conditions where the hydraulic gradient in the waterway may cause reverse flow in the pipe, and cause flooding upstream of the inlet such as in tidally influenced waterways. Standard design detail of this flap gate is shown on Public Works Standard Detail D-11.

16. Main line storm drainpipes shall not be installed in the planting area between the curb and the sidewalk. The storm drainage lines shall be installed parallel with street centerline and entirely within the curb-curb street area. The edge outside of the pipe closest to the curb shall be aligned with the face of the curb and the pipe warped into the catch basin.

17. Minimum vertical separation (distance between outside of each pipe) from a storm drain facility to a water line or sewer line shall be 4 ft. Vertical separation from other utilities shall be a minimum of 3 feet clear. Vertical separations deviating from these minimum requirements shall be approved by the City Engineer.

The following step-by-step procedure for analyzing a drainage situation is offered as a guide. Its use is optional, and it should not be substituted for common sense or good judgment:

1. Determine the area in acres contributing runoff to the drainage inlet in the system.

2. Determine the coefficient of runoff for each of the drainage areas, under ultimate anticipated development. Table 2.4 should be used as a guide in this determination.
3. Determine the time of concentration independently for each drainage area. Please see section 2.03.02 for the complete time of concentration guidelines. For residential lots, the time for water to reach the gutters can be assumed to be 10 minutes.

4. Determine the rainfall intensity for each of the times of concentration determined above. Table 2.3 of these standards or the most current NOAA Point Precipitation Frequency (PF) Estimates should be used for this determination. However, when using the NOAA PF Estimates, rainfall depth should be selected from the highest probable value.

5. Maximum storm runoff for developments whose gross drainage area is 200 acres or less shall be computed using the Rational Method.

6. Determine the gutter capacity immediately upstream from each inlet and at upstream points with a flatter grade. Chart 2.1 may be used to determine the capacity of the gutter.

7. Determine the capacity of all inlets or catch basins within each of the drainage areas.

8. Determine the required pipe size using Manning's equation, under full flow conditions such that the freeboard requirements of Section 2.02 are met. The slope of the hydraulic grade line must be used in this equation. To determine the freeboard, the head on the entrance to the pipe, the entrance losses, the head converted to velocity head, and the head on the outlet must all be considered.

9. If more than one inlet is contributing to the flow in a pipe, revised inlet flows must be computed based on the time of concentration to the inlet furthest upstream, plus the travel time in the pipe to the point in question.

2.03.02 STORMWATER DRAINAGE CALCULATIONS

Stormwater drainage calculations or design drawings shall include the following:

1. Flow in cubic feet per second to each structure and in each pipe including the direction with arrows.

2. Time of concentration at each structure. (Figure 2.8)

3. Intensity of rainfall at each structure. (Table 2.3, Chart 2.2)

4. All applicable existing and proposed improvements including size, material type, length and slope of each pipe proposed between structures.

5. Invert elevation of each pipe structure.

6. Top of structure elevation.

7. Hydraulic grade line elevation at each structure.

8. Hydraulic gradient.

9. Gutter capacity immediately upstream from each inlet and at upstream points with a flatter grade.

10. Catch basin inlet capacities.

11. Calculation Sheets, which include all the appropriate coefficients, acreages and other design details and also summarizes the design in a clear, concise, and professional format.
12. Pipe sizes.

As noted in Table 2.1, several options are available for use in estimating discharge for storm events. Table 2.2 provides the Design Depth Frequency (DDF) for selected storms and Table 2.3 shows Rainfall Intensity Duration.

### TABLE 2.2 – RAINFALL DEPTH (DURATION)

<table>
<thead>
<tr>
<th>DDF</th>
<th>5M</th>
<th>15M</th>
<th>1HR</th>
<th>2HR</th>
<th>3HR</th>
<th>6HR</th>
<th>12 HR</th>
<th>24 HR</th>
<th>2D</th>
<th>4D</th>
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<tbody>
<tr>
<td>2-Yr</td>
<td>0.15</td>
<td>0.27</td>
<td>0.57</td>
<td>0.82</td>
<td>1.02</td>
<td>1.50</td>
<td>1.98</td>
<td>2.45</td>
<td>3.12</td>
<td>4.03</td>
</tr>
<tr>
<td>5-Yr</td>
<td>0.20</td>
<td>0.38</td>
<td>0.80</td>
<td>1.16</td>
<td>1.42</td>
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<td>2.79</td>
<td>3.44</td>
<td>4.51</td>
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</tr>
<tr>
<td>10-Yr</td>
<td>0.25</td>
<td>0.46</td>
<td>0.97</td>
<td>1.39</td>
<td>1.70</td>
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<td>4.12</td>
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<tr>
<td>25-Yr</td>
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<td>2.04</td>
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<td>4.95</td>
<td>6.63</td>
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<tr>
<td>50-Yr</td>
<td>0.32</td>
<td>0.62</td>
<td>1.30</td>
<td>1.87</td>
<td>2.29</td>
<td>3.40</td>
<td>4.48</td>
<td>5.56</td>
<td>7.49</td>
<td>9.44</td>
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<tr>
<td>100-Yr</td>
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<td>0.69</td>
<td>1.44</td>
<td>2.07</td>
<td>2.54</td>
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<td>4.96</td>
<td>6.14</td>
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<tr>
<td>500-Yr</td>
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<td>0.85</td>
<td>1.78</td>
<td>2.55</td>
<td>3.14</td>
<td>4.67</td>
<td>6.15</td>
<td>7.60</td>
<td>10.50</td>
<td>13.01</td>
</tr>
</tbody>
</table>

Source: City of Napa 2006 Storm Drainage Master Plan Table 3-1

### TABLE 2.3 – RAINFALL INTENSITY (DURATION)

<table>
<thead>
<tr>
<th>DDF</th>
<th>5M</th>
<th>15M</th>
<th>1HR</th>
<th>2HR</th>
<th>3HR</th>
<th>6HR</th>
<th>12 HR</th>
<th>24 HR</th>
<th>2D</th>
<th>4D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Yr</td>
<td>1.80</td>
<td>1.08</td>
<td>0.80</td>
<td>0.41</td>
<td>0.34</td>
<td>0.25</td>
<td>0.16</td>
<td>0.10</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>5-Yr</td>
<td>2.40</td>
<td>1.52</td>
<td>0.08</td>
<td>0.58</td>
<td>0.47</td>
<td>0.35</td>
<td>0.23</td>
<td>0.14</td>
<td>0.09</td>
<td>0.06</td>
</tr>
<tr>
<td>10-Yr</td>
<td>3.00</td>
<td>1.84</td>
<td>0.97</td>
<td>0.70</td>
<td>0.57</td>
<td>0.42</td>
<td>0.28</td>
<td>0.17</td>
<td>0.11</td>
<td>0.07</td>
</tr>
<tr>
<td>25-Yr</td>
<td>3.60</td>
<td>2.24</td>
<td>1.16</td>
<td>0.83</td>
<td>0.68</td>
<td>0.50</td>
<td>0.33</td>
<td>0.20</td>
<td>0.14</td>
<td>0.08</td>
</tr>
<tr>
<td>50-Yr</td>
<td>3.84</td>
<td>2.48</td>
<td>1.30</td>
<td>0.94</td>
<td>0.76</td>
<td>0.57</td>
<td>0.37</td>
<td>0.23</td>
<td>0.16</td>
<td>0.10</td>
</tr>
<tr>
<td>100-Yr</td>
<td>4.32</td>
<td>2.76</td>
<td>1.44</td>
<td>1.04</td>
<td>0.84</td>
<td>0.63</td>
<td>0.41</td>
<td>0.26</td>
<td>0.17</td>
<td>0.11</td>
</tr>
<tr>
<td>500-Yr</td>
<td>5.40</td>
<td>3.40</td>
<td>1.78</td>
<td>1.28</td>
<td>1.04</td>
<td>0.78</td>
<td>0.51</td>
<td>0.32</td>
<td>0.22</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Source: City of Napa 2006 Storm Drainage Master Plan Table 3-2

### A. Rational Method

The 10- and 100-year peak runoff shall be determined for each analysis point using the Rational Method. The Rational Method provides reasonable estimates of peak runoff for small watersheds. The method relates a peak discharge for the project site, a runoff coefficient (C), and rainfall intensity (i). Runoff coefficients were found to vary between 0.35 and 0.90 for land use and storm frequency.

The Rational Method equation has the form: \( Q = CiA \)

Where:

\( Q = \) rate of runoff, acre-inches per hour or cubic feet per second  
\( C = \) runoff coefficient, which is the ratio of peak runoff to average rainfall intensity
i = average rainfall intensity, inches per hour, adjust intensity using rainfall M.A.P. correction see Chart 2.2 or NOAA Point Precipitation Frequency Estimates.

A = drainage area, acres

The Rational Method shall be applied using the procedure outlined below.

1. Basic Information Preparation

Layout the proposed storm drainage system and delineate the sub-basins tributary to points of concentration for the design of inlets, junctions, pipelines, etc. delineates the land uses and runoff coefficients within each sub-basin.

2. Rainfall Intensity

Average rainfall intensity, i, shall be selected from Table 2.3 of these standards or the highest probable value of the most current NOAA Point Precipitation Frequency (PF) Estimates (https://hdsc.nws.noaa.gov/hdsc/pfds). Table 2.3 intensity values are based on a M.A.P. of 26 inches. Values selected from this table should be converted to a site-specific intensity using Chart 2.2.

3. Runoff Coefficient Determination:

The runoff coefficients, C, for a storm having a 10-year recurrence interval are presented in Table 2.4 by land use designation and average slope. For 25-year recurrence interval, table values shall be multiplied by 1.1; and for 100-year recurrence the table values shall be multiplied by 1.25; with the results not to exceed 1.0.

4. Time of Concentration Determination:

The time of concentration or the travel time is the time required for runoff to flow from the most upstream point of the drainage area through the conveyance system to the point of interest. The travel time is calculated by dividing the length of the conveyance system component by the corresponding velocity of flow. For typical small residential lots, the time for water to reach the gutter shall be a minimum of 10 minutes. The travel time, $T_c$, is computed as follows:

$$ T_c = T_o + T_g + T_p + T_{ch} $$

Where:

$T_o$ = overland flow time of concentration

$T_g$ = gutter flow travel time

$T_p$ = pipe flow travel time

$T_{ch}$ = channel flow travel time

The equation used to compute the travel time for each conveyance component is described below.

5. Overland Flow

The kinematic wave empirical equation based upon available SCS, COE, and FAA overland flow data (Papadakis, 1987) is:

$$ T_o = \frac{0.66 L^{0.50} i^{0.52}}{S^{0.31} n^{0.52}} $$
Where:

\( T_o \) = overland flow time of concentration, minute

\( L \) = overland flow length, ft.

\( n \) = roughness coefficient for overland flow

\( S \) = average slope of flow path, ft/ft

\( i \) = intensity of precipitation, in/hr

Use of the overland time of concentration equation requires an iterative approach: an initial estimate of the time of concentration updated by successive estimates of precipitation intensity.

6. Gutter Flow: may be determined using Chart 2.1 of the City of Napa Standards.

7. Pipe Flow

Manning's equation can also be used to determine travel time of flow through pipes. Travel time is usually calculated by assuming full pipe flow. Flow velocity is calculated with the equation:

\[
V = \frac{1.49}{n} R^{0.67} S^{0.50}
\]

Where:

\( V \) = velocity in pipe, ft/s

\( R \) = hydraulic radius, \( D/4 \) for full pipe flow, ft

\( D \) = diameter of pipe, ft

\( S \) = slope, ft/ft

\( n \) = Manning’s "n", design value = 0.015 for concrete

8. Trapezoidal Channels

A modified Manning's equation is used for open channel flow to derive the velocity for trapezoidal grass-lined channels. The following assumptions were made in the derivation of the modified equation:

(a) Channel side slopes are 3:1.

(b) Channel bottom width equals the depth.

(c) Top width is seven times the bottom width.

\[
V = \frac{0.995}{n} b^{0.67} S^{0.50}
\]

Where:

\( V \) = velocity, in ft/s

\( b \) = bottom width, ft

\( n \) = Manning’s “n” for channel flow

\( S \) = slope, ft/ft
9. Intensity Determination: The rainfall intensity shall be determined from Tables 2.2 and 2.3.

**TABLE 2.4 – RUNOFF COEFFICIENT FOR RATIONAL METHOD**

<table>
<thead>
<tr>
<th>ZONING OR SURFACE LAYER</th>
<th>RUNOFF COEFFICIENT (C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paved Areas (asphalt or concrete)</td>
<td>0.95</td>
</tr>
<tr>
<td>Industrial Areas</td>
<td>0.85</td>
</tr>
<tr>
<td>Commercial Areas</td>
<td>0.85</td>
</tr>
<tr>
<td>Residential Areas</td>
<td></td>
</tr>
<tr>
<td>Single family, ave. slope less than 2%</td>
<td>0.50</td>
</tr>
<tr>
<td>Single family, ave. slope between 2% and 7%</td>
<td>0.55</td>
</tr>
<tr>
<td>Single family, ave. slope greater than 7%</td>
<td>0.65</td>
</tr>
<tr>
<td>Multi-family, detached</td>
<td>0.65</td>
</tr>
<tr>
<td>Multi-family, attached</td>
<td>0.70</td>
</tr>
<tr>
<td>Schools</td>
<td>0.45</td>
</tr>
<tr>
<td>Agricultural Land</td>
<td>0.45</td>
</tr>
<tr>
<td>Undeveloped open spaces, including pasture</td>
<td></td>
</tr>
<tr>
<td>Average slope less than 2%</td>
<td>0.40</td>
</tr>
<tr>
<td>Average slope between 2% and 7%</td>
<td>0.47</td>
</tr>
<tr>
<td>Average slope greater than 7%</td>
<td>0.55</td>
</tr>
<tr>
<td>Oak Timber and Heavy Brush</td>
<td></td>
</tr>
<tr>
<td>Average slope less than 2%</td>
<td>0.65</td>
</tr>
<tr>
<td>Average slope between 2% and 7%</td>
<td>0.42</td>
</tr>
<tr>
<td>Average slope greater than 7%</td>
<td>0.50</td>
</tr>
</tbody>
</table>

These coefficients are to be used for a return period of 10 years. For return periods of 25 and 100 years, modify the table values as follows:

- 25-Year Return: \( C = \text{Table value} \times 1.10 \)
- 100-Year Return: \( C = \text{Table value} \times 1.25 \)

Note, no value of “C” shall be modified beyond 1.0

**B. Napa Charts**

The 2006 City of Napa Storm Drainage Master Plan developed charts of discharge versus drainage area for the City of Napa watersheds, Figure 2.1. Charts to be used in residential, commercial (+20%) were developed as well. Included in these drainage standards are the most commonly used curves for 10-year and 100-year peak flows for residential, commercial and between 10 and 80 acres. For 25-year discharges multiply 10-year discharges by 1.20. Included in the charts is design flow versus drainage area curves for MAPs ranging from 22 to 36 inches per year. For development exceeding 80 acres in size, the appropriate curve in the City of Napa Storm Drain Master Plan shall be used.

**C. HEC Hydrology Modeling**

U.S. Army Corps of Engineer’s software HEC-HMS (Hydrologic Engineering Center Hydrologic Modeling System) should be used in watersheds over 80 acres and may be used in smaller watersheds if the design engineer desires. Modeling is also necessary when runoff peaks are to be combined, when runoff hydrographs are designed and when
detention and/or water quality BMPs volume-based storage is to be used.

To establish some consistency when modeling in Napa runoff, it is recommended that unit hydrographs be derived based on one of two methods; Clark coefficients or TR-20. Both methods are available in HEC-HMS. Tr-20 is also available as stand-alone software or as a module in hydrology software programs.

1. Clark Coefficient Method

The Corps of Engineers developed values for the Clark time of concentration (Tc) and the Clark storage coefficient (R) as part of their local watershed studies in Napa. The Corps data is the basis for the construction of Figure 2.8 showing Clark coefficients Tc + R plotted to drainage area. A best fit resulted in the adoption of the relationship R/(Tc + R) = 0.25. Entering Figure 2.8 with a drainage area and using the Tc + R from the curve, the Clark coefficients may be derived and used in the HEC-RAS or HEC-HMS model. In summary, the recommended criteria and methods to estimate discharge are presented in Table 2.1. For sizing detention basins in watersheds less than 250 acres, other methods (not including Clark limit hydrograph method) within HEC-RAS or HEC-HMS should be used to adequately represent how the runoff will be routed through the detention basin.

2. TR-20 Method

There are five basic data required to determine runoff using TR-20 – drainage area, runoff curve number, time of concentration, rainfall distribution and 24-hour rainfall depth.

Runoff Curve Number is an index used to rate the runoff potential of a watershed. It is based on the type of soil (hydrologic soil group) and land use/treatment class (surface condition of the watershed).

The National Resources Conservation Service (NRCS) created four synthetic rainfall distributions to represent the various rainfall intensities and geographical regions of the United States. The City of Napa falls under the Type 1A distribution, which corresponds to wet winters and dry summers. The 24-hour rainfall depth is the amount of total rainfall an area will receive in 24-hours during a rain event. This data may be obtained from the publication by the National Oceanic and Atmospheric Association (NOAA) Atlas 2, Volume XI (Northern California).

For a brief study of the TR-20 method and its processes, refer to the NRCS’s publication TR-55 – Urban Hydrology for Small Watershed, which is the non-automated version of the TR-20.

2.03.03 HYDROLOGY / HYDRAULICS
(STUDY REPORT / PLAN SUBMITTAL REQUIREMENTS)

A narrative report shall be provided discussing the hydrologic and hydraulic characteristics of the project and all applicable information specified in Section 2.03.02 of these standards. The report shall state the goals, assumptions, and design concepts underlying the drainage system and include, at minimum, the items listed below:

1. A discussion of pre-development and post-development site conditions. This analysis should include the proposed hydrologic and hydraulic modifications and a summary of the reported results.
2. A drainage basin map showing the limits of all drainage areas and their size in acres or square feet. Drainage basins may not necessarily be limited to project limits and should include the maximum extent of any area that contributes to total runoff. The drainage basin map should show at minimum the following drainage characteristics: Boundaries of all drainage basins, pervious and impervious surfaces, flowlines, and all drainage structures with associated flow elevations.

3. Calculations for all hydrologic properties specified in section 2.03.02 including but not limited to: time of concentration, weighted runoff coefficients, rainfall intensity, and total runoff predicted using the appropriate method specified in Table 2.1. Calculations should be provided for both pre-development and post-development conditions.

4. Hydraulic calculations that show flow capacities for all drainage structures including but not limited to: pipes, swales, gutters, inlets, and outfalls.

5. All charts, tables, and supporting documents used within the report.

Additional information may be required as appropriate depending upon the size and complexity of the project. Incomplete submittals will require subsequent submittals with additional information. Any special issues should be discussed with City staff in advance of the submittal.

2.04 DRAINAGE STRUCTURES

2.04.01 MANHOLES AND JUNCTION BOXES

Manholes and junction boxes shall conform to City of Napa Standard Plans. They shall be located at changes in grade or conduit size, at junction points, on curved pipe at the beginning and ending of the curve. Maximum spacing between manholes and/or accessible structures (catch basins) shall be 400 feet.

2.04.02 CATCH BASINS

Catch basins shall conform to the City of Napa Standard Plans. Catch basins shall be designed and spaced such that they intercept and fully contain the design storm required for the project. Under no circumstance shall the spacing of catch basins result in water flowing in gutters over 500 feet.

2.04.03 GUTTERS

Stormwater runoff in gutters shall be conveyed in underground structures when any one of the following criteria is met:

1. Gutter runoff exceeds 3.0 cfs.
2. Length of gutter flow exceeds 500 feet.
3. Water spread exceeds requirement of Design Criteria, Section 2.02.
4. The minimum longitudinal slope of gutters shall be 0.5 percent. Gutters can slope a minimum of 0.33 percent with a 2-foot-wide gutter pan with the approval of the Public Works Director or their designee.
2.04.04 BOX CULVERTS

Box culverts shall be required when specified by the Public Works Director or their designee and shall be designed on an individual basis per Caltrans Design Standards and Standard Plans.

2.04.05 HEADWALLS

Headwalls, wingwalls, endwalls, etc. shall be considered on an individual basis, and in general, designed in accordance with Section 51 of the Caltrans Standard Specifications.

2.04.06 DRAINAGE PUMP STATIONS

Drainage Pump Stations are not permitted unless approved by the Public Works Director or their designee.

2.04.07 TEMPORARY INLETS AND OUTLETS

Temporary inlets and outlets shall conform to good engineering practice and shall be specifically designed and detailed on the plans.

2.05 OPEN CHANNEL DESIGN

For the purposes of these drainage provisions, a ditch with a capacity of over 2.5 cfs shall be classified as an open channel. Drainage may not be conveyed through a development in open channels without written approval of the Public Works Director or their designee. Requirements for open channels are as follows:

1. Channel construction may require permits and design reviews from environmental regulators outside the City of Napa.

2. **Construction:** Channels shall be constructed to a typical cross section. Fully lined channels shall be designed with maximum side slopes of 2:1; channels with unlined sides shall be designed with maximum side slopes of 3:1. Lined channels shall have a minimum bottom width of at least twice the channel depth and shall have adequate access ramps for maintenance equipment. The lining shall be finished concrete, rip rap rock, or other lining approved by the Public Works Director or their designee. The minimum weight of sacked concrete shall be determined from Figure 2.9, (replacing sack concrete for rock) and in no case shall an individual sack of concrete weigh less than 60 pounds. For use in this figure, impinging velocities shall be 1.4x the mean velocity and the tangential velocity shall be 0.75x the mean velocity.

3. **Design:** Channels shall be designed to convey the 100-year design flow with a minimum velocity of two (2) fps. The maximum velocities shall be as follows:

   (a) Earth channels, six (6) fps.
   (b) Fully lined channels, ten (10) fps.

The hydraulic grade line shall be calculated and plotted on all channel profiles. All computations including a narrative of the design shall be submitted to the Public Works Director or their designee for approval.
A minimum of 3-feet or 1-foot of freeboard in channels with or without levees respectively shall be provided. The latest FEMA Regulations shall also apply.

4. **Curve Radius**: The centerline curve radius of an open channel shall be equal to or greater than twice the bottom width (35-foot minimum).

### 2.06 BENCH DRAINS AND DIVERSION DITCHES

A ditch shall be considered a bench drain or diversion ditch as long as its design capacity is does not exceed 2.5 cfs. Any ditch, which has a capacity greater than 2.5 cfs, shall be considered an open channel and designed as such.

Bench drains and diversion ditches shall be concrete lined and designed with a velocity range of between 3 and 20 feet per second. At changes in alignment and at inlets, adequate measures such as banking, circular curves or energy dissipaters shall be used to confine water to the channel. At locations where, in the opinion of the Public Works Director or their designee, the overflow of a bench drain or diversion ditch could cause flooding, erosion or other damage, the channel section shall be designed to carry the 100-year runoff.

### 2.07 LEVEES

Where new levees are constructed, the landside levee slope shall be 2:1. The waterside slope of the new levee embankment shall be constructed at 3:1. The top width of the levee berm will be 15 feet and shall also function as a patrol road. The limits of the right-of-way shall extend 10 feet beyond the toe of the landside slope of the new levee embankment to provide access for levee maintenance.

Levees may require permits and design reviews from environmental regulators outside the City of Napa.

### 2.08 SLOPE PROTECTION

Where channel slope protection is required, stone riprap protection shall be designed in accordance with USACE Standard EM 1110-02-1601, “Hydraulic Design of Flood Control Channels”.

Slope protection installation may require permits and design reviews from environmental regulators outside the City of Napa.

### 2.09 STRUCTURE OPERATION CRITERIA

All structures such as ponds, control gates, weirs, flap gates, temporary facilities, etc., shall be shown in detail on design and construction drawings. Their purpose, functional operation parameters and settings shall be described on the drawings. Pond ownership and maintenance responsibilities shall also be included.

### 2.10 DETENTION

#### 2.10.01 PURPOSE

The City of Napa’s stormwater systems as well as the Napa River Flood Protection Project do not provide protection for additional flow caused by increases in peak runoff generated by new
development. Much of the City’s storm drain does not have existing capacity to carry 10-year storm flow. Specific areas of the City also have unique drainage situations including the Big Ranch Specific Plan Area which requires “all projects of more than four units draining directly or indirectly to the Salvador Channel or Bel-Aire/Gasser Tributary to provide enough stormwater detention capacity to maintain post-project 100-year peak flows at pre-project levels.” Because of Salvador Creek flooding concerns the above standard is applied to all projects in the Salvador Creek watershed. See Figure 2.10 for a drainage basin map showing the limits of the Salvador Creek watershed. Other requirements also exist which affect the need for detention. Those concerning Water Quality are covered in the BASMAA Post-Construction Manual adopted by the City of Napa.

<table>
<thead>
<tr>
<th>DETENTION REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROJECT TYPE</strong></td>
</tr>
<tr>
<td>Residential</td>
</tr>
<tr>
<td>≥ 1 acre modified or&lt;br&gt; ≥ 0.5 acres of new impervious surfaces</td>
</tr>
<tr>
<td>Commercial</td>
</tr>
<tr>
<td>≥ 25 acres</td>
</tr>
<tr>
<td>Salvador Basin*</td>
</tr>
<tr>
<td>Commercial</td>
</tr>
</tbody>
</table>

* Projects of 4 units or less are required to meet all other detention requirements listed in the above table.

Table Notes:
Existing storm drains may be required to be upsized or replaced if there is inadequate capacity for downstream conveyance.
See Figure 2.10 for location and limits of the Salvador Basin.
A residential unit is defined as any dwelling or place designed for human occupancy which contains a kitchen.

2.10.02 INTRODUCTION

This section is concerned with the planning and design of facilities and features for providing storage in drainage systems. An emphasis is placed in use of storage for flood control.

Storage can also be an effective tool for the management of stormwater runoff. Storage lends itself to multiple land uses and is often the least costly alternative for achieving a particular flood control objective. Temporarily detaining a few acre-feet of runoff can significantly reduce downstream flows and pipe and channel sizes, especially when the flood hydrograph has a rapid rise and fall. Storage can also remove sediment and debris that reduces sediment and pollutant loading on receiving waters.
However, the use of storage to reduce flood peaks is also potentially detrimental to flooding conditions. Storage facilities must be adequately maintained in order to function properly. Further, storage may potentially worsen downstream conditions for events larger or smaller than a single design event, and storage provided at some locations in a basin can actually increase total watershed peak flows by causing runoff peaks to coincide with peaks from other parts of the basin.

Detention facilities shall be designed to capture, temporarily hold and gradually release a volume of stormwater runoff to attenuate and delay stormwater runoff peaks. Outlet structures shall be sized to limit the maximum flow rates. Detention facilities shall drain completely after storm events, within a maximum of 72 hours.

Calculations for detention requirements shall be as outlined for storm drainage design.

Projects shall provide on-site detention of stormwater such that the peak flows from a storm with a two inches per hour intensity, 10-year storm, 25-year storm and 100-year storm does not exceed predevelopment runoff. The Applicant shall provide storm drain inlets with enough capacity to ensure 100-year stormwater enters the detention system. Detention facilities shall not be located within public street rights-of-way. Side slopes should not exceed 3:1 and shall include a 100-year overland escape.

Underground stormwater detention facilities shall be constructed within a Private Drainage Easement at the sole cost of the subdivider, developer and/or contractor. Detention facilities shall not be located within public street rights-of-way.

Maintenance responsibility for stormwater detention facilities shall be the responsibility of an appropriately established Homeowners Association (HOA), or other responsible entity, such as a private maintenance agreement, as approved by the Public Works Director or their designee and the City Attorney. A long-term operations and maintenance plan shall be submitted to and approved by the Public Works Department. The plan shall include a viable method of long term financing for such maintenance, inspection verification reporting and a third party beneficiary agreement. If the Homeowners Association, or other responsible entity, fails to maintain the detention facilities, then the City shall enforce the maintenance through this agreement.

The third party agreement shall allow, but not limit, the City of Napa to force the HOA, or other entity, to do the work, the right to enter onto the property to do the work, the right to charge for the work completed by the City of Napa, or its contractor, and the right to establish a lien to recoup the cost of the work.

**2.10.03 CONCEPTS AND DEFINITIONS**

**A. Detention and Retention**

Detention storage temporarily delays a portion of the inflow so that the maximum outflow is less than the maximum inflow. The storage of runoff is temporary, i.e. water stored is released soon after the maximum inflow has occurred.

Retention storage functions similarly to detention storage except that water is stored for a significantly longer period. Water may be released from retention storage after a storm has ended or it may be retained for a much longer period for other uses such as recreation, surface water supply, or ground water recharge.
B. On-site Storage

The storage of water close to the points of rainfall occurrence is considered on-site storage. On-site storage is typically small scale and includes ponding in parking lots, property line swales, small ponds in green areas, underground tanks and infiltration trenches.

Parking lot detention for industrial/business development shall provide pedestrian access through the ponded areas. Depths of ponding shall not exceed four (4”) inches.

Conduit storage can be utilized by over sizing the underground drainage facilities. Care should be taken to prevent siltation problems.

Channel storage can be utilized by over sizing the open channel facilities. Care again should be taken to prevent siltation problems, and allowances must be made for a minimum capacity at a maximum silt buildup.

2.10.04 PRINCIPLES AND POLICIES

A. Avoiding Detrimental Effects

A storage facility shall not worsen conditions downstream. Any storage facility, especially a detention basin, has a potential for creating worse conditions downstream by altering the timing of peak flows in the stream and its tributaries. In order to avoid detrimental effects, the following criteria are required to be met:

1. A hydrologic study of the watershed in which the basin would be sited is to be conducted. The downstream limit of the study would be the point beyond which changes in peak flows would not be measurable such as tidally influenced water bodies. Where they exist, the HEC watershed models supported by the City should be used.

2. Storage basins must limit outflows to pre-development levels for the 10, 25 and 100-year event peak flow rates with the basin initially empty.

3. The spillway must carry the 100-year storm hydrograph with the basin initially full and provide one foot of freeboard above 100-year event spillway design water surface.

4. Best management practices such as low impact development shall be used to minimize hydromodification to the maximum extent practicable.

B. On-site Storage

On-site storage mitigation of increased runoff shall be used to provide storage where appropriate. Project features, which can be used for incidental storage, include parking lots, parks, and other common areas along with underground storage facilities. On-site storage may create incidental storage, which is effective in reducing peak flows downstream. The ponding function of on-site storage should be considered with the planning and design of the project and coordinated with the master drainage plan.

2.10.05 HYDROLOGIC EVALUATION

The evaluation of the effects of storage on flows is the same, regardless of the scale of the storage facility. The objectives of the hydrologic evaluation are to determine the required storage capacity and to verify the effectiveness of the outlet design in achieving objective
The required capacity of a storage basin is a function of the objective outflows, design inflows, and required freeboard. Carryover and multi-purpose storage are also factors when retention is involved. A routing of the design storm inflows is required to determine the capacity for storage basins. The outflows used in the detailed routing shall be based upon hydraulic rating curves for the outlet works proposed for the basin.

Note that if the actual storage capacity is limited by topography or costs of land acquisition and constructions, it may be necessary to reformulate the objective outflows.

A. Objective Outflows

When storage is to be used to mitigate downstream impacts due to increased flows generated by development of a site, the objective outflow shall be taken as the estimated pre-development peak flow rate.

B. Outflow Control

It is desirable to design the storage to operate under hydraulic control: i.e. the hydraulics of the outlet controls the outflow rates. In no case shall the spillway be manually operated.

C. Duration

The duration of flood routings shall be sufficiently long for stream flows and storage levels to return to initial conditions. Runoff from storms of increasing durations shall be routed through the storage basin to determine the maximum volume required considering carryover from one period of high runoff to the next. Detention facilities shall be designed to drain completely within 72 hours of the end of the design storm.

2.10.06 DETENTION TANKS AND VAULTS

Tanks and vaults provide underground storage of stormwater as part of the runoff quantity control system. As with any underground structure, they must be designed not only for their function as runoff quantity control facilities, but also to withstand an environment of periodic inundation, potentially corrosive chemical or electrochemical soil conditions and heavy ground surface loadings. They must also be accessible for maintenance.

Tanks and vaults typically do not have a built-in design feature for containing sediment, as do multi-cell ponds. Therefore, when tanks or vaults are used for detention storage either a surface sediment containment pond or other sediment control BMP shall be placed upstream of the tank or vault.

Tanks and vaults can be used in conjunction with other detention storage facilities, such as ponds or parking lot ponds, to provide initial or supplemental storage.

A. Design Requirements

The following criteria shall apply to detention tank and vault design:

1. All areas of a tank or vault shall be within 200 feet of a minimum 24-inch diameter access entry cover. All access openings shall have round solid locking lids.

2. Privately owned detention tanks and vaults are not permitted within the public right-of-way. If developments are served with publicly operated and maintained tanks and vaults that are not located within the right-of-way, the tanks/vaults shall be located in...
separate open space tracts with private drainage easements. All privately owned and maintained facilities shall be located to allow easy maintenance and access.

3. All tanks and vaults shall be designed as flow-through systems, unless separate sediment containment is provided.

4. If the collection system piping is designed also to provide storage, the resulting maximum water surface elevation shall maintain a minimum 0.5-foot of freeboard in any catch basin below the catch basin grate. Pipe capacity shall be verified utilizing backwater analysis, using an accepted methodology approved by the City. The minimum internal height of a vault or tank shall be 3 feet and the minimum width shall be 3 feet. The maximum depth of the vault/tank invert shall be 20 feet.

5. All tank and vault shop drawings shall be included with improvement plans for the project.

**B. Materials and Structural Stability**

Pipe materials and joints shall conform to the City of Napa Standards. For pipes outside of City right-of-way, pipe material used may be SDR-35 or PVC Schedule 40 plastic.

All tanks and vaults shall meet structural requirements for overburden support and traffic loadings, if appropriate. HS-20 live loads shall be accommodated for tanks and vaults under roadways and parking areas. End plans and caps shall be designed for structural stability at maximum hydrostatic loading conditions.

Detention vaults shall be constructed of structural reinforced concrete (3000 psi, ASTM 405). All construction joints shall be provided with water stops.

In soils where groundwater may induce flotation and buoyancy, measures shall be taken to counteract these forces. Ballasting with concrete or earth backfill, providing concrete anchors or other counteractive measures shall be required. Calculations shall be required to demonstrate stability.

Tanks and vaults shall be placed on stable, consolidated native soil with suitable bedding. Tanks and vaults shall not be allowed in fill slopes, unless a geotechnical analysis is performed for stability and construction practices.

**2.10.07 CONTROL STRUCTURES**

Detention control structures shall be either weir structures or orifice structures. Weir structures may be enclosed in a catch basin, manhole, or vault or may be installed in the open provided they are accessible for maintenance and are not exposed to damage. Riser type restrictor devices also provide some incidental oil/water separation and spill control. Weir structures provide some oil/water separation when fitted with a baffle plate located upstream of the weir.

The following criteria shall apply to control structure design:

1. Flow control manholes shall have solid locking covers. Open grates shall not be permitted in control manholes.

2. Multiple orifices are usually necessary to meet the design storm performance requirements for a detention system.
2.12 DRAINAGE EASEMENTS

Drainage easements shall be established when drainage facilities exist, or are designed to be constructed, on private property. Clear access must be provided and maintained to all public structures on the drainage system.

Publicly maintained drainage conduits and channels will not be allowed on private property unless they lie within dedicated public drainage easements. When minor improvement of a drainage channel falls on adjacent property (such as day lighting a ditch profile) written permission from the adjacent property owner(s) for such construction shall be required. A copy of the document which grants said approval shall be submitted to the Public Works Director or their designee prior to the approval of the improvement plans.

Easements for closed conduits shall have a minimum width of either 15 feet or a width in feet equal to the required trench width according to the standard detail for trench backfill plus 2 additional feet of width for every foot of depth of the pipe as measured from the bottom of the pipe to finished grade, whichever is wider. For pipes outside the City right-of-way and less than 10” in diameter, a 10’ wide minimum easement shall be provided. All conduits shall be centered at the quarter point within their easements. Drainage easements for open channels with flows of over 3 cubic feet per second shall have sufficient width to contain the open channel and two 17-foot wide service roads. The toe of a bank shall not be within 17 feet of an easement boundary. Easement boundary lines shall, at changes of alignment, have a 50-foot radius sufficient to provide turning room for vehicles operating on the service road.

Easements shall be categorized as follows:

- **Public drainage easements** cover fully improved drainage and detention facilities that provide for the drainage of publicly owned and maintained areas, such as streets and parks. Public drainage easements shall be dedicated to the City and will be accepted by the City. The City will be responsible for the maintenance of drainage facilities within these easements.

- **Private drainage easements** cover improved or unimproved drainage and detention facilities that are constructed on private property for the purpose of draining adjacent privately-owned lots. In a subdivision, these private drainage easements are typically a result of the overall drainage design of the subdivision and may serve many lots. Private easements are generally not dedicated to nor accepted by the City. The private property owner is responsible for the maintenance of all drainage facilities contained within private drainage easement and may be liable for any damage to adjacent properties resulting from a failure to do so. In a subdivision, the CC&R’s or Maintenance Agreement between property owners shall indicate that the maintenance of these private drainage easements is the responsibility of the respective property owner.

There may be situations where, at the City’s election, an irrevocable offer to dedicate a private drainage easement may be required. Normally this would only be necessary to provide overall drainage to an area upstream of a development for future extension of a drainage system that may be a public system in the future.

Physical improvements, beyond landscaping such as grass and low-lying vegetation, are prohibited (including fill) in a public drainage easement. Any obstructions placed in this public drainage easement are subject to removal by the City of Napa with the expense billed to the property owner.

All drainage easements that result from a subdivision development shall be shown on the Final Map, including descriptions for type of easements shown.
The following definitions are provided solely for historical knowledge and are no longer used to designate drainage easements by the City of Napa:

- **Type A** easements cover fully improved drainage facilities that provide for the drainage of publicly owned and maintained areas, such as streets and parks. The City will be responsible for the maintenance of drainage facilities within Type A easements.

- **Type B** easements cover unimproved drainage facilities that serve public as well as privately owned lands. The most common use of Type B easements are for unimproved natural water sources. These easements are dedicated to the City, but will not be accepted by the City and, therefore, will not be maintained by the City. The private property owner is responsible for the maintenance of all drainage facilities contained within Type B easements.

- **Type C** easements cover improved or unimproved drainage facilities that are constructed on private property for the purpose of draining adjacent privately-owned lots. In a subdivision, Type C easements are typically a result of the overall drainage design of the subdivision and may serve many lots. Type C easements are private storm drain easements and shall not be dedicated to nor accepted by the City.

### 2.13 SPECIAL PROVISIONS

All storm drainage pipes installed within public streets or easements shall be a minimum of 18 inches in diameter and shall be a minimum Class III reinforced concrete pipe with rubber gasketed joints, unless otherwise approved by the Public Works Director or their designee.

Whenever a storm drainage pipe is installed in paved public streets, the sides of the trench shall be cut to a neat line in a manner satisfactory to the Public Works Director or their designee. The trench shall be backfilled with ¾” Class II AB and a temporary patch of cold mix asphalt shall be placed on the trench at the end of the workday. Permanent pavement shall be placed on the trench within 48 hours after the storm drainage pipe has been installed unless otherwise approved by the Public Works Director or their designee. Attention is directed to City Standard Plan D-12, “Storm Drain Trench”.

#### 2.13.01 ASPHALT PLACEMENT

After backfilling and compacting trenches passing through pavements, three inches (3”) of asphalt cutback shall be placed to grade. Temporary asphalt cutback shall be maintained at Contractor’s expense until permanent paving is installed.

All trenches through existing asphalt concrete (AC) shall be permanently paved with a minimum of five inches (5”) of AC placed in two (2) lifts. All trenches shall be “T” cut prior to the placement of the permanent AC. The “T” cut shall be created after the trench is recomPActed.

Existing AC or Portland Cement Concrete (PCC) shall be saw-cut or planed only. Jack-hammered edges shall not be allowed. AC must be compacted to 95% minimum.

#### 2.13.02 CRACK SEALING OF TRENCH PATCH

After all permanent ACC or PCC trench patches have been installed, the joint between the existing concrete and the newly placed patch shall be crack sealed. Crack sealing shall be per Section 37-5, “Parking Area Seals”, of the Standard Plans. The cost of crack sealing shall
be at no additional City expense.

The placement and compaction of backfill material shall conform to the provisions in Section 19-3, “Structure Excavation and Backfill”, of the Standard Specifications, the Storm Drain Trench City Standard Plan, D-12, and as directed by the Public Works Director or their designee.

2.13.03 TRENCHING, BORING, BACKFILL AND COMPACTION

A. Description

A trench is defined as an excavation in which the depth is greater than the width. Excavation for appurtenant structures such as, but not limited to, manholes, transition structures, junction structures, catch basins/drain inlets, and bore pits shall be deemed to be on the category of trench excavations.

Excavation shall include the removal of all water and material of any nature which interfere with the construction work. Placement of spoil materials on the paved street area shall only be allowed under written approval from the Public Works Director.

Installation of conduits shall be by open trench unless otherwise specified or shown on the drawings. If a Contractor elects to tunnel or bore and jack any portion of the work, written approval shall be obtained from the Public Works Director. (See Section G, “Tunneling, Boring, and Jacking”).

Open trenching shall be prohibited on all newly paved streets for a period of not less than three (3) years from the date of the latest overlay without written approval by the Public Works Director.

B. Maximum Length of Open Trench

The maximum length of open trench, where prefabricated pipe or other structures are to be placed, shall be the distance necessary to accommodate that amount of pipe which can be installed and backfilled in a single day. The distance is the collective length at any location, including open excavation, pipe laying and appurtenant construction and backfill which have not been temporarily resurfaced. The use of steel plates as open trench or excavation cover shall be allowed only with prior approval of the Public Works Director. All trenches or excavations within a sidewalk area or driveway shall be covered with steel plates. The use of plywood for open trench or excavation cover shall not be allowed within or adjacent to the City right-of-way.

C. Temporary Pavement

Backfilled excavations shall be covered with a minimum 3-inch layer of temporary cold-mix asphalt concrete to create a smooth driving surface, pending placement of the permanent surface. The contractor shall be responsible for checking the temporary driving surface daily to ensure that the surface remains smooth. Any settling or cavitation of the temporary asphalt surface shall be corrected immediately. If the contractor fails to maintain the temporary surface in a safe and clean manner, the City may require that trench plates be used to cover the trench.

D. Trench Plates

When an excavation in the public right of way cannot be backfilled and permanently paved within a workday, steel plate bridging with a non-skid-surface and trench shoring may be
required to preserve traffic flow and to ensure public safety. This includes excavations within a paved street section or within the concrete curb, gutter, and sidewalk area, whether transverse or longitudinal. Excavations shall remain covered with steel plates until permanent pavement is installed unless the City Engineer approves in writing an alternative method of temporary surface restoration.

Steel plate bridging and shoring shall be installed using Method A (as described below), unless the City Engineer approves in writing the use of Method B (as described below), which may be used only where the traffic speed is less than 35 mph. The Contractor is responsible for all temporary excavation surfaces in the public right of way, including the maintenance of cold asphalt concrete, steel plates, and shoring.

- **Method A:** If the traffic speed is 35 mph or more, the road surface shall be cold milled to a depth equal to the thickness of the trench plate and the trench plate shall be installed so that the top is flush with the adjacent road surface. The width and length of the cold milling shall match the width and length of the steel plate as closely as possible, and any edge gaps shall be filled with compacted cold-mix asphalt concrete.

- **Method B:**

For speeds less than 35 mph and with written approval of the City Engineer, steel plate bridging may be placed on top of the asphalt surface without cold milling the existing pavement.

The plate(s) shall be prevented from sliding by being attached to the roadway by dowels pre-drilled into the corners of the plate(s) and drilled 2 inches into the pavement as follows:

i. If only one plate is used, all four corners shall be drilled and dowelled.

ii. If a row of plates is being used across the direction of traffic, all four corners of each plate shall be drilled and dowelled.

iii. If a row of plates is being used in the direction of traffic, two dowels shall be located at the beginning of the approach plate and two dowels shall be located at the end of the ending plate.

Fine-graded cold-mix asphalt concrete shall be placed and tightly compacted around all exposed edges of the trench plates to create a ramp up to the top of the plates. The asphalt shall have a maximum slope of 12:1 (8.3%) and a minimum aper length of 12 inches.

When the steel plates are removed, any dowel holes in the pavement shall be backfilled with either fine-graded cold-mix asphalt, concrete slurry, or an equivalent slurry satisfaction to the City Inspector.

Regardless of the method of steel placement, the following conditions shall apply:

1. Steel plates shall be of ASTM A36 steel, or better, with $F_y = 36$ ksi. min.

2. Steel plates used for bridging shall extend a minimum of 12 inches beyond the edges of the span, with the span being either:

   (a) The trench width, for trenches cut into a hard surface such as concrete or pavement; or

   (b) The trench width plus 12 inches, for trenches cut into native soil.

3. Trenches and excavations shall be adequately shored or braced to withstand the bridging and traffic loads.
4. Steel plates within the City Right of Way whether used in or out of the traveled way shall be without deformation. The City Engineer shall determine the trueness of the steel plate by using a straight edge and will reject any plate that is permanently deformed.

5. Contractor shall not install any steel plate that is delivered without the required surfacing or is permanently deformed.

6. Where multiple trench plates are to be used, all plates shall be tightly butted and tack-welded together at the end of each day. At least two tack welds shall be used to secure a pair of adjacent plates, and the aggregate length of the welds shall be at least 6 inches per pair of plates.

7. The Contractor shall maintain a skid resistant surface on the steel plate having a minimum coefficient of friction equivalent to 0.35 per California Test Method 342.
   
   (a) If a different test method is used, the permittee may utilize a standard test plate with known coefficients of friction available from each Caltrans District Materials Engineer to correlate skid resistance results to California Test Method 342.

8. A “Steel Plates Ahead” (W8-24) sign shall be used in advance of all trench plates.

9. A “Rough Road” (W8-8) sign shall be used in advance of all temporary paving.

10. Signs shall have black lettering on an orange background and shall be used in conjunction with a traffic control plan approved by the City Engineer.

11. All trench plating shall be designed for a minimum of HS-20-44 Truck loading and shall not be accessed by construction vehicles exceeding this loading.

12. The following table shows the maximum allowable span of each standard plate thickness and is for HS-20-44 loading and 36 ksi steel:

<table>
<thead>
<tr>
<th>PLATE THICKNESS</th>
<th>MAXIMUM ALLOWABLE TRENCH PLATE SPAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4”</td>
<td>2’ 6”</td>
</tr>
<tr>
<td>7/8”</td>
<td>3’ 4”</td>
</tr>
<tr>
<td>1”</td>
<td>4’ 6”</td>
</tr>
<tr>
<td>1 ¼”</td>
<td>7’ 0”</td>
</tr>
<tr>
<td>1 ½”</td>
<td>10’ 0”</td>
</tr>
<tr>
<td>2”</td>
<td>14’ 0”</td>
</tr>
</tbody>
</table>

13. For trenches and excavations with spans greater than fourteen feet (14’), a structural design shall be prepared by a Registered Civil Engineer and approved by the City Engineer.

14. Unless specifically noted in the provisions of the encroachment permit, steel plate bridging shall not be left in place for more than 5 consecutive working days in any given week.

15. Steel plates shall not be left in place over a weekend without prior written approval by the City Engineer or City Inspector. If permission is granted, the plates must be checked a minimum of two (2) times a day to ensure stability.
E. Trenching

The maximum clear width of the trench at the top of the pipe shall not be more than the outside diameter of the pipe at any point plus two (2’) feet on each side. Greater width of the trench at the top of the pipe shall be permitted only on written approval by the Public Works Director or by plan design. In no case shall the free working space on each side of the pipe be less than six inches (6”) without Public Works Director’s approval.

If maximum trench width is exceeded, the Contractor shall provide additional bedding, another type of bedding, a higher strength of pipe, or any other additional work, as required or approved by the Public Works Director, to adequately install and protect the pipe equal to the original design, at no additional City cost.

F. Bracing and Shoring Excavations

The manner of bracing and shoring excavations shall be as set forth in the rules, orders and regulations of the State of California Construction Safety Orders, Division of Industrial Safety.

Contractors may be required at the discretion of the Public Works Director to provide drawings or calculations by a registered engineer five (5) working days prior to beginning construction for specially designed bracing and shoring of an excavation where standard pre-manufactured bracing or shoring cannot be used.

Contractors shall submit a copy of their current Annual Excavation Permit issued by the State of California Division of Industrial Safety (CAL-OSHA) along with the Contractor’s own Trench Safety Plan prior to the start of construction.

G. Tunneling, Boring, and Jacking

Any pipe or facility placed underground in any method other than open cut trenching shall be considered as tunneling or boring and jacking.

All tunneling or boring and jacking shall receive the Public Works Director’s approval prior to work start. All existing utilities shall be potholed for actual depth prior to tunneling or boring and jacking operations. A borepath sheet, showing all potholed utilities, shall be submitted for approval by the City Engineer five (5) days prior to start of work. The City shall receive a copy of all permits and orders for the installation of any facilities that require boring and jacking or tunneling that will be within the City right-of-way or within any other agency’s jurisdiction. Including, but not limited to, Caltrans, railroads, and private property within City Limits.

All voids between the inside of the casing and the pipe shall be completely backfilled by blowing sand or pumping grout between the casing and the facilities within the casing as directed by the Public Works Director. Casing inside diameter shall be a minimum of twice the outside diameter of the facility to be placed within the casing. The wall thickness of the casing shall be 0.375 inches or as directed by the Public Works Director. All casings shall be fully fusible C-905 PVC at each joint. All casings shall have a sealed end cap sealing the end of the casing.

All pipes to be installed within the casing shall be installed on plastic skids or spacers with a maximum spacing of three feet (3’) between skids or spacers and banded to the pipe using stainless steel bands or as approved by the City Engineer. All installations shall be per the boring and jacking detail.
2.13.04 COVER REQUIREMENTS

All stormwater conveyance structures shall be designed to allow a minimum of two feet of cover as measured from bottom of sub-grade to the top of pipe. If achieving this cover is not possible due to some sound engineering reason, the pipe shall be encased in concrete or provided with a one-foot concrete cover as approved by the Public Works Director or their designee.

2.13.05 REINFORCED CONCRETE PIPE (RCP)

All storm drainage pipes installed within public streets or easements shall be a minimum of 18 inches in diameter and shall be a minimum of Class III reinforced concrete pipe with rubber gasketed joints, unless otherwise approved by the Public Works Director or their designee.

Reinforced concrete pipe (RCP) shall conform to ASTM Designation C76-08a (or latest ASTM adopted standard). A Certificate of compliance with ASTM C76-08a shall be provided to the City inspector prior to the installation of RCP. Tests results per ASTM C497-17 (or latest ASTM adopted standard) including the following shall also be provided to the City inspector prior to installation of RCP:

- External load crush test
- Hydrostatic: 13 PSI for 20 minutes
- Absorption
- Permeability
- Cylinder strength
- Allowable leakage: none

The following chart lists the minimum allowable classes of reinforced concrete pipe and cover requirements for each class of pipe.

<table>
<thead>
<tr>
<th>MINIMUM CLASS, RCP</th>
<th>COVER (IN FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL V (3000D)</td>
<td>Less than 2.5</td>
</tr>
<tr>
<td>CL III (1500D)</td>
<td>2.5 - 7.9</td>
</tr>
<tr>
<td>CL IV (2000D)</td>
<td>8.0-11.9</td>
</tr>
<tr>
<td>CL V (3000D)</td>
<td>12.0-17.0</td>
</tr>
</tbody>
</table>

No storm drainpipe, which lies totally or in part within the structural section of a street, shall be allowed unless approved by the Public Works Director or their designee.

A geotextile must be placed, per the manufacturer’s directions, between the clean crushed rock and the overlying material.

2.13.06 CAST IN PLACE PIPE (CIPP)

Cast in place pipe (CIPP) is not accepted unless specifically approved by the Public Works Director or their designee. If the use of CIPP is approved the following standards shall apply:

A City approved independent inspector under the direct supervision of an independent Registered Civil Engineer experienced in the manufacture and placement of CIPP shall be
required for continuous inspection of the construction process. The inspection shall be certified in writing and signed by the inspector and the Registered Civil Engineer. The certification to be done on a daily basis of operation shall include, as a minimum, the following:

- Review of trench form, soil conditions, and trench grade.
- Report on method of operation and compliance with these specifications.
- Report on concrete mix used, temperature, transit method, machinery condition.
- Report on visual appearance of the pipe as poured for smoothness, rock pockets if any, alignment, grade, and compliance with these specifications.
- Report on deficiencies that require repair or replacement.
- Report on curing method.
- Report on backfill placement.
- Review of concrete test results and adequacy of the finished product.

The minimum allowable wall thicknesses for CIPP are as follows:

<table>
<thead>
<tr>
<th>INTERNAL DIAMETER</th>
<th>MINIMUM WALL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>24&quot; to 30&quot;</td>
<td>3&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>3½&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>4&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>5&quot;</td>
</tr>
<tr>
<td>54&quot;</td>
<td>5½&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>6&quot;</td>
</tr>
<tr>
<td>66&quot;</td>
<td>6½&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>7&quot;</td>
</tr>
<tr>
<td>84&quot;</td>
<td>8&quot;</td>
</tr>
<tr>
<td>96&quot;</td>
<td>9&quot;</td>
</tr>
<tr>
<td>108&quot;</td>
<td>10½&quot;</td>
</tr>
<tr>
<td>120&quot;</td>
<td>12&quot;</td>
</tr>
</tbody>
</table>

The Contractor shall provide adequate means of providing fresh air delivery to the inside of the pipe. This shall be for the use of workers during construction and for the use of the City Engineer during inspection. The methods and quantities of fresh air delivery shall be suitable for the purpose and shall conform to applicable requirements of local, state and federal rules, regulations, laws and ordinances.

2.13.07 VIDEO INSPECTION
(Cleaning and Closed-Circuit Television Inspection of Newly Constructed Storm Drain Pipelines)
A. Objective

These specifications define the minimum requirements for the preparatory cleaning and closed-circuit television (CCTV) inspection of newly constructed storm drainage pipelines, and for required warranty CCTV inspections of pipelines. The purpose of this work will be to determine the condition of the pipeline, document the location of connections and other key features, identify any structural deficiencies, and to locate defects that may be allowing groundwater to infiltrate into the pipeline. All storm drains shall be CCTV inspected at the completion of construction and at the one-year warranty. A ¾” or 1” gauge shall be used for all CCTV inspections.

B. General

Experienced and pre-qualified personnel utilizing equipment and materials meeting the requirements of these specifications shall perform all work. Pre-qualification shall require that the contracting company and the job supervisor each have a minimum of three (3) years experience in the performance of the type of work specified and shall have specifically performed at least 100,000 feet of cleaning and television inspection within the past three years. A company with less than three (3) years experience may pre-qualify if they can demonstrate to the satisfaction of the City that they have the capabilities and overall experience, equipment and expertise to satisfactorily complete the project in accordance with these specifications.

All work shall be performed to the minimum standards of the industry. Where not conflicting with the requirements of these specifications, the most current available edition of the National Association of Sewer Service Companies (NASSCO) Specifications Guidelines and the NASSCO Inspector Handbook shall be used as a measure of the standard of practice for this work.

The Contractor shall use designated City and standard industry terminology in the performance and documentation of the CCTV inspection work. A pipeline joint, as used within these specifications, refers to the junction of two pipes. The term, “manhole section” as used in these specifications shall mean the length of pipe connecting two manholes or a manhole and a clean-out.

Before final acceptance of the work by the City, the Contractor shall review with the City the findings of the fieldwork to confirm that all necessary work has been performed as needed. This shall include a review of finished written records of defects found, the videotapes, and any sketches or diagrams prepared to illustrate defects found. Videotapes or other acceptable electronic files shall be submitted to the City and become the property of the City.

2.13.08 VERTICAL GRADE / STANDING WATER ALLOWANCE

Any new installed storm drain pipe up to 10 inches in diameter shall have no more than 1/2 inch of standing water in the flow line after construction is completed (3/4 inch for pipes larger than 10 inches). After one year, as part of the warranty inspection, the storm drain pipe shall not have more than 3/4 inch of standing water in the flow line (1 inch for pipes larger than 10 inches). Laterals shall have no standing water in the flow line after construction is completed and after one year of construction. This standing water measurement shall be taken during televised inspections of the storm drainage lines and laterals (see section 2.13.07, “Video Inspection” of these City Standard Specifications), after water is introduced and allowed to leave for measurement indicator to function correctly.
2.13.09 CAPS/STOPPERS

Caps or stoppers shall be furnished with branch pipes that are to be left unconnected. Caps and stoppers shall be prefabricated and watertight fitting the bell of the branch pipe and installed according to the manufacturer’s recommendations.

2.14 STORMWATER QUALITY

In order to achieve compliance with the State Water Resources Control Board’s National Pollutant Discharge Elimination System (NPDES) General Permit for Small Municipal Separate Storm Sewer Systems (2013-0001-DWQ) development activity shall implement stormwater quality control measures and best management practices and shall also comply with Chapter 8.36, “Stormwater Runoff Pollution Control”, of the City of Napa Municipal Code (NMC).

Any construction activity that results in the disturbance of one (1) acre or greater total land area, or is part of a larger common plan of development that disturbs one (1) acre or greater total land area, the developer shall file a Notice of Intent with the California State Water Resources Control Board (“SWRCB”) and obtain a Waste Discharger Identification (WDID) number prior to any grading or ground disturbing activities. Construction activity resulting in less than (1) acre of land disturbance must follow an approved Erosion and Sediment Control Plan (ESCP).

Industrial/commercial facilities shall file a Notice of Intent with the State Water Board in accordance with the Industrial General Permit prior to establishment of the use.

Development projects shall incorporate Low-Impact Development (LID) standards designed to reduce runoff, treat storm water, and provide baseline hydromodification management.

Development projects over an acre in the City of Napa are required to limit the post-development peak stormwater runoff discharge rate leaving certain projects to the estimated pre-development discharge rate.

2.14.01 POST CONSTRUCTION SITE DESIGN MEASURES

All projects creating and/or replacing between 2,500 square feet and 5,000 square feet of impervious surface and are not part of a larger development shall incorporate site design measures to treat and infiltrate stormwater runoff.

Projects that create and or replace more than 5,000 square feet of impervious surface are required to treat stormwater runoff by incorporating site design measures using LID standards.

Regulated projects shall incorporate source control measures for all pollutant generating activities where applicable.

Low Impact Development Standards shall be met by all regulated projects.

Projects that create and or replace more than one acre of impervious surface shall incorporate hydromodification management into the project to match pre-project flow rates. Post project runoff shall not exceed the estimated pre-project flow rate for both the 2-year, 24-hour storm and the 10-year, 24-hour storms events.

The responsible entity shall enter into a long-term maintenance agreement for the maintenance of post construction stormwater quality treatment facilities with the City of Napa.
A long-term operations and maintenance plan shall be incorporated as part of the agreement and shall include a viable method of long term financing for such maintenance, inspection verification reporting and a third party beneficiary agreement. If the Homeowners Association, or other responsible entity, fails to maintain the post construction treatment facilities, then the City shall enforce the maintenance through this agreement.

The third party agreement shall allow, but not limit, the City of Napa to force the HOA, or other entity, to do the work, the right to enter onto the property to do the work, the right to charge for the work completed by the City of Napa, or its contractor, and the right to establish a lien to recoup the cost of the work.

Complete post construction design details can be found by referring to the City adopted BASMAA Post Construction Manual.

2.15 MISCELLANEOUS ITEMS

2.15.01 CREEK SETBACKS

The Napa Municipal Code Chapter 17.52.110 regulates the requirements for stream bank safety and protection and enhancement of riparian habitat corridors.

2.15.02 FENCING

All open channels shall be enclosed by a 6’ high chain link fence per Caltrans Standard Plan A85, or other type as approved by Public Works Director or designee.

The fence shall be located 6 inches inside the required easement lines. Gates must be provided for access through any fence crossing a public storm drain easement. Where vehicular access is required for maintenance, minimum 14’ wide gates must be provided with sliding gates preferred. Where vehicular access is not required 4’ wide gates for pedestrian access must be provided.

2.15.03 SERVICE ROADS

Two service roads shall be provided within the boundary of all open channels. They shall be a minimum of 17 feet wide, each graded for vehicular traffic and clear of trees, shrubbery and other obstructions for its full width. Fourteen feet of the road’s width shall be paved or graveled all-weather (surface type to be determined by the Public Works Director or their designee for each case) with a minimum unpaved shoulder width of 1-foot on each side of the roadway. Service roads are required on both sides of the channel.

2.15.04 FLOOD CONTROL

Flood Plain regulations apply to all new and redevelopment, which would be inundated by the 100-year flood (Floodway and Hazard Area) and are contained in NMC Chapter 17.38. There are several basic requirements which must be met including but not limited to the following:

- All applications for a floodplain permit shall include plans drawn to scale showing at a minimum the nature, location, dimension, and elevation of the area in questions, existing or proposed structures, fill, storage of materials or equipment, and drainage facilities.
• All new residential construction and substantial improvements to residential units must have the lowest floor, including basement, elevated to one foot or more above the base flood elevation.

• All new non-residential construction and substantial improvements to non-residential structures must have the lowest floor, including basement, elevated to one foot or more above the base flood elevation or be flood proofed to one foot or more above the base flood elevation.

• All attendant utilities and sanitary facilities must be constructed to resist flood damage.

• Upon completion of the building the elevation of the lowest floor including basement shall be certified by a professional engineer or surveyor and verified by the Building Inspector.

• Flood evacuation plans required by NMC Chapter 17.38.070, Additional Regulations for Certain Residential Development in Portions of the Floodplain (Flood Evacuation Area) shall be completed and approved by the City prior to occupancy of residential structures in the floodplain evacuation area.
2.16 CHARTS AND FIGURES

2.16.01 CHARTS

Chart 2.1 Flow in Triangular Gutter Sections
Chart 2.2 Isohyetal Map of Napa City
LONGITUDINAL SLOPE

CROSS SLOPE

TURNING LINE

WIDTH OF FLOW

FLOW RATE
\( N = 1.016 \)

\( S_x = 0.03 \)
\( S_w = 0.04 \)
\( T = 6 \) FT

\( Q = \frac{2.4 \text{ FT}^3/\text{S}}{Q_1 = 0.038 \text{ FT}^3/\text{S}} \)

NOTES

1. FOR V-SHAPE, USE THE NOMOGRAPH WITH \( S_x = (S_{xx} \times S_{xx}) / (S_{xx} + S_{xx}) \)

2. TO DETERMINE DISCHARGE IN GUTTER WITH COMPOSITE CROSS SLOPES, FIND \( Q_5 \) USING \( T_5 \) AND \( S_x \). THEN, USE CHART A TO FIND \( E_0 \). THE TOTAL DISCHARGE IS \( Q = Q_3 / (1 + E_0) \) AND \( Q_w = Q - Q_3 \).

\[
Q = \frac{9.865 \cdot 1.57 \cdot 0.0167}{Q = \text{FLOW RATE}, \text{CF}}
\]

\[
T = \text{WIDTH OF FLOW (SPREAD), FT}
\]

\[
S_w = \text{CROSS SLOPE, FT/FT}
\]

\[
S = \text{LONGITUDINAL SLOPE, FT/FT}
\]

\[
N = \text{MANNING'S COEFFICIENT}
\]

CHART A

CITY OF NAPA

FLOW IN TRIANGULAR GUTTER SECTIONS

PUBLIC WORKS DEPARTMENT

DRAWN BY: BRL

CHECKED BY: TCW

DATE: 05/2018

APPROVED BY: JRL

SCALE: NONE

DRAWING NO.: CHART-2.1

FIELD NOTES:
2.16.02 FIGURES

Figure 2.1 City of Napa Discharge vs. Drainage Area
Figure 2.2 Residential Area 10-Year Peak Flow - 0 to 80 Acres
Figure 2.3 Commercial Area 10-Year Peak Flow - 0 to 80 Acres
Figure 2.4 Rural Area 10-Year Peak Flow - 0 to 80 Acres
Figure 2.5 Residential Area 100-Year Peak Flow - 0 to 80 Acres
Figure 2.6 Commercial Area 100-Year Peak Flow - 0 to 80 Acres
Figure 2.7 Rural Area 100-Year Peak Flow - 0 to 80 Acres
Figure 2.8 Tc+R and Area Relationship for Napa
Figure 2.9 Bank and Shore Protection
Figure 2.10 Salvador Drainage Basin
INTENTIONALLY LEFT BLANK
$y = 1.5691x^{0.8488}$

![Graph showing discharge vs. drainage area relationship with data points and line of best fit.](chart.png)

- **1971 Linda Vista Drainage Study by HJK, 1-5-71**
- **COE Appendix D, June 1995**
- **Rational Method**
- **Power (1971 Linda Vista Drainage Study by HJK, 1-5-71)**

**Chart is from City of Napa 2006 Storm Drain Master Plan Figure 3-2**
\( sg = \text{SPECIFIC GRAVITY OF ROCK} \)

\( W = \text{WEIGHT OF ROCK, POUNDS} \)

\( V = \text{VELOCITY OF WATER, FT. PER SEC.} \)

\( B = 70^0 \text{ CONSTANT FOR BROKEN ROCK} \)

\( W = \left( \frac{10000 \times V^2 \times sg}{sg - 1} \right) \)

\( \text{FACE SLOPE} = \cot(\alpha) \)

\( \text{EXAMPLE:} \)

\( \begin{align*}
sg &= 2.55 \\
V &= 10 \text{ FT./SEC} \\
W &= 57.18 \\
V &= 20 \text{ FT./SEC} \\
W &= 1.87 \\
\end{align*} \)
3 - STREET STANDARDS

3.01 STREET DESIGN CRITERIA

3.01.01 DEFINITIONS

A. Arterial

Arterial streets primary purpose is to carry higher volumes of through traffic between major residential and/or commercial areas and channel and distribute traffic from freeways to collector streets and vice versa. The optimum minimum distance between major intersections is approximately ½ mile. Driveways to major traffic generators may be located within the ½ mile spacing. New arterials will be constructed within 74-to-136-foot rights of way. Major arterials consist of four to six lanes and provide for a striped left turn lane or curbed median. Arterials carry up to 40,000 vehicle trips per day. Residential development along arterials generally requires larger than average setbacks and landscape buffers.

B. Collector

Collector streets have the primary purpose of serving as connectors between local and arterial streets. Collector streets provide direct access to parcels. At major intersections, driveways on collector streets should be no closer than 50 feet to the intersection. Collectors carry two lanes of traffic, usually do not have left turn medians, may have continuous left turn lanes, and are generally constructed within rights of way that are up to 84 feet in width. Collector streets carry up to 12,000 vehicle trips per day. Collector street typical intersection spacing is ¼ mile. The collector street standards are used for the industrial and office park street systems.

C. Local Streets

Local streets provide low volume access from abutting parcels to collector and arterial streets. Local streets generally consist of two travel lanes and rights of way widths up to 56 feet.

3.01.02 GENERAL

Design of City facilities shall conform to the provisions of these standard specifications, supplemented by these publications:

- Caltrans Highway Design Manual, latest edition
- Manual of Uniform Traffic Control Devices as amended by the California Supplement, latest edition
- A Policy on Geometric Design of Highways and Streets (AASHTO), latest edition
- Caltrans Standard Plans, latest edition. Use revised standard plans as applicable.
- County Engineers Association & Caltrans & League of California Cities Flexible Pavement – Structural Section Design Guide for Cities and Counties (1979)
- Asphalt Institute MS-1, Thickness Design – Asphalt Pavements for Highways & Streets

Modifications to these design standards may be considered on a case-by-case basis as appropriate to accommodate and provide for storm water quality measures (Best Management Practices for storm water pollution prevention) as reviewed and approved by the City Engineer.

3.01.03 STREET DESIGN CRITERIA TABLE

The **Street Design Criteria Table** (Table 3.1) provides the minimum right of way widths, centerline radii, design speeds, structural sections, maximum longitudinal grades and the traffic indexes that correspond to the various city street classifications shown on City Standard Plans S-6(a-f).
<table>
<thead>
<tr>
<th>STREET CLASSIFICATION</th>
<th>AVG. DAILY TRAFFIC (ADT)</th>
<th>R/W WIDTH</th>
<th>PAVEMENT WIDTH (FC To FC)</th>
<th>MIN. C.L. RADIUS</th>
<th>DESIGN SPEED (MPH)</th>
<th>TRAFFIC INDEX</th>
<th>MIN. STRUCTURAL SECTION</th>
<th>MAX. GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTERIALS</td>
<td>Up to 40,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>AC AB</td>
</tr>
<tr>
<td>6 Lane (Type A)</td>
<td>Up to 40,000</td>
<td>1000’</td>
<td>50</td>
<td>10</td>
<td>6’</td>
<td>20”</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>(Divided w/ Pkg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Lane (Type B)</td>
<td></td>
<td>126’ to 136’</td>
<td>88’ to 98’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Divided w/ Pkg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Lane (Type C)</td>
<td></td>
<td>102’ to 112’</td>
<td>64’ to 74’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2-Way LTL w/o Pkg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Lane (Type D)</td>
<td></td>
<td>84’ to 94’</td>
<td>64’ to 74’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Undivided w/ Pkg)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor</td>
<td></td>
<td>600’</td>
<td>40</td>
<td>9</td>
<td>5.5”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2-Way LTL w/ Pkg)</td>
<td>Up to 12,000</td>
<td>74’ to 84’</td>
<td>54’ to 64’</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COLLECTORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type A</td>
<td>Up to 12,000</td>
<td>60’ to 84’</td>
<td>40’ to 64’</td>
<td>450’</td>
<td>35</td>
<td>7</td>
<td>4”</td>
<td></td>
</tr>
<tr>
<td>Type B</td>
<td>Up to 12,000</td>
<td>68’ to 82’</td>
<td>48’ to 62’</td>
<td>300’</td>
<td>30</td>
<td>9</td>
<td>5.5”</td>
<td></td>
</tr>
<tr>
<td>LOCAL STREETS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 5,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td></td>
<td>56’</td>
<td>36’</td>
<td>200’</td>
<td>25</td>
<td>5.5’</td>
<td>3.5”</td>
<td>15%</td>
</tr>
<tr>
<td>Parking One Side</td>
<td></td>
<td>48’</td>
<td>28’</td>
<td>200’</td>
<td>25</td>
<td>4.5’</td>
<td>2.5”</td>
<td>15%</td>
</tr>
<tr>
<td>No Parking</td>
<td></td>
<td>40’</td>
<td>20’</td>
<td>200’</td>
<td>25</td>
<td>4.5’</td>
<td>2.5”</td>
<td>15%</td>
</tr>
<tr>
<td>Hillside Street</td>
<td>Varies</td>
<td>20’ No Pkg</td>
<td>28’ Pkg one side</td>
<td>200’</td>
<td>25</td>
<td>4.5’</td>
<td>2.5”</td>
<td>15%</td>
</tr>
<tr>
<td>Rural Street</td>
<td></td>
<td>29’</td>
<td>28’</td>
<td>200’</td>
<td>25</td>
<td>4.5’</td>
<td>2.5”</td>
<td>15%</td>
</tr>
</tbody>
</table>

Table Notes:
1. Type A collectors serve residential, mixed use and commercial projects. Type B collectors serve corporate park and industrial projects.
2. See Standard Detail S-4 for Sidewalk and Landscape area standards.
3. 4 foot sidewalks separated from the street by a 6 foot planter are required on both sides of all street sections except:
   a) Hillside and rural local streets as indicated on Standard Details S-6e and S-6f.
   b) Private streets that will ultimately serve 4 or fewer units or as provided by Municipal Code Section 17.52.360 Pedestrian Friendly Streets Standards.
4. See Future Bikeway Map (Figure 3-5) in the General Plan for bike lane locations.
5. LTL = Left Turn Lane
6. Street cross sections may be wider than indicated in Table 3.1 as necessary to conform to the sight distance and visibility standards, parking requirements, vehicle backup turnaround movements and Fire Department turning movements. Compliance with access requirements is to be demonstrated by plotting the parking space locations and the appropriate AASHTO vehicle turning templates on the improvement plan.
7. Street pavement structural sections are to be designed in accordance with Section 3.01.06 of these specifications. If the calculated street structural section per Section 3.01.06 is less than that shown in Table 3.1, then the values shown in Table 3.1 are required.

*Requires specific approval by the City Engineer.
3.01.04 VERTICAL ALIGNMENT

The vertical alignment of streets shall meet the following minimum criteria:

1. The minimum longitudinal grade on all streets shall be 0.5%.
2. The minimum grade around curb returns at intersections shall be 0.7%.
3. The minimum grade across valley gutters and around cul-de-sacs and Knuckles shall be 0.5%.
4. Cross-slopes for all streets shall be 2%. In special cases approved by the City Engineer cross-slopes up to 5% may be considered. A minimum cross slope of 1% may be approved in special cases as determined in accordance with a design exception approved by the City Engineer.
5. The gradient of each street entering an intersection shall not be more than 7% within a distance of 25 feet from the near curb line of the crossing street, except as approved by the City Engineer.
6. All street elevations and grades shown on the improvement plans shall be established in accordance with City of Napa benchmarks. The benchmark shall be identified on the plans.
7. Vertical parabolic curves shall be used to connect grade profiles where the algebraic difference in grade rates exceeds 1% (does not apply at intersecting streets).
8. Vertical curves shall be designed in accordance with Caltrans’ Highway Design Manual. If the calculated vertical curve is less than 100 feet, a minimum 100-foot vertical curve shall be used. The length of sag vertical curves shall be calculated with the assumption that street lighting will not be installed.

3.01.05 HORIZONTAL ALIGNMENT

The horizontal alignment of streets shall meet the following minimum criteria:

1. Streets which are designed with reverse curves shall have a minimum tangent length between the curves equal to 50 feet for local streets and smaller, and 100 feet for all other streets unless otherwise approved by the City Engineer.
2. All streets shall be designed for two-way traffic (minimum 20 feet wide, no parking on either side) unless specific approval is obtained from the City Engineer to allow one-way traffic (minimum 14 feet wide, no parking on either side).
3. All street centerlines shall intersect one another as near to a 90-degree angle as practical. Driveways shall intersect streets as near to a 90-degree angle as practical. Angles may not deviate from the perpendicular more than 10-degrees.
4. At intersections, the centerlines of cross streets (including full access driveways to commercial developments, industrial developments, or five (5) or more residential units) shall be collinear or shall have a minimum centerline separation as indicated in the Table 3.2 and Figure 3.1 scenarios.
TABLE 3.2 – MINIMUM CENTERLINE STREET SEPARATION

<table>
<thead>
<tr>
<th>STREET CLASSIFICATION (1)</th>
<th>SCENARIO A DISTANCE IN FEET (MIN.) (2)</th>
<th>SCENARIO B DISTANCE IN FEET (MIN.) (2)</th>
<th>SCENARIO C DISTANCE IN FEET (MIN.) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Street</td>
<td>125</td>
<td>150</td>
<td>125</td>
</tr>
<tr>
<td>Collector</td>
<td>175</td>
<td>185</td>
<td>125</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>225</td>
<td>230</td>
<td>125</td>
</tr>
<tr>
<td>Major Arterial</td>
<td>300</td>
<td>275</td>
<td>125</td>
</tr>
</tbody>
</table>

Reference: Access Management Handbook, Center for Research and Education, Iowa State University

Table Notes:

(1) Street classification refers to the classification of the main roadway (not the cross streets).
(2) Designs not meeting the above requirements are subject to design exception approval by the City Engineer and additional safety enhancements may be required.
(3) The distances listed in Table 3.2 are minimums. The actual distance may be longer based on a traffic operations analysis and the resulting intersection configuration design parameters.

FIGURE 3.1
5. At street intersections, the curb return ramps shall be designed in accordance with City Standard Plans S-8 & S-9 and applicable Americans with Disabilities Act (ADA) standards.

6. Through access or turnarounds shall be provided in accordance with Section 3.04 – “Fire Department Access” of these Standard Specifications.

3.01.06 PAVEMENT STRUCTURAL SECTION (STREETS)

Improvement plans shall include the design “R” values, Expansion indexes and Traffic Indexes in the typical sections or in a note or table on the same sheet as the typical sections. In addition, the following design requirements must be met:

A. Pavement Structural Section Design

The street pavement structural section shall be determined by a Registered Civil or Registered Geotechnical Engineer from “R” values obtained from native material gathered from the level of the proposed subgrade using the design methods in Chapter 600 of the State of California, Department of Transportation Highway Design Manual. If this calculated street pavement structural section is greater than the minimum pavement structural section listed in Table 1, then the calculated section shall be used. If this calculated street pavement structural section is less than that shown in Table 1, then the Table 1 values are required.

Streets designated as truck routes shall be designed to meet the minimum pavement structural section identified for arterials (see TRUCK ROUTE MAP – FIGURE 3.2).

B. Geotechnical Report (Pavement Structural Section Data)

1. Resistance “R” Values

The subgrade soil shall be tested in accordance with California Test 301 “Method of Determination of the Resistance “R” Value of Treated and Untreated Bases, Sub-bases and Basement Soils by the Stabilometer” in use by the California Department of Transportation, Transportation Laboratory.

In general, design of the structural section for a particular street shall be based on the lowest “R” Value material encountered. If the design is based on something other than the lowest “R” Value material encountered, then the geotechnical report is to include data and an explanation that specifically addresses and supports this alternative. If an “R” Value of 5 is utilized, then “R” Value tests will not be required.

2. Active Soils

An Expansion Index Test shall be provided regardless of the “R” Value used.

A soil will be classified as active if the Expansion Index is 50 or greater as measured by the Uniform Building Code Standard 29-2, “Expansion Index Test”.

The design of all streets constructed on active soils must include measures to prevent pavement structure damage resulting from shrink-swell movement of these soils. These measures may include lime treatment of subgrade materials, over-excavation and placement of additional aggregate base rock and stabilization fabric, cut-off walls or other methods presented by the developer’s Geotechnical Engineer and deemed appropriate by the City Engineer. The structural section required in some cases may be governed by
the expansion-shrinkage properties of the soils rather than the traffic and soils bearing criteria.

The proposed measures identified in the soils report to deal with active soils shall be submitted for review and approval by the City Engineer. A peer review of the proposed measures may be required.

3. The geotechnical report or supplemental letter shall include the location and elevation of sampling points, “R” Values, and Expansion Index Tests data. The developer’s geotechnical engineer may be required to make a field survey of soils conditions when rough subgrade has been cut to verify data presented in the Soils Report. The costs of all sampling and testing shall be at the developer’s expense.

4. All subgrade design selections shall be shown on the improvement plan set that is signed by the geotechnical engineer.
3.01.07 PAVEMENT RESTORATION LIMITS (STREETS)

The *Pavement Restoration Table* (Table 3.3) provides the minimum restoration limits based on existing pavement conditions. Final limits of restoration to be verified by the City Inspector. Pavement Condition Index (PCI) will be provided by the City by contacting Public Works Engineering Division at engineering@cityofnapa.org.

**TABLE 3.3 – PAVEMENT RESTORATION LIMITS**

<table>
<thead>
<tr>
<th>PAVEMENT CONDITION INDEX (PCI)</th>
<th>RESTORATION LIMITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-100</td>
<td>For roads less than 24 feet wide – Curb to curb</td>
</tr>
<tr>
<td></td>
<td>For roads over 24 feet wide – To centerline, unless repair crosses the centerline, then up to a full width restoration is required</td>
</tr>
<tr>
<td></td>
<td>For all restoration –</td>
</tr>
<tr>
<td></td>
<td>• The limits must extend 10 feet on each side of trench, 20 feet total</td>
</tr>
<tr>
<td></td>
<td>• If another trench is found within 10 feet, the restoration limits will be combined into a continuous repair</td>
</tr>
<tr>
<td></td>
<td>• Unused sawcuts into the roadway will require a full 10 feet wide repair</td>
</tr>
<tr>
<td>50-69</td>
<td>For roads less than 24 feet wide – A T-cut trench repair is required per City Standards</td>
</tr>
<tr>
<td></td>
<td>For roads over 24 feet wide – The paving limits will clear the apparent wheel path located approximately 2-3 feet from the apparent centerline for the driver side and 9-10 feet for the passenger side</td>
</tr>
<tr>
<td></td>
<td>For all restoration –</td>
</tr>
<tr>
<td></td>
<td>• Restoration to extend up to 5 feet beyond each side of the trench excavation, 10 feet total.</td>
</tr>
<tr>
<td></td>
<td>• If the limits of the repair are with 3 feet of the lip of gutter, the repair must extend to the lip of gutter</td>
</tr>
<tr>
<td></td>
<td>• Unused sawcuts into the roadway will be considered a trench repair</td>
</tr>
<tr>
<td>0-49</td>
<td>A T-cut trench repair is required per City Standards. Restoration to extend minimum 1 feet beyond each side of the trench excavation</td>
</tr>
<tr>
<td></td>
<td>For all restoration –</td>
</tr>
<tr>
<td></td>
<td>• If the limits of the repair are with 3 feet of the lip of gutter, the repair must extend to the lip of gutter</td>
</tr>
<tr>
<td></td>
<td>• Unused sawcuts into the roadway will be considered a trench repair</td>
</tr>
</tbody>
</table>
3.02  DRIVEWAYS AND PARKING FACILITIES

3.02.01  DEFINITIONS AND REGULATIONS

Driveway Definition – Driveways are defined in Section 17.54.150 of the Napa Municipal Code (NMC).

Driveway Regulations – Driveways and parking facilities are regulated in accordance with Chapter 17.54 of the NMC and these standards.

3.02.02  TWO-WAY SERVICE

All driveways (except residential driveways serving up to two single family dwelling units) shall be designed for two-way traffic (minimum 20 feet wide, no parking on either side) unless specific approval is obtained from the City Engineer to allow one-way traffic (minimum 14 feet wide, no parking on either side).

One-way driveways will only be permitted when a two-way driveway is not feasible because of site physical limitations or to avoid operational impacts to the public street system.

Where an entrance only driveway is allowed, on-site circulation shall provide for connection to a suitable exit drive.

Backing out of driveways (except on local streets or smaller for single family residences, accessory second units or duplex residences where each is served by an individual driveway) onto a public street shall not be allowed. A suitable on-site turn around or circulation pattern shall be provided that will enable the driveways to provide forward entry to the public street.

For a flag lot (that does not require Fire Department access) when through access is not available, a passenger vehicle (AASHTO P-Vehicle) turnaround is required to provide for forward entry and exit. When Fire Department access is required, turnarounds shall be provided per Section 3.04 – “Fire Department Access” of these Standard Specifications.

When forward entry and exit is required a minimum 25-foot backup turn-around street or drive aisle width shall be provided behind all required parking spaces, including tandem spaces, except for parking spaces served off of a driveway that provides access to a flag lot, in which case the backup turnaround minimum access width behind parking spaces may be 20 feet.

Dead-end parking lot drive aisles that are less than 30 feet wide shall extend a minimum 5 feet beyond the last parking space to provide for the required backup turnaround maneuver.

To avoid congestion at the entrance from the street to parking lots, no on-site parking space shall be allowed within the initial 20-feet of the driveway, where it connects to the public street measured from the back of sidewalk of the fronting street or from the ultimate right of away line in areas without sidewalks.
3.02.03 DESIGN CRITERIA

The design of all features relating to driveways and parking facilities shall conform to the requirements of these standards and Chapter 17.54 of the Napa Municipal Code and are subject to review and approval by the City Engineer.

1. The construction plans shall include a fully dimensioned layout of the parking lot, driveways and related features on the site being developed. These features shall include emergency vehicle access routes (with the appropriate Fire Department vehicle AASHTO turning template plotted at curves), accessible routes of travel conforming to ADA Standards, utilities, curbs, gutters, sidewalks, drainage facilities, pavement structural section, traffic circulation signing and pavement striping and markings. As an alternative to using a fire apparatus turning template, a proprietary vehicle turning program, such as “auto-turn” may be used to demonstrate compliance with fire department standards. The construction plans shall also include proposed finish grades and topographic mapping 100 feet beyond the boundaries of the site, or a sufficient distance to determine drainage patterns and related impacts to neighboring properties.

2. Parking stalls shall be marked using 4-inch-wide white paint stripes. All directional arrows and legends shall be white. Double lining of parking stalls may be used with specific approval of the City Engineer.

3. Construction materials and placement procedures shall meet the City construction specifications and standards as contained herein.

4. Portland Cement Concrete curbs and gutters are required around the perimeter of the parking facilities and driveways to control the surface drainage and contain the landscape planting areas. Concrete curbs shall be a minimum of 6 inches high above the paved areas. Asphalt berms may only be used with specific approval of the City Engineer. Railroad ties may be considered for specific applications if they will not be used to control drainage. Alternate curb designs may be considered on a case-by-case basis as required to accommodate and provide for water quality measures (Best Management Practices) as reviewed and approved by the City Engineer.

5. Pavement Structural Section (Driveways & Parking Facilities)
   a. The minimum pavement structural section for driveways that serve a maximum of two residential units and do not serve as Fire Department access routes shall be equivalent to 2 inches of asphalt concrete over 6 inches of Class 2 Aggregate Base material over 95% compacted subgrade.
   b. The pavement structural section for (1) driveways serving as Fire Department access routes, and (2) parking areas and drive aisles shall be determined using the design methods described in Section 3.01.06 “Pavement Structural Section (Streets)” of these Standard Specifications. In no case shall the minimum section for these facilities be less than 3 inches of asphalt concrete over 10 inches of Class 2 Aggregate Base. If the calculated pavement structural section is greater than the minimum pavement structural section, then the calculated section shall be used.
   c. Equivalent Portland Cement Concrete Pavement structural sections may be used for parking facilities and driveways if designed by a registered civil or geotechnical engineer and approved by the City Engineer.
6. Project storm water runoff may not surface flow across any public sidewalk or driveway approach nor may it be directed onto adjacent properties without appropriate easements. Project drainage must be conveyed under the public sidewalk to the gutter (per Standard Detail D-5A and D-5B), or connected by pipe directly into either the public storm drain system or adjacent creek, if available.

7. The minimum slope of asphalt concrete surfacing shall be 1% and the minimum slope of Portland Cement Concrete surfacing shall be 0.5%.

8. The maximum cross slopes of parking space surfacing shall be 5%.

9. Handicap parking areas shall be designed to satisfy the Americans with Disabilities Act requirements.

10. Vertical parabolic curves shall be used to connect grade profiles where the algebraic difference in grade rates exceeds 1%.

11. Portland Cement Concrete valley gutters when used in non-traffic lane areas shall be a minimum of 2 feet wide. Valley gutters when used in traffic lanes shall be a minimum of 3 feet wide when running parallel with the drive aisle and shall be a minimum of 4 feet wide where crossing the drive aisle. The minimum grade across valley gutters shall be 0.5%.

12. City standard storm drain inlets (D-2 or other approved side opening inlet) shall be used where possible for curb inlets when pipe sizes are 10-inch diameter or larger.

13. Parking facilities shall drain away from the paths of travel of the pedestrian. Valley gutters shall not be located at pedestrian crossings if reasonable drainage alternatives are available.

14. Signs and/or red curb markings are required where necessary to prevent vehicles from parking in the driveway.

15. For compact parking stalls “Compact Parking Only” shall be stenciled on the pavement at the entrance to each stall with 6” minimum height letters.

16. The minimum vertical clearance shall be 13 feet 6 inches at all points across the required width of driveways.

17. Vehicle path of travel pavement width changes shall occur only at intersections or at other logical locations as approved by the City Engineer.

18. Porous and pervious pavement structural sections may be considered for private streets, parking areas and driveways on a case-by-case basis as appropriate to accommodate and provide for water quality measures (Best Management Practices for storm water pollution prevention) as reviewed and approved by the City Engineer.

19. Modifications to these design standards may be considered on a case-by-case basis as appropriate to accommodate and provide for storm water quality measures (Best Management Practices for storm water pollution prevention) as reviewed and approved by the City Engineer.

3.03 DRIVEWAY & PRIVATE STREET CONNECTIONS TO PUBLIC STREETS

For projects with frontage on a designated collector or arterial street, the design and location of driveways and private street connections is critical to maintaining good traffic flow on the street. Driveways and private street connections for these projects may be subject to special traffic operation studies as determined by the City Engineer.
1. The number of driveways and private street connections to public streets shall be kept to a minimum.

2. Driveways and private street connections to public streets shall be located as far as possible from public street intersections and other full access driveways to commercial, industrial or residential developments.

3. Residential driveways shall connect to the public street with Standard Detail S-5 concrete driveway approaches. Private streets and commercial driveways shall connect to the public street with Standard Detail S-5 concrete driveway approaches, or a street type opening with Standard Details S-8 & S-9 curb returns. When street type openings are used the limits of the private pavement areas shall be clearly distinguishable from the public street by installing a minimum 10 foot wide decorative concrete strip on the project parcel along the public street right of way line.

4. Driveway approach aprons (excluding the flare) shall be the same width as the required width of the driveway.

3.04 FIRE DEPARTMENT ACCESS

3.04.01 GENERAL

A. Access

More than one fire apparatus access route shall be provided when it is determined by the Fire Chief that access by a single route might be impaired by vehicle congestion, condition of terrain, climatic conditions or other factors that could limit ingress or egress.

Residential developments having more than 50 dwelling units shall be provided with at least two points for fire apparatus access.

When two points of access are required, they shall be located a distance apart equal to not less than one half of the length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between the two access points.

Emergency vehicle only access routes are not permitted as a means to satisfy the second point of access requirement.

Fire apparatus access routes shall be unobstructed as defined by the following criteria:

1. Streets and commercial driveway minimum widths shall be as follows:
   (a) 14 feet for one-way traffic (no parking on either side).
   (b) 20 feet for two-way traffic (no parking on either side).

2. Residential driveway minimum widths shall be 12 feet.

3. A minimum unobstructed vertical clearance of 13 feet 6 inches shall be provided.

4. A maximum longitudinal grade of 15% shall be provided.

Refer to the City of Napa "Citywide Guidelines for Traffic Calming and Neighborhood Traffic Management" for appropriate and acceptable traffic calming measures.

All temporary and permanent Fire Department access routes surfacing structural sections shall be designed to support an HS-20 loading, and in accordance with Section 3.01.06 – "Pavement Structural Section (Streets)" of these Standard Specifications.

Permanent Fire Department access routes shall be surfaced with an asphalt concrete or
Portland Cement Concrete structural section (or an alternate equivalent all-weather pavement structural section approved by the Fire Chief and City Engineer).

The City of Napa Fire Department’s largest apparatus (currently the ladder truck) shall be used as the design vehicle for all fire access routes.

Fire Department access shall be provided so that a 150-foot length of hose can be extended from the parked fire vehicle to all points along the exterior perimeter of all structures along an approved route.

**B. Turnaround**

Public Street Turnaround – Fire Department access for all public streets shall be along a through route or (when through access is not available) shall end in a standard cul-de-sac bulb designed and installed in accordance with City Standard Plans S-7A & S-7B.

All streets (and driveways exceeding 150 feet in length) shall be along a through route or shall end with an approved turn around area (to provide for forward entry and exit). Private street access will be reviewed and approved by the Fire Chief and City Engineer based on site constraints in accordance with the following hierarchy:

1. Through access shall be provided.

2. Standard Turnaround – When through access is not available, a cul-de-sac bulb shall be installed at the end of the street as follows:

   (a) Residential Developments

      (1) **Standard Bulb** – A standard cul-de-sac bulb designed in accordance with Standard Detail S-7A shall be installed at the end of the street.

      (2) **Reduced Bulb** – Generally, the cul-de-sac bulb face of curb radius shall be 40 feet to provide for on-street parking. However, on private streets the bulb face of curb radius may be reduced to 35 feet when at least one 8-foot-wide parallel parking bay is provided, outside of the 35-foot radius area, along the frontage of each lot. No parking is allowed along the reduced portion of the bulb, and appurtenant bulb return frontages. These no-parking frontages require red curbing and/or “No-Parking” signs (Standard Details FP-2A & FP-2B) as determined by the Fire Chief.

   (b) Commercial/Industrial Developments

      (1) A standard cul-de-sac bulb designed in accordance with Standard Detail S-7B shall be installed.

      (2) The cul-de-sac bulb face of curb radius shall be 55 feet to provide for on-street parking.

3. Alternate Turnaround – For residential development private streets, when through access is not available, and a standard turnaround is not feasible, alternate turnarounds will be allowed (in accordance with Standard Details S-29A & S-29B) as follows:

   (a) Based on evidence supplied by the developer (in the form of a design exception that is approved by the Fire Chief and City Engineer) when:

      (1) The standard cul-de-sac bulb will cause significant environmental impacts such as excessive hillside grading, rock outcroppings, and/or removal of significant trees.
(2) The standard cul-de-sac bulb will prevent site layouts that achieve minimum development densities.

(b) For a driveway serving a flag lot.

(c) For a street that abuts 4 or less lots.

(d) The layout of the hammerhead turnaround and surrounding lots and connecting driveways shall be “self-policing”, (i.e., in addition to signage and painted curbing the layout configuration shall include design elements that discourage the parking of vehicles or placement of obstructions within the fire lane turnaround area), as reviewed and approved by the Fire Chief and City Engineer.

Residential Partial Cul-de-Sac (Standard Details S-7C & S-7D) – When a standard turnaround is required for residential developments (and that turnaround will serve future development across the street on an abutting parcel) a partial cul-de-sac designed in accordance with either City Standard S-7C (Fire Engine) or City Standard S-7D (Fire Ladder Truck) will be allowed as an interim solution when approved by the Fire Department. All public street partial cul-de-sacs shall be designed with parking, i.e., a minimum 40-foot face of curb radius partial bulb and a minimum 28-foot pavement width partial street cross section are required.

The cross slope of a turnaround area shall not exceed 5%.

When required by the Fire Chief, Fire Department apparatus access routes shall be designated as “Fire Lanes” and appropriate signs and/or markings shall be installed in accordance with City Standard FP-1 and the California Vehicle Code.

To allow for Fire Department apparatus access, 1) parking shall be prohibited on streets with pavement widths that are less than 28 feet, 2) parking on one side of a street is permitted on streets with pavement widths that are 28 feet or greater, and 3) parking on both sides of the street is permitted on streets with pavement widths that are 36 feet or greater.

Fire Department access routes that exceed 500 feet in length require additional intermittent turnaround areas. The maximum spacing between turnaround areas shall be 500 feet. Hammerhead turnarounds may be used to satisfy the intermittent turnaround requirement.

3.04.02 FIRE ACCESS REQUIREMENTS (FOR BUILDING CONSTRUCTION)

If the streets or access roads in a development are not paved from October 15th through April 15th, a temporary all weather access road shall be provided by the Contractor.

The City of Napa Fire Department requires that a fire hydrant be in service within 250 feet of the furthest point of construction prior to the stockpiling of combustible materials or the beginning of combustible construction. (Exception: Storage of combustible materials for framing of slab(s) only shall be allowed).

Temporary all weather construction phase Fire Department access route structural sections shall consist of a minimum of 12 inches of base rock material over either: (1) a lime treated subgrade, or (2) a subgrade covered with fabric in accordance with the following design criteria:

1. Subgrade is defined as the native soil at the bottom of the access route structural section, excavated to the lines and grades shown on the project grading plan, and
provided with a discharge for the collected storm water runoff, as approved by the City Engineer.

2. Base rock shall be Class II aggregate base compacted to at least 95% relative compaction.

3. Base rock shall be placed only on a firm and unyielding (compacted to at least 95% relative compaction) excavated and drained subgrade to a depth of 12-inches.

4. Lime treated subgrades shall be designed in accordance with the recommendations of a geotechnical engineer and compacted to at least 95% relative compaction.

5. Fabric shall be a ground stabilization fabric such as Mirafi 600X or equivalent.

6. Fire Department access shall be a minimum 20 feet in width and provided so that a 150-foot length of hose can be extended from the parked fire vehicle to all points along the exterior perimeter of all structures.

7. Alternate all weather access road sections may be proposed by a geotechnical engineer and submitted to the Public Works Director for approval. Approval of the Public Works Director and Fire Marshal is required for alternate all weather access roads.

### 3.05 STREET SPECIAL PROVISIONS

Whenever a pipe is installed in paved public streets, the sides of the trench shall be cut to a neat line in a manner satisfactory to the Public Works Director or their designee. The trench shall be backfilled with ¾” Class II AB and a temporary patch of cold mix asphalt shall be placed on the trench at the end of the workday. Permanent pavement shall be placed on the trench within 48 hours after the storm drainage pipe has been installed unless otherwise approved by the Public Works Director or their designee. Refer to City of Napa Standard Plan D-12, “Storm Drain Trench” for drainage related facilities, City of Napa Standard Plan W-16, “Water Trench Detail” for water related facilities, and City of Napa Standard Plan S-12, “Standard Backfill Detail”, for all other facilities.

#### 3.05.01 EXISTING FACILITIES

The work performed in connection with various existing highway facilities shall conform to the provisions in Section 15, "Existing Facilities," of the Standard Specifications and these City Standard Specifications.

The Contractor shall remove and relocate/reset traffic signs and poles and other facilities which are in the construction area.

#### 3.05.02 AGGREGATE BASE

Aggregate base shall be Class 2, three quarter inch (¾”) maximum grading, and shall conform to the provisions in Section 26, "Aggregate Bases," of the Standard Specifications and these City Standard Specifications.

Aggregate for Class 2 aggregate base placed in street sections shall not include material processed from portland cement concrete, lean concrete base, cement treated base or a combination of any of these materials. All subgrade and aggregate base placed must be compacted to a minimum relative compaction of ninety-five percent (95%).
Amend Section 26-1.03E of the Standard Specifications, “Compacting”, by adding the following:

In addition, contractor shall obtain complete stabilization of aggregate base material with no rolling or deflection of the finish aggregate base grade. This proof-rolling is determined by passing a loaded 3 axle water truck, cement truck or similar vehicle over the completed subgrade without the material rolling, deflecting more than ¼” or cracking perpendicular to the path of travel.

If accepted aggregate base becomes saturated and/or disturbed or more than five working days pass between acceptance of the material and placement of the upper layer, the aggregate base must again be proof-rolled and retesting will be required. The cost of the retesting shall be borne by the Contractor.

3.05.03 ASPHALT CONCRETE


Amend Section 39-1.01 “General” of the Standard Specifications to add the following:

Produce and place ½ inch Type A HMA, Grade PG 64-16 per Section 39-2 “Standard Construction Process,” of the 2010 Standard Specifications.

Amend Section 39-1.02B “Tack Coating” of the Standard Specifications to add the following:

Tack coat must be utilized and be emulsified asphalt Grade RS-1, RS-1h, SS-1, or SS-1h and must conform to Section 94 “Asphaltic Emulsions”, of the 2010 Standard Specifications.

Amend Section 39-1.02C “Asphalt Binder” of the Standard Specifications to add the following:

Asphalt binder to be mixed with aggregate shall be grade PG 64-16.

The Contractor must submit mix designs for all asphalt concrete to be used on the project.

Amend Section 39-1.02E “Aggregate” of the Standard Specifications to add the following quality characteristic to the “Aggregate Quality” table:

The Durability Index for all HMA aggregates must be a minimum of 35.

The aggregate must not be treated with lime, cement or other chemical material before the Durability Index test is performed.

Amend Section 39-1.03A “General” of Hot Mix Asphalt Mix Design Requirements of the Standard Specifications to add the following:

The HMA must be ½ inch Type “A” HMA.

Amend Section 39-1.03C “Job Mix Formula Submittal” of the Standard Specifications to add the following:

The Contractor must submit mix designs for all asphalt concrete to be used on the project.

Each delivery ticket must include information on the material type, binder type, oil content, and the mix design number. Material delivered to the project without such annotations shall be subject to rejection. Only original delivery tickets (no photocopies) shall be delivered to the City Engineer on a daily basis.
Amend Section 39-1.04F “Density Cores” of the Standard Specifications to delete the following:

To determine density for Standard and QC/QA construction process projects, take 4- or 6-inch diameter density cores at least once every 5 business days. Take 1 density core for every 250 tons of HMA from random locations the City Engineer designates. Take density cores in the City Engineer’s presence and backfill and compact holes with authorized material. Before submitting a density core, mark it with the density core’s location and place it in a protective container.

If a density core is damaged, replace it with a density core taken within 1 foot longitudinally from the original density core. Relocate any density core located within 1 foot of a rumble strip to 1 foot transversely away from the rumble strip.

Amend Section 39-1.04F “Density Cores” of the Standard Specifications to add the following:

In-place density and relative compaction for the Standard Construction Process projects is determined by the nuclear density device per California Test 375.

Amend Section 39-1.07 “Production Start-Up Evaluation” of the Standard Specifications to delete the following:

Within the first 750 tons produced on the 1st day of HMA production, in the City Engineer’s presence and from the same production run, take samples of:

For Standard and QC/QA construction process projects, take 4- or 6-inch diameter density cores within the first 750 tons on the 1st day of HMA production. For each density core, the Department reports the bulk specific gravity determined under California Test 308, Method A, in addition to the percent of maximum theoretical density. You may test for in-place density at the density core locations and include them in your production tests for percent of maximum theoretical density.

Amend Section 39-1.07 “Production Start-Up Evaluation” of the Standard Specifications is add the following:

Within the first 500 tons produced on the 1st day of HMA production, in the City Engineer’s presence and from the same production run, take samples of:

In-place density and relative compaction for the Standard Construction Process projects is determined by the nuclear density device per California Test 375. Test density within the first 500 tons on the 1st day of HMA production.

Amend Section 39-1.09A “General” of Subgrade. Tack Coat, and Geosynthetic Pavement Interlayer of the Standard Specifications to add the following:

**Surface Preparation**

The work must consist of preparing the existing street surfaces prior to the commencement of paving. Such work shall include removing raised pavement markers, removing thermoplastic and painted traffic markings and legends, controlling nuisance water, sweeping, watering, and removing loose and broken asphalt concrete pavement and foreign material as specified in the Standard Specifications and as directed by the City Engineer.

Amend Section 39-1.11 “Transporting, Spreading, and Compacting” of the Standard Specifications to add the following:

The Contractor must have hand-compaction equipment immediately available for compacting all areas inaccessible to rollers. Hand-compaction must be performed
concurrently with breakdown rolling. If for any reason hand-compaction falls behind breakdown rolling, further placement of HMA must be suspended until hand-compaction is caught up. Hand-compaction includes plate compactor, pneumatic tamper and hand tampers. Hand torches must be available for rework of areas which have cooled.

After compaction, the surface texture of all hand work areas must match the surface texture of the machine placed mat. Any course or segregated areas must be corrected immediately upon discovery. Failure to immediately address these areas will cause suspension of HMA placement until the areas are satisfactorily addressed, unless otherwise allowed by the City Engineer.

Cold Joints

All cold joints, both longitudinal and transverse, must be heated with a torch immediately prior to paving. Cold joints include previously installed asphalt passes that are more than three hours old. All cold joints must be tack coated.

Tolerances

The average pavement thickness must be equal to the specified thickness for the project. For total pavement thicknesses of less than four inches, the minimum allowable thickness will be $\frac{1}{4}$ inch less than that specified. For total pavement thicknesses of four inches or more, the minimum allowable thickness will be $\frac{1}{2}$ inch less than that specified.

You are responsible for verifying the anticipated tonnage for each street segment using the data from the JMFs for the mix to be used at least 10 days prior to paving. If the anticipated quantity varies more than +/-5% from that indicated in the bid schedule, you must notify the City Engineer in writing of the discrepancy and provide computations regarding tonnage.

Daily Paving Completion

The Contractor must schedule paving activities such that each layer of HMA is placed across the entire excavated area at the end of each work shift.

Pavement Thickness and Temperatures

Pave HMA in maximum 0.25-foot thick compacted layers.

If the surface to be paved is both in sunlight and shade, pavement surface temperatures must be taken in the shade.

Spread HMA Type A and Type B at the atmospheric and surface temperatures shown in the following table:

<table>
<thead>
<tr>
<th>Minimum Atmospheric and Surface Temperatures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compacted layer thickness, feet</td>
</tr>
<tr>
<td>Unmodified asphalt binder</td>
</tr>
<tr>
<td>&lt;0.15</td>
</tr>
<tr>
<td>0.15-0.25</td>
</tr>
</tbody>
</table>

*Except asphalt rubber binder.

If the asphalt binder for HMA Type A and Type B is unmodified asphalt binder, complete:

1. First coverage of breakdown compaction before the surface temperature drops below 250 degrees F
2. Breakdown and intermediate compaction before the surface temperature drops below 200 degrees F
3. Finish compaction before the surface temperature drops below 150 degrees F

If the asphalt binder for HMA Type A and Type B is modified asphalt binder, complete:

1. First coverage of breakdown compaction before the surface temperature drops below 240 degrees F
2. Breakdown and intermediate compaction before the surface temperature drops below 180 degrees F
3. Finish compaction before the surface temperature drops below 140 degrees F

Amend Section 39-2.02B “Quality Control Testing” of the Standard Specifications is remove the following:

For any single quality characteristic except smoothness, if 2 consecutive quality control test results do not comply with the action limits or specifications:

1. Stop production.
2. Notify the City Engineer.
3. Take corrective action.
4. Demonstrate compliance with the specifications before resuming production placement.

Amend Section 39-2.03A “Testing” of the Standard Specifications to remove the following:

Remove “HMA Acceptance – Standard Construction Process” Table.

No single test result may represent more than 750 tons or 1 day’s production, whichever is less.

For any single quality characteristic except smoothness, if 2 consecutive quality control test results do not comply with the action limits or specifications:

1. Stop production.
2. Take corrective action.
3. Take samples and split each sample into 4 parts in the City Engineer’s presence. Test 1 part for compliance with the specifications and submit 3 parts to the City Engineer. The Department tests 1 part for compliance with the specifications and reserves and stores 2 parts.
4. Demonstrate compliance with the specifications before resuming production placement and placement.

The Department tests the density core you take from each 250 tons of HMA production. The Department determines the percent of maximum theoretical density for each density core by determining the density core’s density and dividing by the maximum theoretical density.

If the specified total paved thickness is at least 0.15 foot and any layer is less than 0.15 foot, the Department determines the percent of maximum theoretical density from density cores taken from the final layer measured the full depth of the total paved HMA thickness.

For percent of maximum theoretical density, the City Engineer determines a deduction for each test result outside the specifications using the reduced payment factors shown in the
Amend Section 39-2.03A “Testing” of the Standard Specifications to add the following:

The City will perform acceptance testing of the HMA based on the Acceptance Criteria as shown in the following Table 1.

Table 1 - HMA Acceptance - Standard Construction Process

<table>
<thead>
<tr>
<th>Quality characteristic</th>
<th>Test method</th>
<th>HMA Type A</th>
<th>Frequency</th>
<th>Location of Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate gradation(^a)</td>
<td></td>
<td>HMA Type A</td>
<td>Frequency</td>
<td>Location of Sampling</td>
</tr>
<tr>
<td>Sieve</td>
<td>California Test 202</td>
<td>JMF ± tolerance(^c)</td>
<td>1 per day</td>
<td>At plant per CT 125</td>
</tr>
<tr>
<td>3/4&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>(\times)^3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/8&quot;</td>
<td>(\times)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 4</td>
<td>(\times)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 8</td>
<td>(\times) (\times) (\times)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. 200</td>
<td>(\times) (\times) (\times)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand equivalent (min)(^d)</td>
<td>California Test 217</td>
<td>47</td>
<td>1 per day</td>
<td>At plant per CT 125</td>
</tr>
<tr>
<td>Asphalt binder content (%)</td>
<td>California Test 379 or 382</td>
<td>JMF + 0.45</td>
<td>1 per 500 TONS</td>
<td>Loose mix behind paver per CT 125</td>
</tr>
<tr>
<td>HMA moisture content (%), max</td>
<td>California Test 226 or 370</td>
<td>1.0</td>
<td>1 per 500 TONS</td>
<td>Loose mix behind paver per CT 125</td>
</tr>
<tr>
<td>Percent of maximum theoretical density (%)(^e,f)</td>
<td>California Test 375</td>
<td>91-97</td>
<td>1 per day (max th. Density)</td>
<td>Loose mix behind the paver</td>
</tr>
<tr>
<td>In-Place Density and Relative Compaction (Nuclear)</td>
<td>Nuclear California Test 375 or ASTM D2950</td>
<td>91-97</td>
<td>1 per 500 TONS</td>
<td>Random locations per CT 375</td>
</tr>
<tr>
<td>Stabilometer value (min)(^g)</td>
<td>California Test 366</td>
<td>37</td>
<td>1 per 500 TONS</td>
<td>Loose mix behind paver per CT 125</td>
</tr>
<tr>
<td>Air Void content (%)(^d,h)</td>
<td>California Test 367</td>
<td>4 ± 2</td>
<td>1 per 500 TONS</td>
<td>Loose mix behind paver per CT 125</td>
</tr>
<tr>
<td>Asphalt binder</td>
<td>Various</td>
<td>Section 92</td>
<td>Sample 1 per day</td>
<td>At plant per CT 125</td>
</tr>
<tr>
<td>Percent of crushed particles Coarse aggregates (%), min</td>
<td>California Test 205</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One fractured face</td>
<td></td>
<td>90</td>
<td>1 per mix per plant</td>
<td></td>
</tr>
<tr>
<td>Two fractured faces</td>
<td></td>
<td>75</td>
<td>(sample aggregates</td>
<td></td>
</tr>
<tr>
<td>Fine aggregate (%), min</td>
<td></td>
<td></td>
<td>1 per and hold)</td>
<td></td>
</tr>
<tr>
<td>(Passing no. 4 sieve and retained on no. 8 sieve.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One fractured face</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Los Angeles Rattler (%), max</td>
<td>California Test 211</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss at 100 rev.</td>
<td></td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loss at 500 rev.</td>
<td></td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality characteristic</td>
<td>Test method</td>
<td>HMA Type A</td>
<td>Frequency</td>
<td>Location of Sampling</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>---------------------</td>
<td>------------</td>
<td>-----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Fine aggregate angularity (% min)</td>
<td>California Test 234</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flat and elongated particles (% max by weight @ 5:1)</td>
<td>California Test 235</td>
<td>Report only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voids filled with asphalt (%)&lt;sup&gt;1&lt;/sup&gt;</td>
<td>California Test 367</td>
<td>76.0-80.0</td>
<td>73.0-76.0</td>
<td>65.0-75.0</td>
</tr>
<tr>
<td>No. 4 grading</td>
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<tr>
<td>3/8&quot; grading</td>
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<tr>
<td>1/2&quot; grading</td>
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<tr>
<td>3/4&quot; grading</td>
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<tr>
<td>Voids in mineral aggregate (% min)&lt;sup&gt;2&lt;/sup&gt;</td>
<td>California Test 367</td>
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<td>15.0</td>
<td>14.0</td>
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<tr>
<td>No. 4 grading</td>
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<td>3/8&quot; grading</td>
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<td>1/2&quot; grading</td>
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<td>3/4&quot; grading</td>
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<tr>
<td>Dust proportion&lt;sup&gt;3&lt;/sup&gt;</td>
<td>California Test 367</td>
<td>0.9-2.0</td>
<td>0.6-1.3</td>
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<tr>
<td>No. 4 and 3/8&quot; gradings</td>
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<tr>
<td>1/2&quot; and 3/4&quot; gradings</td>
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<td>Smoothness</td>
<td>Section 39-1.12</td>
<td>12-foot straight-edge, must grind, and PI</td>
<td>As necessary to confirm contract compliance</td>
<td>Final pavement surface</td>
</tr>
</tbody>
</table>

<sup>a</sup>The Engineer determines combined aggregate gradations containing RAP under California Test 367.

<sup>b</sup> "X" denotes the sieves the Engineer tests for the specified aggregation gradation.

<sup>c</sup>The tolerances must comply with the allowable tolerances in section 39-1.02E.

<sup>d</sup>The Engineer reports the average of 3 tests from a single split sample.

<sup>e</sup>The Engineer determines percent of maximum theoretical density if the specified paved thickness is at least 0.15 foot under California Test 375, except the Engineer uses:

1. California Test 308, Method A, to determine in-place density of each density core instead of using the nuclear gauge in Part 4, "Determining In-Place Density By The Nuclear Density Device"
2. California Test 309 to determine maximum theoretical density instead of calculating test maximum density in Part 5, "Determining Test Maximum Density."

<sup>1</sup>The Engineer determines maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

<sup>2</sup>California Test 304, Part 2.13.

<sup>3</sup>The Engineer determines the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

<sup>4</sup>Report only if the adjustment for the asphalt binder content TV is less than or equal to ±0.3 percent from the OBC value submitted on a Contractor Hot Mix Asphalt Design Data form.

The Acceptance test results do not meet the Acceptance Criteria shown in Table 1 the HMA shall be rejected, removed and replaced as directed by the City Engineer at Contractor’s expense.

Field density acceptance testing will be accomplished using the nuclear gauge method. If the density acceptance tests indicate failing compaction results, the City Engineer determines a deduction for each test result outside the Acceptance Criteria using the "Reduced Payment Factors for Percent of Maximum Theoretical Density," table in Section 39-2.03A “Testing” of the 2010 Standard Specifications.

If the Contractor requests verification of the nuclear density results by coring, the Contractor must perform the coring at no cost to the City.
The City Engineer will randomly identify core locations and test cores for density at no cost to the City.

The Contractor must backfill the core holes with HMA temperatures above 250°F. The HMA must be firmly tamped in place in lifts not to exceed three (3) inches. Tamping must consist of a minimum of 20 blows with a ten-pound minimum weight bar with an approximate two (2) inch diameter head or by a suitable head attached to a demolition hammer or pneumatic hammer. The finished surface must be flush with the adjacent pavement surface.

3.05.04 MISCELLANEOUS CONCRETE CONSTRUCTION

Miscellaneous concrete shall conform to the provisions in Section 73, “Concrete Curbs and Sidewalks,” and Section 90, “Concrete”, of the Standard Specifications and these City Standard Specifications.

First paragraph of Section 73-1.02A “General” of the Standard Specifications is amended to read:

Concrete for curbs, sidewalks and their appurtenance must be minor concrete conforming to the provisions in Section 90-2, “Minor Concrete,” except as follows:

1. Concrete aggregate shall be ¾” max unless otherwise approved by the City Engineer.

2. All concrete shall be 6 sacks per cubic yard (4,000 psi).

The Contractor shall be responsible for setting all of the utility boxes when installing sidewalk (except AT&T and PG&E) to the grade of the finished sidewalk and for cleaning and clearing concrete mortar from all utility boxes in the area so that they are fully accessible upon completion of the sidewalk installation. The Contractor shall be responsible for setting meter boxes to grade.

The Contractor shall be responsible for coordinating with AT&T and PG&E for the adjustment of AT&T and PG&E facilities prior to installing new curb, gutter, sidewalk, and driveway.

The Contractor shall be responsible for guarding or otherwise protecting concrete work from vandalism or other damage. All such damage shall be repaired by the Contractor at the Contractor’s own expense.

The Contractor shall replace any asphalt paving that is removed as part of curb and gutter removal and as part of valley gutter removal; a 2-feet wide by 6-inches thick AC plug is required. The extent of removal and replacement of asphalt concrete on either side of valley gutters shall be a minimum of two feet. Attention is directed to the section 3.05.03, “Asphalt Concrete” of these City Standard Specifications.

Constructing P.C.C. curb, gutter, sidewalk and driveways shall include any necessary excavation and backfill, furnishing and installing aggregate base, reinforcement, expansion joint filler, and all other required materials, including water.

Utility identification symbols, typically “S” for sanitary sewer and/or “W” for water, may exist on some curb. Contractor shall reference these symbols prior to removal of the curb and gutter and stamp a new symbol at the location of the original symbol or the where the utility line has been identified. New symbol must be stamped where the underlying utilities are identified, 1/8” minimum depth, into the curing P.C.C., of a plain font that is easily read with a letter height of approximately 3” placed on top and face of curb. If the Contractor elects to use the curing compound method for curing concrete, the curing compound shall be curing compound (6),
non-pigmented, conforming to the provisions in Section 90-1.03B(3), "Curing Compound Method," of the Standard Specifications.

The curing compound shall be applied in a manner that will provide a complete coating of all exposed faces of the concrete surface.

The Downtown Napa Specific Plan states that all sidewalk within the “Parkway Plaza Redevelopment Area” shall include a 2 by 2-foot square scoring pattern. Jet-black lampblack shall be added to the Portland Cement Concrete at the rate of one (1) pound lampblack per cubic yard of concrete (only within the Downtown Specific Area).

3.05.05 SIGNS, PAVEMENT MARKERS, AND STRIPING

A. Special Directional Signs

To the extent that the Napa Municipal Code authorizes directional signs to be installed, they shall be installed in accordance with the requirements of the Napa Municipal Code.

B. Street Addresses on Curb Face

The painting of house address numbers on the face of the curb is used to identify houses for emergency vehicles, delivery vehicles and other similar purposes, and shall conform to City Standard Plan S-26.

C. Street Name Signs

These signs are used to identify intersecting public streets and shall conform to the following specifications:

1. Metal name and block number plates are to be unpainted aluminum alloy 6061-T6, 0.063 inch (standard street-sign thickness), degreased to such extent that water will wet the surface uniformly, etched and free from all dents, and are to have a smooth and uniform flat surface. The metal plates are to be cut to size and shape, and shall be smooth and free from defects, prior to application of the reflective sheeting.

2. Each individual sign face shall have 3/4-inch radius corners and 3/16-inch holes pierced as shown on Standard Plan S-19, entitled “Standard Street Name Sign”.

3. Name and block number plate background to be 3M diamond cubed retro-reflective or equivalent. After the sign blank surface has been processed as specified, a reflective sheet shall be applied to the full face of the sign, unless otherwise noted.

4. Street name and number plate height total shall be 9 inches; width shall be a minimum of 24 inches. Sign letters shall be 4 inches high California Department of Transportation Series C; block numbers and arrows shall be 2 inches high and shall be 605 Black Scotch-Cal, direct screened with 705 Black, or approved equal.

5. Sign shall have a 1/4-inch wide black border, inset 1/8 inch from edge of sign.

6. Shall conform or be approved equal as shown on the street name sign City Standard Plan S-19.

7. Street name signs for private streets intersecting public or other private streets shall meet the above specifications except for color. These street name signs are to be privately owned and maintained and shall be located outside of the public street right-of-way. See City Standard Plans S-18B and S-19 for color and other details.
8. All traffic signs (excluding temporary construction signs) shall have 3M diamond cubed retro-reflective or equivalent base and 3M 1160 protective overlay film or equivalent.

9. Traffic control is to be per CA MUTCD per Section 6 (Section 5 is not allowed).

10. Internally illuminated street name signs shall conform to City Standard Plan E-12.

D. Striping and Pavement Marking

Traffic striping shall be thermoplastic with reflector unless otherwise specified.

Contrast striping shall be placed on all concrete roadway surfaces.

Prior to the street opening after HMA is placed, there shall be temporary paint, tape, or reflective markers placed City Engineer’s approval. Contractor to wait a minimum of 5 days and a maximum of 10 days after HMA is placed before permanent striping is placed.

Bike lane legends shall be helmeted cyclist with arrow.

Green-backed dashed bike lanes shall be placed at Conflict Zones.

Median Nose Paint is required and shall be colored the same as the leading lines per City Standard Plans S-31 and S-32.

Type Q markers shall be place one foot (1’) back from all median nose.

Median nose shall be signed at intersections and at the start of a median chain.

All striping and legends must be cat-tracked prior to placement of striping and markings. Contractor shall notify the City Engineer after the cat-tracking is placed. Striping and markings must not be placed until the City Engineer has authorized the cat-tracking alignment and placement details.

Contractor must submit certificates of compliance from the materials suppliers indicating compliance of the materials with the requirements as specified in “Prequalified and Tested Signing and Delineations Materials” of the Standard Specifications.
4 - LANDSCAPING STANDARDS

4.01 PUBLIC RIGHT-OF-WAY STREET TREE PLANTING

Trees shall be planted from a minimum 15-gallon container and be of a size not less than 5 feet in height nor less than 3/4 inch in diameter. Trees shall have a healthy root system that is established in its container. The roots shall not be circled in the container. Trees shall have a single trunk with vertical leader branches that have not been “topped”. Tree shall be free from pests, dead and damaged branches or trunks. When 24-inch box container size trees are required, trees shall be a minimum of 8 feet tall and have a minimum trunk diameter of 1¾ inches.

The 15-gallon tree shall be planted in a hole that is a minimum of 24 inches square by 24 inches deep. In severely compacted or layered soil it will be necessary to break the continuity of the hardpan, clay pan or compacted layer by digging deep enough to penetrate below the pan or compacted layer. The excavation material in most cases can be returned to the hole. For 24-inch box container size trees the planting hole shall be a minimum of 36 inches square and at a minimum depth of 24 inches or deeper in order to accommodate the root ball.

Root barriers shall be installed whenever adjacent sidewalk and or curb are replaced. Root barrier shall be placed in the trench created alongside the new, or existing sidewalk and curb. The barrier shall be a continuous length and shall extend from 1/2” above finished soil grade downwards to a minimum depth of 12” adjacent to the sidewalk and 18” adjacent to the curb. Root Barriers shall be the Deep Root Barrier panel LB12-2 and UB18-2, or acceptable equivalent. Refer to Manufacturer's Specifications for all other applicable requirements.

Trees shall be planted in original soil material unless otherwise required by the City Engineer. Trees shall be set 2 inches higher than grown at the nursery.

Install two deep watering perforated plastic pipes as shown on City Standard Plan T-1. Fill pipes with 3/4-inch clean drain rock.

Trees shall be staked as indicated below:

- **Double stake support system** - Two 2-inch diameter by 8 foot minimum lodge pole pine stakes or approved equal and spaced with a Mission Manufacturing tree stake stabilizer or approved equal. Stakes shall be pressure treated with a wood preservative material. Trees shall be tied with a 24-inch minimum GroStrait tree ties or approved equal.

Exact location of trees shall be determined by the Parks and Recreation Services Department. Tree spacing varies depending on type. Trees shall be located a minimum 20 feet from curb returns, 15 feet from street lights, 6 feet from driveways, 8 feet from all utility boxes, and 10 feet from sewer laterals and water facilities.

When the area between the curb and the sidewalk contains a concrete or similar hard surface, a minimum 40 inches square opening around the tree shall be maintained.

Tree species designated for each street are on file at the Parks and Recreation Services Department Office. Large tree types shall not be planted when overhead utilities are present or when it is determined by the City that inadequate planting space is available.

Newly planted trees shall be watered deeply during the dry season or twice a week by the property owner or occupant. Water for approximately ten minutes with a hose adjusted to very low pressure (approximated 10 gallons). The root ball of the tree shall be thoroughly soaked. The two deep watering perforated pipes that have been installed shall be used to get water.
down to the root ball. Deep watering will encourage the roots to go deep into the soil away from paved surfaces.

4.02 PUBLIC RIGHT-OF-WAY LANDSCAPE SPECIFICATIONS

4.02.01 GENERAL REQUIREMENTS

All landscape construction plans shall have been approved by the City of Napa Parks and Recreation Services Department. A pre-construction conference must be scheduled with the Parks and Recreation Services Department prior to the start of the landscape installation.

4.02.02 REQUIRED INSPECTION POINTS

During the course of construction, approval of City Engineer shall be required as follows:

<table>
<thead>
<tr>
<th>APPROVAL REQUIRED ON</th>
<th>PRIOR TO</th>
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<tbody>
<tr>
<td>Electrical Installations</td>
<td>Covering Trenches and Connection</td>
</tr>
<tr>
<td>Irrigation Mains and Laterals</td>
<td>Covering Joints</td>
</tr>
<tr>
<td>Fine Grading</td>
<td>Planting</td>
</tr>
<tr>
<td>Plant Materials</td>
<td>Installation</td>
</tr>
</tbody>
</table>

4.02.03 SITE PREPARATION AND GRADING

Clearing and grubbing shall include the removal of the vegetation, asphalt, concrete and other debris from the site. Tree stumps, roots and other unsuitable material shall be removed to a depth of 12 inches below the finished grade.

Curb, gutter and sidewalk which is required to be removed shall be cut to minimum depth of 1½ inches with an abrasive type saw, on a score line, and the entire section shall be removed.

Removing concrete shall conform to the provisions in Section 15-1.03B of the Standard Specifications.

The Contractor shall roto-till or otherwise cultivate soil to remove the existing vegetation from the site.

All utility and valve boxes shall be adjusted to meet the finished grade of the site. All finished soil grades shall be one inch below sidewalk or curb level and shall not create run-off into adjacent properties.

4.02.04 IRRIGATION PIPING AND ELECTRICAL SYSTEMS

A. Materials

Sprinklers: Rainbird 1800 series or approved equal.

Gear Drive rotors: Hunter I-40, I-20

Bubblers: Rain Bird 1400 series or approved equal.

Subsurface Dripline: Rain Bird XFS Subsurface Dripline
Automatic Remote-Control Valve: Hunter ICV Series valve or approved equal centered in approved valve boxes. Each valve shall have a polyurethane tag with station identification number. Tag shall be Christy’s ID-STD-Y1 or approved equal.

Remote Control Valve Boxes: Carson Industries Model 1419-12 with 1419-4B (bolt down) lid marked “Irrigation”. Color shall be green for potable water and purple for reclaimed water applications.

Gate Valve: Three inches and smaller shall be Nibco T-113 or approved equal. Four inches and larger shall be Nibco F-619 –RW series as specified.


Backflow Preventer: To be approved by the Parks and Recreation Services Department’s Cross Connection Specialist. Wilkins 975 XL reduced pressure / 950 XL double check or equal approved by California Department of Health. Installed with Wilkins Model No. 500XL Pressure Reducer Valve on services of 80 PSI or greater. Polar Parka backflow insulation is required.

Backflow Preventer Enclosure Strong Box: Model BC-CR.

Pressure Regulator: Wilkins Model No. 600 regulator to be used whenever the system pressure exceeds manufacturer specifications for sprinkler performance.

Quick Coupler Valves: Model 44 Rainbird or equal installed in Carson 910-12B box with bolt down lid. Coupling valve must be capable of receiving RB44K keys.

Irrigation Piping: Schedule 40 PVC

Electrical Conduit: Gray schedule 40 PVC.


B. Installation

The Contractor shall install the irrigation and electrical systems in accordance with the approved plans, each controller cabinet shall contain a GFI electrical receptacle. All work and installations shall be in accordance with the California Plumbing Code, the National Electric Code and the local regulations.

Irrigation systems shall be installed to provide full coverage of all landscaped areas. If areas are receiving insufficient coverage, the contractor shall adjust and/or reinstall the system to provide proper coverage.

Trenches shall be straight with bottoms of uniform slopes. The bottom of the trench shall be undisturbed native material or imported material compacted. Main lines shall be installed with a minimum cover of 18 inches. A minimum of 1-inch vertical clearance shall be maintained between lines which cross. No line shall be installed parallel to and directly over another line. All lines, when passing under areas that are to be paved, shall be placed in a P.V.C. conduit sleeve.

All main lines shall be placed on sand bedding, a minimum of 2 inches thick.
Irrigation control wires shall be installed in the same trench as irrigation pipe, maintaining a 2-inch clearance at pipe joints. Control wires are to be on the same level as (not on top of) irrigation pipe. Irrigation control wire shall be bundled and taped at 6-foot intervals. There shall be a minimum of 36 inches for each wire coiled inside each valve box. Irrigation pipe is to be installed with identifying marks visible for inspection.

A minimum of 5 inches of sand shall be placed over the lines. Native material may be used for remainder of the backfill.

The entire irrigation system shall be thoroughly flushed with water to remove dirt scale and foreign material of any nature prior to the pressure test.

Prior to backfilling, the main lines shall be filled with water. The irrigation system shall not leak and a pressure test of 125 psi for a period of 2 hours, shall be maintained on the entire system.

Control and common ground wire shall be type UF600V with a minimum 1/16-inch insulation or of a type approved by the governing electrical code for underground direct burial for Class 2 wiring for 24 volt, 60 cycle A.C. Direct lines shall be No. 14-1 AWG-UF, black. Common lines shall be No. 14-1 AWG-UF, white. All control and common ground wires shall be placed in minimum 1½-inch PVC conduit when passing under areas that are to be paved. All 24-volt splices shall be made using 3M Company No. DBR/Y-6 Splice Kit, or approved equal. Install spare control wires of a different color along entire main line. Loop 36-inch excess wire into each single valve box. Minimum of two spare wires per controller.

Galvanized pipe or fittings will not be permitted in the system.

The control and quick coupler valves shall be installed as shown on the approved plans. The valve boxes shall extend from the finished grade to the bottom of the valve.

The electrical system shall be installed to properly operate the irrigation system.

The Contractor shall furnish and install all required materials and equipment to connect the system to electrical service point and water meters.

The Contractors shall furnish and install all required materials and equipment to install the controller in the cabinet.

Wiring for the remote control valves shall be in accordance with the manufacturer recommendations. Each master valve shall have a dedicated control wire and dedicated common wire.

The Contractor shall furnish a reproducible “as built” plan of the irrigation and electrical system.

The Contractor shall furnish applicable operating manuals, warranty cards for controllers, valves, backflow preventer and pressure regulators.

4.02.05 CENTRAL CONTROL SYSTEM SPECIFICATIONS

A. General

All materials furnished and installed shall be new and shall conform to the City of Napa Standard Specifications and Standard Plans, current edition, as adopted by the City.

All materials except interconnect conductors shall have a five-year limited warranty. The contractor shall submit proof of warranty to the City inspector prior to the start of the
maintenance period. It shall be the contractor’s responsibility to obtain the necessary warranty inspections from the equipment supplier. No installation will be accepted without proof of warranty.

All existing and new computerized irrigation control system components shown on the plans shall be fully operational at final acceptance.

All incidental parts which are not shown on the plans or specified herein and are necessary to complete or modify the existing system shall be furnished and installed as though such parts were shown on plans or specifications. All systems shall be in satisfactory operation at the time of completion.

Existing interconnect systems shall be maintained in effective operation by the contractor for the duration of the work. The contractor shall notify the City inspector 48 hours prior to performing any work on an existing system.

The contractor shall coordinate with the local telephone company for connections to the service and/or installation of conduits, telephone conductors, jacks and modems at the locations shown on the drawings. Minor changes caused by actual site conditions shall be made at no cost to the City. All changes to plans shall be approved by the City Engineer.

**B. Products**

**Conduit**

All central control system interconnect conduit and fittings shall be PVC schedule 40, 1-inch in size, unless otherwise noted.

All telephone service interconnect conduit and fittings shall be as approved by the local telephone company.

**Conductor**

The communication cable as required from the sub master satellite assembly to the other satellite assemblies on line shall be a 4 conductor shielded cable (Part No. EV-CAB-COM). Communication cable may be used to link satellites up to 5,000 feet from each other. Cable shall be installed in a gray 1-inch schedule 40 PVC.

The flow sensor wire as required from the flow sensor into the satellite assembly enclosure shall be a 2 conductor shielded cable (Part No. EV-CAB-SEN). The sensor cable may be used to connect the flow sensor to a satellite up to 2,000 feet from each other. Cable shall be installed in a gray 1-inch schedule 40 PVC. Each flow sensor cable shall be a continuous run.

All conductors shall be the same type and size shown on the drawings as required for proper operation of the system.

**Wire Splices**

Conductors shall be installed with NO UNDERGROUND splices unless absolutely necessary and unavoidable. Any and all underground splices that are required to be made must be approved by the City Inspector and shall be placed in a suitable type, 14 inch by 19 inch valve box for easy access.

Wire splices on the communication or sensor cable shall be made with a splice kit (3M Company Part No. 72-N1).
Pull Boxes
Pull boxes shall be fabricated from a durable plastic material resistant to weather, sunlight and chemical action of soil. Pull boxes shall be a minimum size of 20 inches in length, 15.25 inches in width and 12 inches in height. In paved areas, the pull box shall be a concrete type with a cast iron lid.

Ground Rod
A 5/8-inch by 8 foot ground rod, clamp and No. 6 wire shall be provided at every satellite location. It shall be installed between 8’ – 12’ from enclosure, installed in a 10” round valve box.

All central control system equipment shall be grounded to conform to requirements of the National Electric Code; current edition as adopted by the City, and the manufacturer’s specifications. No solder connection will be allowed. Resistance to ground shall be no more than 25 ohms.

Satellite Assembly
The number and location of the satellites shall be as shown on the drawings and shall be as manufactured by Rain Master.

All satellites shall be pre-assembled, hereafter referred to as Satellite Assembly, by Site One Green Tech in a top entry (SA6 series) or metered (SA5 series) “Strongbox” stainless steel weatherproof, vandal resistant, lockable enclosure manufactured by V.I.T. Products.

The satellite assembly shall consist of a stainless steel enclosure, stainless steel removable backboard, interconnect terminal strips, primary power voltage surge protection, on/off switch, a ground fault interrupt circuit, ground rod, wire and clamp.

The satellite assembly (Part No. SA6-RM4-XX/PHB or SA5-RM4-XX/PHB series) shall include a phone communication circuit board for communicating with the central computer by means of the telephone system.

The satellite assembly (Part No SA6-RM4-XX/RHG or SA5-RM4-XX/RHG or RFL series) shall include a radio communication circuit board for communicating with the central computer by means of a data radio. For proper antenna selection, contact Site One Green Tech at (888) 438-7435.

The satellite assembly (Part No. SA6-RM6 or SA5 series) shall include a hard wire communication circuit board for communicating with a submaster satellite assembly (Part Nos. SA6-RM4-XX/HWB, SA5-RM4-XX/HWB) when interconnected by means of hard wire (Part No. EV-CAB-COM).

The satellite assembly (where applicable) shall include a flow sensing assembly with a normally open master valve assembly option (Part No. FSAV series) for each point of connection (maximum of two per satellite/group) or a dual flow sensing assembly with master valves option (Part No. DFSAV series) for a single point of connection with a bypass to monitor very low and high flows.

The satellite assembly (where applicable) shall include a Rain Master PRO-MAX transmitter and built-in remote receiver with a controller access code (Part No. PMR) or PRO-MAX built-in receiver only with controller access code (Part No. PMR-CAC) whichever is applicable.

The satellite assembly shall include a flow sensing assembly with a normally open master valve assembly option (Part No. FSAV series) for each point of connection (maximum of two per satellite/group) or a dual flow sensing assembly with master valves option (Part No. DFSAV series) for a single point of connection with a bypass to monitor very low and high flows.

The satellite assembly (where applicable) shall include a Rain Master PRO-MAX transmitter and built-in remote receiver with a controller access code (Part No. PMR) or PRO-MAX built-in receiver only with controller access code (Part No. PMR-CAC) whichever is applicable.

The satellite assembly shall be covered by a five-year limited warranty.
C. Execution of Work

Interconnect Conduit

The interconnect conduit shall be located within the public right-of-way whenever possible. If the conduit is installed outside of the public right-a-way, an easement shall be provided to the City prior to installation.

Conduit runs shall be installed as shown in the approved plans. Any changes shall be approved by the City Engineer prior to installation.

The ends of the conduits, whether shop or field cut, shall be reamed to remove burrs and rough edges. Cuts shall be made square and true.

The ends of the conduit shall be capped until the pulling of wiring is started.

Conduit bends, except factory bends, shall have a radii of not less than six times the inside diameter of the conduit.

Conduit shall be installed at a depth of not less than 18 inches below finished grade.

Conduit shall be free of soil and debris.

A nylon or polypropylene pull rope with a minimum tensile strength of 500 pounds shall be installed in all conduits which are to receive future interconnect cable. At least 2 feet of pull rope shall be extended beyond each end of the conduit run and secured.

Interconnect Conductors

All interconnect conductors shall be pulled by hand.

A total of 3 feet of cable shall be left at each satellite assembly and pull box. Sufficient slack shall be left to allow the wire to extend 18 inches above the top of the pull box grade.

The interconnect wire shall be continuous from satellite to satellite. All splices shall occur within the satellite enclosure unless specifically authorized by the City Engineer. Splices shall be capable of satisfactory operation under continuous submersion in water.

Pull Boxes

Pull boxes shall be installed with a 36-inch loop inside the box, at intervals not to exceed 200 feet, at all changes in direction, and where the conduit crosses a roadway, bridge or railroad track.

Pull boxes shall be installed in area to be landscaped whenever possible.

The bottom of the pull box shall be bedded in crushed rock six inches deep prior to installation of the interconnect cable.

D. Equipment Supplier Support

- Review system and plans.
- Conduct one pre-construction meeting on site, for the contractor and owners’ representative.
- Hook-up communication and flow sensor cable inside the assembly.
- Test to verify proper grounding.
- Field test for proper operation of the assembly components.
• Communication cable continuity and resistance test.
• Calibration of assembly flow sensing components (if applicable).
• Verify equipment conforms to and is installed in accordance with Site One Green Tech and Manufacturers specifications and recommendations.
• Perform functional test of system from a computer.
• Provide written certification letter.

4.02.06 LANDSCAPING MATERIALS

All trees/shrubs (all plant material) shall possess a County of Napa Agricultural Commission inspection stamp.

A. Soil Mix
Import soil mix shall consist of 50 percent loam and 50 percent nitrogen fortified redwood sawdust or approved equal.

B. Fertilizers and Soil Conditioners
Controlled release fertilizer for groundcover: 20-6-8 (N-P-K) or approved equal with a minimum of one percent iron.

Soil Amendment: Redwood sawdust – nitrogen stabilized or approved equal.

Controlled release fertilizer for trees and shrubs: 20-10-10 (N-P-K) or approved equal with calcium, sulfur and iron.

All fertilizers and soil conditioners shall be first quality, standard brand, and agricultural products.

C. Pre-emergent Herbicides
All herbicides must be approved by the Parks and Recreation Services Department and be registered for plant materials used. Applications must be performed in accordance with CDPR standards.

D. Compost
Available from Napa Garbage Company

All plant material shall be approved prior to installation by the Parks and Recreation Services Department, must be well suited to Napa’s climate and require minimal water once live.

E. Trees
Fifteen-gallon trees with a root system established in its container a minimum of 6 months. Trees shall be not less than 5 feet in height, nor less than 3/4-inch caliper and shall not have evidence of stem damage, disease, fungus, root restriction or deformity. Additionally, no co-dominant stem growth shall be present; that is the tree shall possess one dominant stem with an internal branch structure.
F. Shrubs
Shrubs with a root system established in its container shall not have evidence of root restriction or deformity.

G. Ground Cover Plants
Ground cover plants shall be rooted plants grown in flats, unless otherwise approved in advance by the Parks and Recreation Services Department. Plants shall be full and compact.

4.02.07 SOIL PREPARATION

A. Weed and Debris Removal
All ground areas to be planted shall be cleaned of all weeds and debris prior to any soil preparation or grading work. Noxious weeds and grasses shall be removed by the roots wherever they are found at any stage of the work. Weeds and debris shall be disposed of off-site.

B. Moisture Content
Soil shall not be worked when moisture content is so great that excessive compaction will occur, nor when it is so dry that dust will form in the air or that clods will not break readily. Water shall be applied, if necessary.

C. Soil Loosening
Soil in all planting areas shall be cultivated to a depth of 8 inches below finish grade. Water shall be added and cultivating shall be continued until the entire 8-inch depth is loose and friable. All debris, concrete and rocks shall be removed to the 8-inch depth and shall be disposed off-site. No rocks or debris over 2 inches will be allowed to remain.

4.02.08 SOIL CONDITIONING

A. General
After soil preparation has been completed and the soil and water settled, high and low spots re-graded and the rough grade established, add soil amendments as indicated below and rototill, making repeated passes with the cultivator to the depth specified until the amendments have been thoroughly mixed.

B. Ground Cover Areas
Rototill 6 cubic yards nitrogen stabilized Redwood Sawdust or approved equal into the top 6 inches of soil at the specified rates per 1,000 square feet area.

C. Shrub Areas
Broadcast 3 cubic yards nitrogen stabilized Redwood Sawdust or approved equal and rototill into the top 3 inches at the manufacturer specified rates per 1,000 square feet of area.
Backfill all tree and shrub holes with soil from excavated hole.
D. Tree and Shrub Holes

Locate tree and shrub per the planting plan bringing any conflict with underground utility lines to attention of the City Engineer.

Holes shall be excavated to depth of the root ball and to a width twice the diameter of the root ball. In compacted soils, planting holes shall be excavated to a minimum depth of 1½ times the depth of the root ball. The sides and bottom of the hole shall be scarified before planting.

The Contractor shall place mulch to a depth of 4 inches on all shrub areas. The mulch shall cover all soil areas with the exception of the circular well formed around each plants drip line.

E. Finish Grading

When weeding, rough grading, and soil conditioning have been completed and soil has been thoroughly water settled, all planting areas shall be smooth graded, and ready for placement of plant materials.

Grading shall be done when soil is at optimum moisture content for working.

Grades not otherwise indicated shall be uniform slopes between points where elevations are given, or between points established by curbs. Finished grades shall be smooth, even and on a uniform plane with no abrupt change of surface. Minor adjustments shall be made if required. Finished grade shall be one inch below curb and sidewalk.

All grades shall provide for natural runoff of water without low spots or pockets. Flow line grades shall be accurately set and shall be not less than 2 percent gradient wherever possible.

4.02.09 TREE STAKING (OTHER THAN STREET TREES)

Trees shall be supported by double stakes as detailed on the standard plans. All stakes shall be at right angles to prevailing wind.

Wooden tree stakes shall be 8-foot minimum by 2-inch diameter round, pressure treated.

Stakes shall be set plumb. Tree ties shall be 24-inch minimum tire strap, “Gro Strait” or approved equal. Staking apparatus to be removed once the tree root system is well established. Follow the staking guidelines set forth in the latest edition ANSI A300 Standards – Part 6, Planting and Transplanting.

4.02.10 PLANTING

Plant materials shall not be installed until all construction work has been completed and sprinkler systems have been installed and tested. Planting areas shall have been graded and prepared as herein specified.

No planting shall be done during unfavorable weather.

All trees or shrubs shall be set so that, when settled, the natural grade at the top of container is at finished grade of the adjacent soil. No soil in muddy condition shall be used for backfilling. No filling will be allowed around trunks. The tree root flare shall be exposed at finished grade level.
All trees shall be staked per City Standard Plans T-1, T-2.
Trees planted in curb strips or near sidewalks shall be planted per City Standard Plans T-1, T-2.

Plants shall be irrigated to a depth of at least 18 inches.

Watering Basins: Form circular earth basin centered on the stem of each tree or shrub. The rim of basin shall be 4 inches above the grade at the trunk.

All plants shall be planted immediately after removal from the containers and containers shall be removed from the site so as to not present a hazard to persons using the area.

Upon completion of all planting operations, and again just prior to final inspection, all soil shall be lightly cultivated and neatly raked. Basins shall be left around trees and shrubs unless otherwise specified or directed.

All landscape areas must be treated with pre-emergent herbicides approved by the Parks and Recreation Services Department and registered for the plant materials that are planted in accordance with CDPR regulations.

4.02.11 ESTABLISHING MAINTENANCE PERIOD

As soon as all planting is completed, a planting review and preliminary inspection to determine the condition of the plantings will be held by the City Engineer upon request by the Contractor.

Upon approval of the work by the City Engineer and Parks, Trees & Facilities Manager, the 60-day maintenance period shall begin. Contractor is responsible for maintaining the plants and trees during the maintenance period.

4.02.12 MAINTENANCE

Continuously maintain all plantings in area, from the beginning of work, during the progress of work, for a minimum of 60 days after completion of all planting, and until final acceptance of all work.

Maintenance shall include continuous operations of watering, weeding, cultivating, edging, trimming, and fertilizing. Treatment of insect, disease, rodent, and any other pest control operations shall utilize Integrated Pest Management practices to assure good, normal growth.

Weed Control: All planting areas are to be treated for pre-emergent weed control with material approved by the Parks, Trees & Facilities Manager and at recommended label rates, uniformly distributed in accordance with CDPR regulations.

Planting areas shall be kept neat and free from debris at all times and shall be cultivated and weeded at not more than 10-day intervals. Planting areas shall be weed free at the end of the maintenance period.

Replacements: Immediately replace any plant materials that die, are stolen or are damaged. Replacements shall be made to the same specifications as required for original plantings.

Records of regular maintenance activities and dates must be provided to the City Parks and Recreation Department every 2 weeks. The Maintenance Period may be doubled if it is determined that the above maintenance standards have not been met.
At the termination of the Maintenance Period, all plant materials shall be live, healthy, undamaged and free from infestations. Plantings that do not conform to specifications shall be replaced and brought to a satisfactory condition before final acceptance of the work can be made. Based on City review, maintenance period may be doubled until all plant materials are sufficiently established.

4.03 TREE PRESERVATION STANDARDS

4.03.01 PURPOSE

Tree Preservation Standards shall be utilized for the protection of trees located on public property including street right of ways, public easements; or on private property where trees have been designated City of Napa Significant Trees or Protected Native Trees; as required by the City of Napa Parks and Recreation Services Department where said trees may be subjected to construction impacts or activity on either public or private land. Construction activity shall include but is not limited to: grading, trenching, excavating, and operation of construction equipment or vehicles in the vicinity of the public or Significant Tree which has the potential to harm or affect the health or vigor of the tree.

4.03.02 CONSTRUCTION INSPECTION AND SUPERVISION

All arboricultural and related soil work shall be performed under the supervision of International Society of Arboriculture (ISA) Certified Arborist (Project Arborist) or the City Engineer or designated representative.

All specified arboricultural work shall be completed prior to site grading (hand trenching, pruning, fencing, etc.)

4.03.03 PROTECTION WITHIN DRIP LINE OF INDIVIDUAL TREES

Prior to initiating any construction activity in the area, including demolition or grading, temporary protective fencing shall be installed at each site tree in the immediate vicinity of construction.

Fencing is to be located a minimum of one foot beyond the canopy drip line. If available space and logistics follow, fence shall be placed at a greater distance or up to twice the diameter of the drip line.

Fencing shall be a minimum of 5 feet in height at all locations, and shall form a continuous barrier without entry points around all individual trees, or groups of trees. Barrier type fencing such as chain link, but any fencing system which adequately prevents the entry of equipment and activity will be acceptable. The use of simple post and cable fencing is not permitted as this provides minimal protection and is easily removed or moved by construction personnel. Fencing shall be installed in a professional manner with adequate uprights and appropriate attachments. Concrete footings are not required due to the temporary nature of the fencing. Any encroachment into the drip line for fencing or construction purposed requires the permission of the City Inspector.

This fencing shall serve as a barrier to prevent drip line encroachment of any type by construction activities, equipment, materials storage, and personnel.
Contractors and subcontractors shall direct all equipment and personnel to remain outside the fenced area at all times until project is complete, and shall instruct personnel and subcontractors as to the purpose and importance of fencing and preservation.

Fencing shall remain in place and not be removed until all construction activities are completed. This shall include grading and compaction activities, installation of underground construction activities, and any other construction or activity, which may be scheduled prior to landscapes installation. There may be occasion when access is required, and fencing may temporarily be moved to facilitate the work.

Roots of single standing trees often extend two to three times the distance of the actual drip line and function primarily in the uptake of nutrients and water. The drip line is arbitrarily established as the minimum root area generally required to preserve tree health. As much area around the circumference of tree beyond the drip line should have minimum intrusion to further ensure tree survival and health.

4.03.04  GRADE CHANGES

Grade changes within a tree drip line are to be minimized wherever possible. Grade should not change from that which existed prior to grading activities without approval from the project arborist.

Maximum cut or fill within actual or estimated drip lines shall not exceed 6 inches. All cut activities should be done in conjunction with the project arborist, even those under 6 inches, to minimize root damage.

Estimated drip line is defined as the widest distance from main trunk to furthest branch tip applied around the entire circumference of each individual tree. This definition specifically applies to all trees where a one-sided or unbalanced structure exists and the actual drip line is not truly representative of the area of the root zone requiring protection. Cut and fill activities apply to this definition.

No more than 6 feet of fill soil shall occur without specifically developed mitigation measures. Removal of soil within tree drip line is also limited to 6 inches, or a lesser amount, which can be removed without contacting major roots. Detailed mitigation is required to remove a greater amount.

The amount of cut and fill is to be determined by actual tree species, rooting characteristics, soil conditions, and purpose of grade change.

All cut and fill activities within tree drip line increases percentage of short and long-term tree decline and loss, and approval of these activities, or compromise in this area, shall be done with full knowledge of the negative potential that is incurred.

Original grade shall be maintained in immediate area of the root crown, where the soil contacts tree bole, at all times. No increase in grade shall be allowed under any circumstances in this area.

Physical retaining structures are required where any fill operation is approved and exceeds 6 inches above original grade. Retaining structures function to prevent soil grade from being raised in the root crown area.

Physical retaining structures shall be permanent in nature and may be constructed from any material that is appropriate in function to hold raised grade away from root crown flare on a long-term basis. Engineering may be required in some instances.
Tree retaining structures shall be installed a minimum distance of 4 feet from any tree trunk and may completely or partially surround the tree depending on the location of grade change. If grade is raised on 50 percent of the drip line, then retaining structures must be installed to prevent that soil from moving to the immediate root crown flare in that area. If 100 percent of the grade is raised, structure must surround the tree entirely. It is the responsibility of the project designer to develop an appropriate structure for this purpose with the approval of the project arborist.

If site conditions exist which necessitate installation of retaining structures closer than 4 feet to tree trunk, the project arborist shall be consulted for details of this installation.

No part of the dry well structure shall be placed below original grade to minimize impact on root system. If necessary, structural posts may be installed to hold walls in place, providing that care is taken during the installation to minimize damage to the root system, and that posthole size is minimized. The excavation and pouring of footings and other structural support is not compatible with tree preservation.

Grade changes outside the retaining structures shall be such that drainage water of any type or source is not diverted toward or around the root crown in any manner. Grade shall drain away from root crown at a minimum of 2 percent.

If grading toward root crown is required, appropriate surface and/or subsurface drain facilities shall be installed so that water is effectively diverted away from root crown area. The project arborist shall be consulted for details and approval of installation.

Where fill is approved and/or where paving of any type is planned within the drip line, aeration tubes shall be installed from the dry well or retaining structure to the limit of the drip line and placed at a depth corresponding to slightly below original grade. A description of aeration tube use and construction follows:

- In all areas where paving, impermeable or semi-permeable surfaces, or fill over 6 inches is to be installed within any tree drip line, aeration tubes shall be required to the limit of the drip line or beyond where possible. Tubes shall radiate horizontally from each dry well to the root crown area to the limit of the drip line, and shall be located on 4-foot centers. Ends of tubes shall be connected to one another. A proportional number of tubes shall be installed when partial paving or filling within drip line is required.

- Aeration tubes shall consist of rigid and perforated PVC pipe, minimum class 200, styrene plastic, or molded ABS, minimum 3-inch diameter, 10 perforations per foot. Pipe shall be placed slightly below original grade. Each tube shall be wrapped in suitable filter fabric securely fastened with waterproof tape. Aeration tubes shall daylight within the retaining structure around tree trunk, and a grate shall be attached, but not glued, to the end of each day-lighted tube to prevent the entry of debris. Aeration tubes shall also daylight near the outer perimeter of the drip line with a fitted metal grate properly installed such that water of any type or source back drains into dry well.

The installation of aeration tubes is meant to facilitate the normal exchange of atmospheric gasses with the soil and root system. When impermeable or semi-permeable paving is installed, or when soil grade is raised, this normal exchange is limited and commonly becomes a source of root damage and potential disease.

Tree roots will be expected to grow into areas of soil fill, and quality of imported soil should be considered. Ideally, fill soil should be site soil that closely matches that present within tree
drip line. If import soil is utilized, it should be the same or slightly coarser texture than existing site soil, should have a pH range comparable to site soils, and generally should have acceptable chemical properties for appropriate plant growth. A soil analysis is required prior to importation to evaluate import soil for these criteria.

All approved soil cuts should be made outside the immediate drip line for minimal negative impact on trees. If approved within drip line, crown foliage shall be reduced accordingly to balance the estimated root loss. Any construction activity, which necessitates soil excavation in the vicinity of preserved trees, should be avoided where possible, or mitigated under the guidance of the project arborist. Roots are to be clearly hand cut and sealed wherever possible when major structural roots are encountered over one inch in diameter. The tearing of roots by equipment of any type within the drip line shall not be allowed.

4.03.05 UNDERGROUND CONSTRUCTION

All underground work within tree drip lines shall be avoided wherever possible to reduce negative impact on trees. The location of underground utilities well outside drip line is recommended as part of tree preservation.

Weakened anchorage, root system integrity, and the ability to acquire moisture from the root soil areas are the most critical issues when considering any type of root impact or removal.

Underground work in the area of site trees has a potentially serious impact on tree health and tree stability. Underground trenching for a variety of utilities will sever large structural roots reducing nutrient and water uptake and more seriously affecting the ability of each tree to remain appropriately anchored.

The existing root system within the drip line should not be severed by construction activities of any type. If undergrounding within the drip line is required for unavoidable logistical reasons, the project arborist shall be consulted to determine the impact on tree health.

All underground work required within the drip line of the trees and below original grade shall be previewed by the project arborist to determine potential impact on trees and to prepare mitigation measures. The project arborist shall be present during the actual underground work.

4.03.06 PRUNING REQUIREMENTS

The removal of dead wood, damaged branches, and structurally unsound wood including bark, narrow crotches, and crossing branches shall be the priority for any pruning work. Co-dominant leaders or lateral branches shall be removed and pruned to retard growth if possible.

Pruning shall be as minimal as possible, removing dead or damaged branches, crossing or rubbing branches, or correcting other structural deficiencies that may be present. Removal of lower branches may be required to allow for access and clearance following construction. Minimal pruning is the desired approach to all trees. Follow the pruning guidelines set forth in the latest edition ANSI A300 Standards – Part 1, Tree Pruning.

The following general guidelines shall be used during all pruning procedures:

1. Lateral Branch Removal
   
   (a) All laterals shall be removed immediately beyond the branch bark ridge, always preserving the branch collar.
(b) No stub cuts should be made which leave an inch or more beyond the branch collar.

(c) No flush cuts through the branch collar shall occur.

2. Triple Cuts

(a) All branches too large to be hand held shall be removed by means of the triple cut; undercutting branch 4 to 8 inches beyond base, removing branch beyond undercut, and removing remaining stub utilizing a shoulder cut.

3. Terminal Pruning

(a) Thinning: Cut back terminal portions of branches by cutting back to laterals with a basal diameter 1/3 the size of the terminal being removed. Removal of many smaller terminals is preferred over removal of a few large ones.

(b) Size reduction: Remove portions of the crown for reducing height by removing terminals back to laterals. Each lateral remaining should be located to serve as a new terminal. This will establish the crown at a lower level. The diameter at the base of a remaining lateral should be 1/3 the diameter of the terminal being removed.

Pruning may also be required to create appropriate access for construction equipment where low limb presence may obstruct access. This pruning is to be done by a qualified arborist, and shall by no means be done by construction personnel under any circumstances.

Pruning shall occur prior to initiation of all approved underground trenching. No ground shall be broken within the drip line of street trees without having pruning completed.

Project arborist shall be consulted prior to initiation of any pruning procedures to coordinate activities with the working arborist.

4.03.07 ADDITIONAL RECOMMENDED PROCEDURES

Continued discussion and coordination between project arborist, owners, contractors, and City Engineer shall occur to further discuss and define these guidelines based on the actual work planned in the vicinity of these trees.

4.03.08 FERTILIZATION

Following completion of construction, all native trees shall be fertilized with a complete fertilizer which shall supply a minimum of 1½ pounds of actual nitrogen per 1000 square feet of drip line area, per year. A thorough irrigation shall immediately follow. This application shall be completed twice during the growing season following completion of construction. Ideally, application shall be by high-pressure soil injection or drenching.

Following completion of construction activities a determination of tree health should be conducted to visually evaluate tree performance and to recommend additional mitigation if it should be required. Owners additionally should monitor visible tree appearance and contact the project arborist should the tree exhibit unusual growth or characteristics.
4.03.09 MULCHING

Following completion of construction, 2 to 3 inches of wood chip mulch is recommended for placement under the drip line of the tree. Mulch shall remain a minimum of 2” from the trunk of the tree.

4.03.10 PEST CONTROL

A close visual examination for tree pests shall be conducted by the project arborist and/or the tree worker as he completes pruning procedures. If a serious infestation is present which was not apparent from ground observation then pesticide application should be considered at that time. However, the simple presence of tree pests does not warrant the use of chemical pesticides, and it should be clear that a serious infestation capable of causing tree decline must be present to warrant their use. The use of organic sprays or pesticidal soaps is the preferred method for treating any serious pest infestation. If infestations should occur, discussion with the project arborist is recommended. Treatment should only be performed by a licensed pest control operator/applicator under the direction of a use recommendation or prescribed treatment in accordance with labeling and in accordance with applicable California State laws and regulations. Administered by the California Department of Pesticide Regulation and regulated by the Napa County Agricultural Commissioner's office.

4.03.11 DISEASE CONTROL

No specific measures are recommended for disease control unless otherwise noted in the Individual Tree Evaluations. The tree-pruning specialist should note any serious problem during climbing procedures if they become evident.

4.03.12 REFERENCE

The use of asphalt or concrete as a primary paving surface within the canopy drip line is prohibited. Utilization of a permeable substance which does not impede the natural percolation of water or limit the nature of gaseous exchange is recommended. Materials such as decomposed gravel or cobble are ideal for this purpose, however; generally do not function satisfactorily as a parking or driving surface.

Interlocking pavers come in a variety of shapes, colors and sizes and provide a suitable surface for driving, parking and walking. At the same time they will allow some infiltration of water and air to the original soil level. Functionally and aesthetically they are appropriate for consideration at many projects. Utilization of an installation method which excludes fine sand joints must be used, however, to maintain infiltration. A course sand leveling bed and course sand joints are recommended to increase water infiltration and aeration.

4.03.13 PLANTING UNDER EXISTING TREES

The installation of lawn beneath established native trees is prohibited. The ideal treatment under native trees is the use of organic or inert mulch. Redwood chips, gravel, or stone cobble are all excellent materials. If planting is required for aesthetic or functional purposes, the use of drought tolerant, woody species is most appropriate. Species should be selected for their ability to survive with minimal or no water through the summer months after initial
establishment period. Only drip irrigation should be utilized within the canopy drip line to minimize summer water in the root zone.
5 - WATER DISTRIBUTION SYSTEM PROVISIONS

5.01 WATER DESIGN

5.01.01 GENERAL WATER DESIGN

Contractor shall conduct all water system improvements in accordance with the following:

- The City-adopted project special conditions of approval;
- The approved improvement plans including any supplemental updates thereto;
- The City-approved permit(s);
- The Standard Specifications of the State of California Department of Transportation, the latest edition, and the Standard Plans of the State of California Department of Transportation, the latest edition;
- The City of Napa Standard Plans, including any supplemental updates thereto;
- These Water Distribution System Provisions;
- The latest version of the applicable AWWA standards;
- The regulation(s) and requirement(s) of appropriate agencies (e.g. State Department of Transportation, Department of Fish and Wildlife, Pacific Gas & Electric, Napa Sanitation District, AT&T, et al.).

Contractor shall submit any proposed revisions to the approved plans in writing which shall be reviewed and approved prior to any work taking place. The Water Division Engineer may allow modifications to the Water Distribution System Provisions or Standards for the convenience of the City on a case-by-case basis; all water system standard(s) modification(s) shall be subject to the review and approval of the Water Division Engineer.

If standards or other government regulations (including but not limited to minimum separation requirements) are in conflict, the stricter requirement shall prevail.

Contractor shall submit all record drawings to the Water Division office in a timely fashion.

The terms Applicant, Developer, Customer, and Contractor are used throughout these Water Distribution System Provisions and are intended to mean the same and can be used interchangeably.

5.01.02 WATER SYSTEM DESIGN AND INSTALLATION

Water mains shall consist of either fusible C900 or C905, standard C900 or C905 with epoxy-coated fittings, metallic zinc-coated ductile iron pipe with epoxy-coated fittings, or standard ductile iron pipe and fittings with cathodic protection that shall be noted in the approved improvement plans.

When new water system connections are made to existing metallic water mains, cathodic protection shall be installed on the existing pipeline as directed by the Water Division.

Water mains shall be installed within the public right-of-way and shall include fire hydrants, service laterals, meters, and their appurtenances (i.e., public water facilities) as directed by the City. Installation of new water facilities within a dedicated water line easement shall be at
the sole discretion of the Water Division Engineer. Unless otherwise approved, easements shall be a minimum of 20 feet wide, centered on the water line and designated as Public Water Utility Easements.

All new distribution pipelines shall be a minimum of 6 inches or be of sufficient size to supply adequate fire flow unless otherwise approved. Standard top of pipe cover depths shall be 36 inches unless otherwise approved by the Water Division Engineer. Cover depths shall be measured from the top of the pipe barrel to the finish street surface.

Water services shall be sized appropriately for the intended use and comply with the current California Plumbing Code. The Water Division Engineer may request an engineered water analysis of the private water system (new or existing) to evaluate capacity and service size. Undersized water services shall not be permitted under any circumstances. A Water Fixture Count for determining the proposed water service size shall be performed per the latest edition of the California Plumbing Code as required by the Water Division and the Building Division.

Water service laterals shall not exceed the size of the public water main that is connected to the service. The allowance of size-on-size water service laterals shall be at the sole discretion of the Water Division Engineer. In the event proposed demands cannot be met by the City’s distribution system, the Water Division Engineer shall conduct a hydraulic analysis (or direct the Applicant to conduct a hydraulic analysis at his or her own expense) to determine water system deficiencies that shall be addressed at the sole expense of the Applicant.

Water mains shall be installed as part of a looped system to ensure reliable service. Dead-end mains shall be avoided whenever possible.

Future water main extensions to the boundary of a subdivision where streets are stubbed shall be at the sole discretion of the Water Division Engineer.

Changes in pipeline grade to clear existing or proposed underground facilities shall be achieved through vertical offsets with the use of fittings, if required. All fittings shall be made with fully restrained joints and shall adhere to the requirements of City Standard Plan W-15. Deflection of pipelines may be used to avoid existing or proposed underground facilities if approved by the Water Division Engineer; deflection at pipe joints shall not exceed 3 degrees (minimum radius = 345 feet).

Signs, fences, trees, foundations, streetlights, or other permanent structures shall not be installed within 10 feet of a City water main or water facility, or within a public water utility easement.

Thrust blocks and restrained joints shall be installed as required and conform to the City of Napa Standard Plans W-14A, W-14B and W-14C.

All freeway/expressway crossings shall be fusible C900 or C905, have a minimum 12-inch carrier pipe inside an appropriately sized casing pipe, and conform to City Standard Plan W-13B and these Water Distribution System Provisions.

Installation of a private pressure system may be required where sufficient pressure is not available from the existing or proposed water distribution facilities.

Only those personnel trained and equipped to meet the various standards and requirements contained herein shall conduct water system installations.

Installation of new water mains shall include saw-cutting and removal of asphalt and trench excavation; furnishing and installation of all pipe, fittings, valves, anodes, tracer wires, bonding fittings; connectivity testing; placing and compacting bedding and backfill material; pressure testing; chlorinating; installation of temporary trench paving tying back into the existing water
system; and other miscellaneous work to ensure a complete and functional water system is turned over to the City.

5.01.03 DISTRIBUTION MAINS

Distribution mains shall refer to the main pipeline within a public right-of-way or easement that supplies water to one or more service connections. Installation shall include the main pipeline and associated fittings, valves, combination air-vacs, top blow-offs, and other materials necessary to provide a complete and functional system.

Only authorized City personnel shall operate existing valves on the water system at all times. The Applicant or Contractor shall be responsible for notifying the Water Division of a scheduled shutdown a minimum of 48 hours (two working days) in advance.

Main extensions shall extend from the end of an existing main to a point defined in the approved plans. Contractor shall be responsible for notifying water customers affected by the water shutoff a minimum of 48 hours (two working days) prior to commencement of the work.

City water mains extended from an existing main at a dead-end, with the feasibility of being extended further in the future, shall end with a tee that connects to a fire hydrant (per City Standard W-8), equipped with a mechanical joint cap at the end. The extended main shall be installed with restrained joints per City standards. If the length of the new main is less than the required restrained length, the new main shall be installed with restrained joints to the point of the existing main, with a wing wall installed on the live section of the main. A concrete thrust block shall not be installed at the end of the main unless otherwise permitted by the Water Division Engineer.

Final tie-in locations shall be potholed in a timely manner to verify line and grade and facilitate adjustments, if necessary. Separation between the newly installed water system and the tie-in location on the active water system shall not exceed 10 feet. Tie-ins shall be at the same line and grade and be conducted under direct inspection by the Water Division Engineer or Designee.

Permanent connection(s) between the existing water system and newly built water main(s) shall conform to the tie-in locations shown in the approved plans and occur only after approval by the Water Division Engineer. Final tie-ins shall occur only after successful completion and passing of the pressure, chlorinating, flushing, and bacteriologic tests.

Contractor shall be responsible for notifying the Water Division of a scheduled tie-in a minimum of five working days in advance of the tie-in. Contractor shall notify all affected customers a minimum of 48 hours in advance of the water system shutdown.

The Water Division Engineer may forbid connection to the existing water system if it is determined that the newly installed system is not complete and functional or does not conform to the approved plans.

5.01.04 BLOW-OFFS

Contractor shall install blow-off(s) as shown in the approved plans, and conform to City Standard W-8, W-10A, or W-10B. The plans shall indicate the size, type, and location of the proposed blow-off(s).

Blow-offs shall be installed on all dead-end mains smaller than 6 inches in diameter or at other locations as required by the Water Division Engineer. Fire hydrants shall be installed at the
ends of all water mains 6 inches and larger in diameter, which shall serve as the blow-off assembly.

The piping between the outlet valve and the riser shall be at a continuous downgrade of not less than ¼ inch per foot.

Blow-offs installed in unpaved areas or rural settings shall be set at the existing ground surface and may require special covers, markings, signs, protective bollards, concrete pad, etc., as directed by the Water Division Engineer.

5.01.05 COMBINATION AIR RELEASE AND VACUUM VALVES

Contractor shall install combination air release and vacuum valve(s) as shown in the approved plans, and conform to City Standard W-11A or W-11B and the latest version of AWWA C512. The plans shall indicate the size, type, and location of the proposed combination air release and vacuum valve(s).

Combination air release and vacuum valves or top blow-offs shall be installed at high points within the distribution system, or at other points designated in the approved plans. Other locations may be required as directed by the Water Division Engineer.

The piping between the outlet valve and the riser shall be at a continuous upgrade of ¼ inch per foot.

Combination air release and vacuum valves placed in urban settings may require special screening or approved covers, protective bollards, etc., as directed by the Water Division Engineer.

Combination air release and vacuum valves installed in unpaved or rural settings may require special covers, markings, signs, protective bollards, concrete pad, etc., as directed by the Water Division Engineer.

5.01.06 VALVES AND VALVE BOX INSTALLATIONS

Contractor shall install valve(s) as shown in the approved plans, and conform to City Standard W-9 and the latest applicable version of AWWA standards. The plans shall indicate the size, type, and location of the valve(s).

Resilient seated gate valves shall be used for pipe sizes smaller than 12 inches.

Butterfly valves shall be used for pipe sizes 12 inches and larger, unless otherwise approved by Water Division Engineer.

When possible, all valves shall be installed at the intersections of two pipelines, and within straight runs so that no more than 500 feet of water main would be out of service during water system shutdowns.

Valves shall be installed in a level position with the operating stem in a vertical position and be stabilized and supported separately from the pipeline.

Valves installed in unpaved or rural settings may require installation of additional signs, markings, witness posts, concrete pads, etc., as directed by the Water Division Engineer.

Valve box caps shall be set flush with the finished pavement surface.

Valve box caps shall be marked "WATER".
5.01.07 FIRE HYDRANTS

Contractor shall install fire hydrants as shown in the approved plans and conform to City Standard W-8 and the latest version of AWWA C502. The size and location of all fire hydrants may be subject to final approval by the City of Napa Fire Department, with exception of fire hydrants used at the end of water mains as blow-offs. Standard bury depths shall be 24 inches.

A minimum of one fire hydrant shall be located at each intersection and shall be installed in the parkway and/or sidewalk area adjacent to the curb. The Water Division Engineer may, upon request approved by the City of Napa Fire Department, change the location of fire hydrant(s) within such strip as necessary.

Hydrants will be required on opposite sides of the streets where raised median strips are present, where heavy traffic loads are common, and where the street consists of more than 80 feet of dedicated width. Contact the City of Napa Fire Prevention Division for additional hydrant spacing and placement information.

The Water Division Engineer may require, on a case-by-case basis, the installation of additional fire hydrants above the number required by the City of Napa Fire Department for the convenience of the City.

5.01.08 WATER SERVICES AND METERS

Contractor shall install water services as shown in the approved plans and conform to City standards and the latest version of the applicable AWWA standards. The plans shall indicate size, direction, and location of the water service and meter box. The Water Division Engineer will, insofar as practicable, work with the Applicant to locate the water meter along the property line at a point designated by the Customer.

The allowance of size-on-size water service laterals shall be at the sole discretion of the Water Division Engineer.

Water service laterals shall not exceed the size of the public water main that is connected to the service. In the event proposed demands cannot be met by the City’s distribution system, the Water Division Engineer shall conduct a hydraulic analysis (or direct the Applicant to conduct a hydraulic analysis at his or her own expense) to determine water system deficiencies that shall be addressed at the sole expense of the Applicant.

Water meter boxes and vaults shall be located outside all driveways and traveled ways, and be accessible at all times for inspections, reading, testing, and maintenance.

Water services within areas where the static pressure is in excess of 80 pounds per square inch (psi) shall be equipped with a pressure regulator that conforms to the most current California Plumbing Code. Conversely, installation of a private pressure system may be required where sufficient pressure is not available from the existing or proposed water distribution facilities.

All water service laterals shall be metered connections, with the exception of those designated by the Water Division Engineer.

All fire services with designated private hydrants shall be metered through an approved fire service meter as directed by the Water Division Engineer. Fire services without private hydrants shall have tattletale meters installed as part of the detector assembly on the backflow device.
Water meters installed in high-density urban settings may require the use of separate meters (i.e., hotel, restaurant, residential, or mixed-use) as directed by the Water Division Engineer. Water meter banks shall be clearly labeled on the outside of the meter boxes to delineate units served.

Meter installations in multi-family residential settings (e.g., apartments, condominiums, townhomes, etc.) will require the use of a master meter.

Water meter(s) installed in unpaved or rural settings may require installation of additional signs, markings, witness posts, concrete pads, etc., as directed by the Water Division Engineer.

Water meter installations may be scheduled upon receipt of payment, parcel address(es) and responsible party; meter installations shall only occur after successful completion and passing of the pressure, chlorinating, flushing, and bacteriologic tests and after all backflow devices have been certified and tested.

5.01.09 BACKFLOW DEVICES

Contractor shall install backflow device(s) as shown in the approved plans and conform to applicable City and latest version of AWWA standards. The plans shall indicate size, location, and reference the applicable City Standard. Backflow device(s) shall be installed in a manner that provides the clearances shown on the applicable City standard to facilitate inspection and maintenance.

Backflow devices installed on residential, commercial, industrial, or irrigation water services shall be installed as close to the meter or property line as practical, but in all cases before the first branch line. Residential water service(s) shall be equipped with an approved double-check backflow prevention assembly. All commercial, industrial, or irrigation water service(s) shall be equipped with an approved reduced-pressure (RP) principle backflow prevention assembly.

A Water Division Representative with Cross-Connection Specialist Certification may, at his or her own sole discretion, require the installation of an RP device in lieu of a double-check backflow device assembly (i.e., the type of backflow protection required is commensurate with the degree of hazard that exists on the premises).

Backflow devices installed on fire services shall be installed as close to the meter or property line as practical, but in all cases before the first branch line. The Water Division Engineer may approve, on a case-by-case basis, fire service backflow device installations inside a building or closet for installation within high-density urban areas.

Backflow device installations in high-density urban settings may require special screening, landscaping, or approved covers, protective bollards, etc., as directed by the City Planning Division.

All backflow prevention assemblies shall be a model and size approved by the Foundation for Cross-Connection Control and Hydraulic Research of the University of Southern California and listed on the Foundation’s current list of approved backflow prevention assemblies.

The approved backflow prevention assembly list can be obtained at http://fccchr.usc.edu/list.html
Meter shall be installed in the lock position before backflow devices can be tested. Use of jumpers, hose bibs, or other devices shall not be permitted. Water service will not be unlocked until passing results are received by the City of Napa.

5.01.10 TEMPORARY WATER SUPPLY (FIRE HYDRANT METERS)

Contractor shall install fire hydrants for the primary purposes of extinguishing fires and water utility maintenance activities. Only an authorized City representative(s) or permitted customer(s) shall withdraw water from fire hydrants.

Water withdrawn from any hydrant shall be taken through a hydrant meter. In all cases where the City grants a permit to take water from a fire hydrant, the permitted customer shall use the eddy valve on the hydrant meter assembly to regulate the delivery of the water.

Contractor can obtain a permit to withdraw water by submitting a Hydrant Meter Set Form (www.cityofnapa.org/newdevelopment, under Construction Water/Hydrant Meters) to the City's Revenue Division. The City shall collect a deposit prior to issuance of any hydrant meter.

All hydrant meters and backflow devices shall be fully supported to ensure the weight of the meter and backflow device are not bearing on the steamer opening of the hydrant.

The water meter and backflow device shall be protected from damage at all times and be returned to the City in good working order. The City reserves the right to determine whether or not a meter and/or backflow device is in good working order; retention or release of the deposit will be based on the condition of the meter and/or backflow device and shall be at the sole discretion of the City.

5.01.11 MATERIALS

Contractor shall furnish all materials required to complete the work.

A list of material sources shall include, but not be limited to, type, manufacturer, and model number of proposed materials. Specific manufacturers and part numbers may be indicated within these Provisions and City Standard Plans. The list of material sources shall be approved by the City prior to the installation.

Submitted materials shall conform to the requirements contained herein. All substitutions and “or approved equal” shall be reviewed by the Water Division Engineer prior to installation. Submittal of an approved equal will be reviewed on a case-by-case basis.

The list shall be furnished in sufficient time to permit proper inspection and testing of materials furnished from such listed sources in advance of their use. Such samples shall be furnished, without charge, as may be required. Inspection and tests, if deemed necessary, will be made by the Water Division or designated representative, but it shall be understood that such inspections and tests, if made at any point other than the point of incorporation in the work, in no way shall be considered as a guarantee of acceptance of such material, or of continued acceptance of material presumed to be similar to that upon which inspections and tests have been made.

Manufacturer’s warranties, guarantees, instruction sheets, and parts lists, which are furnished with certain articles or materials incorporated in the work, shall be delivered to the Water Division before final acceptance. In certain instances, the Water Division Engineer may require electronic format of submittals.

Specific requirements for water facilities are described as follows.
A. Fusible Polyvinyl Chloride Pipe (Fusible PVC)

Fusible PVC pipe shall be manufactured to conform to the latest version of AWWA C900. Fusible PVC shall be blue in color, pressure Class 305, and DR-14, or approved equal pipe.

The pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in the latest version of AWWA C900, applicable sections of ASTM D2241, ASTM D3034, or ASTM F679. Testing priority shall be in conformance with the latest version of AWWA C900, which shall be tested to those standards.

All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784. Testing shall be in accordance with the latest version of AWWA standards for all pipe types. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe. Fusible polyvinylchloride pipe shall be manufactured in a standard 40-foot nominal length.

Each pipe shall be marked to conform to the latest version of AWWA C900, and shall include as a minimum:

- Nominal pipe size
- PVC
- Dimension Ratio, Standard Dimension Ratio, or Schedule
- AWWA pressure class
- AWWA Standard designation number
- Extrusion production-record code
- Manufacturer’s trademark or trade name
- Cell Classification 12454 and/or PVC material code 1120 may also be included

B. Polyvinyl Chloride Pipe (PVC)

C900 PVC pipe shall be manufactured to conform to the latest version of AWWA C900. PVC pipe shall be blue in color, pressure Class 305, and DR-14, or approved equal pipe.

The pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in the latest version of AWWA C900, applicable sections of ASTM D2241, ASTM D3034, or ASTM F679. Testing priority shall be in conformance with the latest version of AWWA C900, except for pipe made to the ASTM D3034 or ASTM F679 standards, which shall be tested to those standards.

All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784. Testing shall be in accordance with the latest version of applicable AWWA standards for all pipe types. Pipe shall be homogeneous throughout, and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

The ends shall be square to the pipe and free of any bevel or chamfer. Pipe shall be manufactured in a standard 20-foot nominal length.

Each pipe shall be marked to conform to the latest version of AWWA C900, and shall include as a minimum:

- Nominal pipe size
• PVC
• Dimension Ratio, Standard Dimension Ratio or Schedule
• AWWA pressure class
• AWWA Standard designation number
• Extrusion production-record code
• Manufacturer’s trademark or trade name
• Cell Classification 12454 and/or PVC material code 1120 may also be included

C. Ductile Iron Pipe (DIP)

Ductile iron pipe shall be zinc-coated and manufactured to conform to the latest version of AWWA C151 and designed to conform to the latest version of AWWA C150. Cement mortar lining shall be required to conform to the latest version of AWWA C104. The coating materials shall be metallic zinc wire with a zinc content of at least 99.99 percent by mass, and bituminous paint topcoat compatible with zinc. The interior pipe lining shall conform to the latest version of AWWA C151. Each pipe shall be marked to conform to the latest AWWA standard and shall include as a minimum:

• Nominal size
• DIP
• Pressure class
• Nominal thickness
• Manufacturer’s mark and year
• Zinc coating and thickness

DIP shall be pressure class 350. Joint type shall be “push-on joint” standard with the manufacturer, except where shown otherwise on plans.

DIP shall be zinc-coated U.S. Pipe, or approved equal. The mean mass of the metallic zinc coating shall be a nominal of 200 grams per square meter, with a minimum of 170 grams per square meter when measured in accordance with the section titled “Test Method for Determining Zinc Mass” of this specification. Use of regular DIP (i.e., not zinc-coated) shall be at the sole discretion of the Water Division Engineer and will require the installation of magnesium anodes.

All ductile iron pipe and associated fittings shall be encased with V-Bio polyethylene encasement (polywrap) in accordance with ANSI/AWWA C105/A21.5, ASTM A674, ISO, or approved equal. Encasement shall be secured with 2-inch-wide polyvinyl pipe wrap tape.

D. Coated Fittings

All ductile iron fittings shall be exterior coated and conform to the latest version of AWWA/ANSI C116/A21.16 (Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings). Use of regular non-coated fittings shall be at the sole discretion of the City and will require installation of magnesium anodes.

Ductile Iron fittings shall conform to the latest version of AWWA C110 or AWWA C153 and shall have the same cement mortar lining specified for ductile iron pipe.

E. Restrained Joints (for PVC)

Restrained joints shall be installed as shown in the approved plans, conform to all applicable City and latest version of AWWA standards and the following:
• **Pipe Joints (bell and spigot):** PVC Bell Restraints rate for Class 305 PVC DR-14 Pipe shall be “Bulldog” or approved equal. At joints where “Bulldog” restraints cannot be used, EBAA Iron 1500 Series PVC Bell Restraints or approved equal.

• **Pipe Joints (fittings):** Ductile iron mechanical joint fittings with restrained locking glands rated for Class 305 PVC pipe shall be used. Joint restraint shall be EBAA Iron Series 2000PV Mechanical Joint Restraint or approved equal.

**F. Restrained Joints (for DIP)**

Restrained joints shall be installed as shown in the approved plans, conform to all applicable City and AWWA standards, and the following:

• **Pipe Joints (bell and spigot):** DIP restraint gaskets shall be U.S. Pipe TYTON JOINT Pipe with FIELD LOK Gaskets or approved equal.

• **Pipe Joints (fittings):** Ductile iron mechanical joint fittings with restrained locking glands shall be EBBA Iron MEGALUG or approved equal.

**G. Flanged Joints (for PVC)**

All stainless-steel bolts and studs shall be the proper length to ensure proper bolt-up is achieved between two Class 125 Standard Cast Iron Flanges, flanged valve and cast-iron flange, and any other flanged configuration. All bolts, studs, nuts, and washers shall be Type 304 Stainless Steel with Teflon blue nuts and conform to the latest version of AWWA C111.

**H. Flanged Joints (for DIP)**

All stainless-steel bolts and studs shall be the proper length to ensure proper bolt-up is achieved between two Class 125 Standard Cast Iron Flanges, flanged valve and cast-iron flange, and any other flanged configuration. All bolts, studs, nuts, and washers shall be Type 304 Stainless Steel with Teflon blue nuts and conform to the latest version of AWWA C111.

**I. Flanged Adapters**

Flanged adapters shall be Rockwell International, Baker Series, or Columbus Standards, Inc. All bolts, studs, nuts, and washers shall be Type 304 Stainless Steel with Teflon blue nuts.

**J. Flanged Bolt-up Kits**

All stainless-steel bolts and studs shall be the proper length to ensure proper bolt-up is achieved between two Class 125 Standard Cast Iron Flanges, flanged valve and cast-iron flange, and any other flanged configuration. All bolts, studs, nuts, and washers shall be Type 304 Stainless Steel with Teflon blue nuts and conform to the latest version of AWWA C111.

**K. Gate Valves**

Gate valves shall be a resilient-seated type and manufactured to conform to the latest version of AWWA C-509 and be non-rising stem with square operating nut, open left, and have stainless steel nuts and bolts. Gate valves used for combination air and vacuum valves shall be Mueller H-10914 or approved equal.
All certified drawings and parts lists shall be submitted to the Water Division Engineer. Gate valves shall be used for all pipe sizes smaller than 12 inches, unless otherwise approved by the Water Division Engineer.

**L. Butterfly Valves**

Butterfly valves shall be manufactured to conform to the latest version of AWWA C504. Valves and operators shall be class 250 and constructed for direct burial applications. Unless otherwise approved, butterfly valves shall be manufactured by Mueller Company, Kennedy Valve Manufacturing Company, or Henry Pratt Company.

The valve operators shall conform to the latest version of AWWA C504 and shall be designed to hold the valves in an intermediate position between fully open and fully closed without fluttering or creeping. Manual valve operators shall be of the worm-gear or traveling-nut type and fully enclosed. Adjustable stops shall be provided to stop valves in the fully opened and fully closed positions.

Valves shall open with a counter-clockwise rotation of a 2-inch square operating nut. The minimum number of turns to close the valve shall not be less than two turns per inch of valve size.

Operator components shall, at the extreme operator position, withstand without damage an input torque of 300 ft-lbs.

The Contractor shall submit all certified drawings and parts lists of the valve and operator to the Water Division Engineer.

Butterfly valves shall be used for pipe sizes 12 inches and larger, unless otherwise approved by Water Division Engineer.

**M. Combination Air Release and Vacuum Valves**

Combination air-release and vacuum valves shall be A.R.I. D-040 or approved equal and be manufactured to conform to the latest version of AWWA C512 and be designed for a working pressure of 150 psi.

Combination valves shall consist of an air and vacuum valve with an air-release valve connected to its chamber, and a drainage valve at the base (for testing and maintenance purposes).

The valve shall be capable of: (1) venting large quantities of air when not under water pressure; (2) permitting the entry of air to prevent a vacuum; and (3) positive action in releasing air entrained in water under pressure.

The valve body and cover shall be cast iron, trim shall be bronze, and float shall be stainless steel. Cast-iron parts shall be coated to retard corrosion.

**N. Fire Hydrants**

Fire hydrants shall be vertical flange shoe and "Dry Barrel" manufactured to conform to the latest version of AWWA C502, and shall be Mueller "Super Centurion," American Darling "B-62-B" or Kennedy "Guardian." No substitutes accepted.

Fire hydrant valves shall be slow opening.

All hydrants shall be 6-inch mechanical joint inlets. The upper portion of each hydrant shall be painted aluminum color before project is completed.
Fire hydrant (DB Marker 6) pavement markers shall be installed on all streets (public and private) per Standard Specification W-21.

O. Transition and Flexible Couplings

Transition and flexible couplings shall be manufactured to conform to the latest version of AWWA C111, and shall be Rockwell International Type 441, Baker, Dresser, Ford, and Smith-Blair, or approved equal. Transition and flexible couplings shall be cast-iron or steel sleeves with wedge-type rubber gaskets suitable for use in potable water supply systems.

The coupling shall be designed for 150-psi working pressure, unless otherwise approved by the Water Division Engineer.

Each coupling shall be sized to properly fit the ends of the two pieces of pipe being joined and have a sufficient number of bolts to compress the gasket without distorting the followers.

P. Copper Tubing and Fittings

Copper service tubing, fittings, saddles, et al., shall be manufactured to conform to ASTM Specifications B88-47 Type K soft copper and the latest version of AWWA C800.

The tubing shall be installed without splicing in lengths up to 50 feet, where possible.

Q. Miscellaneous Appurtenances

Miscellaneous appurtenances, including check valves, service materials, saddles, regulator valves, insulators, pumps, pressure tanks, valve boxes, and miscellaneous hardware shall be of the type shown on the plans and/or submittals, and be of a quality acceptable to the Water Division Engineer.

Upon request, Contractor shall deliver samples of any such miscellaneous appurtenances to the Water Division Engineer for examination and testing and, if rejected, remove all similar appurtenances from the job site, including that which may have already been installed.

R. Magnesium Anodes (Bag)

Anodes shall be prepackaged high potential magnesium anodes. Lead wire for the anodes shall be 30 feet long, No. 10 AWG solid-copper wire with black RHW-USE insulation. Lead wires shall be silver-soldered to anode core with the connection encapsulated in epoxy resin.

All metallic fittings shall be continuity bonded or directly bonded to an anode.

S. Bond Wire Connections

- Open cut: Bond wire shall be No. 10 AWG/HMWPE bond cable and shall be installed for all non-epoxy coated metallic joints, bell, and spigot connections; tie-in points; and valves to ensure connectivity along entire water main installation.

- Horizontal Directional Drilling: Bond wire shall be No. 8 AWG/HMWPE bond cable and shall be installed for all non-epoxy coated metallic joints, bell, and spigot connections; tie-in points; and valves to ensure connectivity along entire water main installation.
T. Tracer Wire:
Tracer wire shall be taped to the top of the pipe at a minimum of 5-foot intervals, and at all crosses, tees, and elbows. When taping tracer wire to pipe, wrap the tape once around the tracer wire before wrapping the tape around the full diameter of the pipe.

Tracer wire material shall be installed as follows:
- **Open Cut**: Tracer wire shall be at a minimum No. 10 AWG annealed bare copper UF solid type wire with cross-linked polyethylene insulation minimum 30 mil thickness or subject to the approval of the Water Division Engineer. The insulation shall be blue in color. Connectors shall have a dielectric gel and must be sealed.
- **Horizontal Directional Drilling**: Tracer Wire No. 8 CCS Extra High Strength Hard Drawn 1150 lb. or approved equal, and installed for all non-metallic pipe. HDPE coating with minimum 45 mil thickness. The insulation shall be blue in color.

U. Sand Backfill
Sand Bedding shall conform to the following specifications:

<table>
<thead>
<tr>
<th>SEIVE SIZE</th>
<th>WATER DIVISION SPEC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5 mm</td>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>25 mm</td>
<td>1&quot;</td>
</tr>
<tr>
<td>19 mm</td>
<td>3/4&quot;</td>
</tr>
<tr>
<td>12.5 mm</td>
<td>1/2&quot;</td>
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</tr>
<tr>
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<td>#200</td>
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<tr>
<td>Sand Equivalent</td>
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</tr>
<tr>
<td>Minimum Resistivity</td>
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</tr>
<tr>
<td>Soil PH</td>
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</tr>
<tr>
<td>Chloride</td>
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</tr>
<tr>
<td>Sulfate</td>
<td>≤150 ppm</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>Non Plastic</td>
</tr>
<tr>
<td>Organic Impurities</td>
<td>Not Present*</td>
</tr>
</tbody>
</table>

*This sand is a clean natural sand mined and processed in fresh water. It is free from clays, seashells, and other organic materials.
V. Controlled Low Strength Material

Controlled Low Strength Material (CLSM) shall be a hand-excavatable, self-leveling, self-compacting mixture of cement, pozzolan, coarse and fine aggregate and water which has been mixed in accordance with ASTM C 94 and is in a flowable state during placement. Prior to beginning any work, you shall submit to the City Engineer for review, the proposed CLSM mix designs which shall show the proportions and gradations of all materials proposed for each class and type of CLSM to be used.

Density shall be between 120 PCF minimum and 135 PCF maximum. Compressive strength at 28 days for flowable CLSM shall be between 50 psi minimum and 150 psi maximum.

Cement shall be Type II in accordance with the requirements of ASTM C 150. Pozzolan shall be added to improve the flowability and shall be Type F in accordance with the requirements of ASTM C 618. Coarse and fine aggregate may include native soil materials derived and separated from project excavations. Aggregate shall consist of sands and gravels with fines content not exceeding 30 percent. Fines content shall have a plasticity index of 3 or less. Clay balls formed by fines shall not exceed 10 percent on a wet mass basis. The maximum size of any clay balls shall not exceed ½-inch. The maximum particle size in the soil cannot exceed 1/8 of the open distance between the pipe and the trench wall or 1-1/2 inch, which ever is less. All material shall be free from organic matter and not contain more alkali, sulfate, or salts than the native materials at the job site.

CLSM shall be delivered to the job in standard transit mix trucks. CLSM shall be delivered in place by means of tailgate discharge, conveyor belts, pumped in place, or other means acceptable to the City Engineer. CLSM shall be directed in place by means of vibrator shovel or rod to ensure that all voids, cervices, and pockets are filled with CLSM. Care shall be taken to avoid over consolidation of the material separating the large and fine aggregate. CLSM shall be placed in appropriate lifts or with methods to prevent movement of the pipe, including by flotation.

CLSM shall be protected from running water, rain, freezing or other conditions that could damage the material until the material has been accepted and final fill completed. No equipment, traffic, or backfill shall be allowed on the CLSM until the surface of the CLSM is able to withstand a 20-psi load without displacement of damage. If necessary, you shall provide steel trench plates that span the trench until the CLSM has reached the required strength.

W. Lubrication

Lubrication shall be NSF 61-approved water-soluble and non-toxic, be non-objectionable in taste and odor imparted to the fluid, be non-supporting of bacteria growth, and have no deteriorating effect on the PVC or rubber gaskets.

X. Miscellaneous Iron and Steel

Miscellaneous iron and steel shall conform to the provisions in Section 55 of the 2015 Standard Specifications.

Y. Reinforcement

Reinforcement shall conform to the provisions in Section 52 of the 2015 Standard Specifications.
Z. Concrete

Concrete shall conform to the provisions in sections 51 and 90 of the 2015 Standard Specifications. Thrust blocks shall be constructed of Class C concrete, as a minimum.

5.02 CONSTRUCTION

5.02.01 PRE-CONSTRUCTION MEETING

Contractor shall schedule a pre-construction meeting prior to installation of any water infrastructure intended for City ownership. Contact the City of Napa Water Division Inspector at 707-257-9521 or 707-257-9544 to schedule the pre-construction meeting. The Water Division Inspector shall be notified of the pre-construction meeting at least two business days in advance of the meeting.

5.02.02 WATERMAIN AND WATER SERVICE INSTALLATION

Contractor shall install all water mains and services as shown in the approved plans and conform to applicable City and latest version of AWWA standards. This section applies to installation of new water mains, new water services and work with existing water mains and services.

Contractor shall strictly adhere to all manufacturer requirements and storage procedures, including storage of all pipe lubricant, gaskets, and appurtenances.

For water service installation or reconnections, the Water Division Inspector or Engineer reserves the right to require a completely new water service installation based on field conditions.

Each section of pipe shall be carefully inspected for damage that may have occurred in transit. Any damaged or rejected pipe shall be marked appropriately and removed from project area immediately.

Each section of pipe and each fitting shall be thoroughly cleaned out before it is lowered into the trench. Cleaning of each pipe or fitting shall be accomplished by swabbing out, blowing out with compressed air, washing out with water, or by any combination of these methods to achieve removal of all foreign matter.

If clean pipe sections and fittings cannot be placed in the trench without getting dirt into the open ends, the Water Division Engineer may require that a piece of tightly woven canvas be tied over the ends of the pipe or fitting until it has been lowered into position in the trench. After the pipe or fitting has been lowered into the trench, all foreign matter shall be completely brushed from the bell and spigot ends before assembly.

No pipe or fitting shall be lowered into any trench containing water. The trench bottom shall be free from pieces of rock or other material that could potentially damage the pipe. Water shall be pumped from wet trenches, and the trenches shall be kept dry until the joints have been completed and the open ends of the main have been closed with watertight plugs or bulkheads.

Whenever pipe-laying is discontinued on any job for short periods, or whenever work is stopped at the end of the day, the open ends of the main shall be closed with approved watertight plugs or bulkheads. The plug or bulkhead shall not be removed unless the trench is dry. Every effort shall be made to keep the trench dry at all times.
Each section of pipe shall be lowered into the trench by means of slings of a type approved by the Engineer, and the pipe main assembled piece by piece. Bells usually face the direction in which the work is progressing. Care shall be taken to provide for uniform support of the pipe in the bottom of the trench, as well as to prevent damage to the interior coating or lining. If damage occurs, repairs must be made before the damaged pipe will be acceptable. All pipe shall be cut squarely to length using manufacturer-approved methods.

5.02.03 TRENCH PLATES

Trench plates for water trenches shall conform to Section 2.13.03 and the General Construction Notes. Trench plates installed on highly travelled streets (including all arterials) will be required to be set flush with the existing asphalt concrete. Plates shall be skid resistant, pinned and welded.

5.02.04 DIRECTIONAL DRILLING

A. Prequalified Drillers

Due to the specialized nature of the work to be performed, the directional drilling operations shall be completed by one of the pre-qualified drillers approved by the City of Napa Water Division.

Only prequalified drillers from the approved pre-qualified drillers list shall be permitted to complete the directional drilling operations for the project.

Driller shall use key personnel identified with prequalification documentation provided to the owner and City Inspector. The key personnel shall remain for the entire duration of the drilling operations. If key personnel for the driller are different than those listed on the prequalification submittals, Contractor shall provide the modified list of key personnel with qualifying resumes as part of the submittal package.

B. Drilling Operations

Work site as indicated on drawings shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made.

Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as recommended by the pipe supplier.

Contractor shall confine all activities to designated work areas.

Bore path and alignment are as indicated in the contract documents. The path of the bore may be modified based on field and equipment conditions upon approval of City Inspector and owner. Entry and exit locations and control-point elevations shall be maintained as indicated in the contract documents.

The drill path shall be accurately surveyed with entry and exit areas placed in the appropriate locations within the areas indicated on drawings. If using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.

Bore depths shall not exceed specified depths (as shown on the Plans) unless otherwise authorized by Engineer.

Instrumentation shall be provided and maintained at all times, which accurately locates the pilot hole, measures drill-string axial and torsional loads, and measures drilling-fluid
discharge rate and pressure.

Bend radii shown in the contract documents are minimum-allowable radii and shall not be reduced.

**C. Drilling Equipment**

1. **General**

   The directional-drilling equipment, as a minimum, shall consist of a directional drilling rig of sufficient capacity to perform the bore(s) and pullback of the pipe(s), a drilling fluid mixing and delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system.

   All equipment shall be in good, safe operating condition with sufficient supplies, materials, and spare parts on hand to maintain the system in good working order for the duration of this project. All required equipment shall be included in the emergency and contingency plan as submitted per these specifications.

   The directional-drilling equipment must be of a sufficient size (with a sufficient drill-bit size and type for proper and safe installation of the pipeline) to safely complete the longest/largest bore length of the project.

   Correct location of all underground utilities that could impact the installation is the Contractor responsibility, regardless of any locations shown on the drawings or previous surveys completed.

   Utility location and notification services shall be contacted by the Contractor prior to the start of construction.

   All existing lines and underground utilities shall be positively identified, including exposing those facilities that are located within an envelope of possible impact of the installation as determined for the project specific site conditions. It is the Contractor’s and operator’s responsibility to determine this envelope of safe offset from existing utilities. This will include, but is not limited to, soil conditions and layering, utility proximity and material, drilling system and equipment, and foreign subsurface material.

2. **Casing and Carrier Pipe Installation**

   All freeway/expressway crossings shall be fusible C900 and have a minimum 12-inch carrier pipe inside an appropriately sized casing pipe. Carrier pipe shall be installed into the casing pipe after pullback operations, unless otherwise authorized by Engineer.

   Fusion bead within casing pipe and exterior of carrier pipe shall be removed prior to inserting carrier pipe into casing. Removal of the fusion bead shall be conducted with proper bead removal equipment and be completed by the fusion technician per the manufacturer’s recommendations.

   For each crossing, casing spacers shall be installed on the extent of the carrier pipe (with a maximum 10-foot separation between each spacer) prior to the insertion of the carrier pipe into the casing pipe. The ends of the casing pipes shall be sealed with split-type casing seal after the completion of the pipe, pull-back of the casing pipe, and installation of the carrier pipe.

   Contractor shall trim casing pipe to proper length (after pull-back). Contractor shall take extra precautions when trimming carrier pipe, when carrier pipe is within casing. Damage
to the carrier pipe or casing pipe shall be repaired by the full removal of the damaged pipe and fusing new pipe (as necessary) to replace the damaged section.

3. Pilot Hole Bore

Pilot hole shall be drilled along bore path. In the event that the pilot bore does deviate from the bore path, Contractor may be required to pull-back and re-drill from the location along bore path before the deviation.

Contractor shall limit curvature in any direction to reduce force on the pipe during pull-back.

The minimum radius of curvature shall be no less than that specified by the pipe supplier and as indicated on the drawings.

4. Reaming

After successfully completing the pilot hole, the bore hole shall be reamed to a diameter which meets the requirements of the pipe being installed. The following table is offered as an estimated guide:

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter</th>
<th>Bore Hole Diameter</th>
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</thead>
<tbody>
<tr>
<td>&lt; 8 inches</td>
<td>Pipe Dia. + 4 inches</td>
</tr>
<tr>
<td>8 inches to 24 inches</td>
<td>Pipe Dia. x 1.5</td>
</tr>
<tr>
<td>&gt; 24 inches</td>
<td>Pipe Dia. + 12 inches</td>
</tr>
</tbody>
</table>

Multiple reaming passes shall be used at the Contractor's discretion and shall conform to this specification.

In the event of a drilling-fluid fracture, returns loss or other loss of drilling fluid, Contractor shall be responsible for restoring any damaged property to original condition and cleaning up the area in the vicinity of the damage or loss.

At the terminus of each new casing (after installation), all voids between the drilled hole and the new casing that are not filled with drilling fluid, shall be filled with concrete slurry. Filling the voids with other backfill materials (including sand, native soil, or rock) may not be used instead of concrete slurry.

5. Drill Head

The horizontal directional-drilling equipment shall produce a stable fluid-lined tunnel with the use of a steerable drill head and any subsequent pre-reaming heads.

The system must be able to control the depth and direction of the drilling operation.

Drill head shall contain all necessary cutters and fluid jets for the operation and shall be of the appropriate design for the ground medium being drilled.

6. Drilling-Fluid System

Drilling fluid shall be composed of clean water and the appropriate additive(s) for the fluid to be used. Water shall be from a clean source and shall meet the mixing requirements of the mixture manufacturer(s).
The water and additives shall be mixed thoroughly to assure the absence of any clumps or clods.

No hazardous additives may be used.

Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall(s).

Contractor shall be responsible for the proper documentation and disposal of all drilling fluids, including temporary storage, transportation, and off-haul to final destination, in accordance with local, state, and federal requirements and/or permit conditions.

No additional chemicals or polymer surfactants shall be allowed to be added to the drilling fluid, unless they have been submitted per this specification.

A drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid for the project.

The mixing system shall be able to ensure thorough mixing of the drilling fluid. The drilling fluid reservoir tank shall be sized for adequate storage of the fluid.

The mixing system shall continually agitate the drilling fluid during drilling operations.

The drilling fluid pumping system shall have a minimum capacity to supply drilling fluid in accordance with the drilling equipment pull-back rating at a constant required pressure.

The delivery system shall have filters or other appropriate in-line equipment to prevent solids from being pumped into the drill pipe.

Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. The use of spill containment measures shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps, vacuum truck(s), and/or storage of sufficient size shall be in place to contain excess drilling fluid. A closed-loop drilling fluid system and a drilling-fluid cleaning system shall be used to whatever extent practical, depending upon project size and conditions. Under no circumstances shall drilling fluid that has escaped containment be reused in the drilling system.

7. Drilling Control System

Calibration of the electronic detection and control system shall be verified prior to the start of the bore.

The drilling head shall be remotely steerable by means of an electronic or magnetic detection system. The drilling head location shall be monitored in three dimensions:

- Offset from the baseline
- Distance along the baseline
- Depth of cover

Point of rotation of the head shall also be monitored.

Contractor shall ensure the pipeline will stay within 3 feet of design depth and horizontal location as defined on the project Plans unless otherwise authorized by the City inspector.

D. Pipe Pull-Heads

Pipe pull-heads shall be utilized that employ a positive through-bolt design, assuring a smooth wall against the pipe cross-section at all times.
Pipe pull-heads shall be specifically designed for use with fusible polyvinylchloride pipe and shall be as recommended by the pipe supplier.

**E. Pipe Rollers**

Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations.

A sufficient quantity of rollers and spacing, per the pipe supplier’s guidelines, shall be used to assure adequate support and excessive sagging of the product pipe.

**F. Fusion Process**

Unless otherwise specified, fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. Contractor shall follow the pipe supplier’s guidelines for this procedure. All fusion joints shall be completed as described in this specification.

Fusion bead for the Fusible C905 casing pipe (interior and exterior) and the exterior of the Fusible C900/Fusible C905 carrier pipe shall be removed. Removal of the fusion bead shall be conducted with proper bead removal equipment and be completed by the fusion technician per the manufacturer’s recommendations.

Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process, and in accordance with this specification and pipe supplier’s guidelines.

Fusible polyvinylchloride pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine.

Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following properties, including the following elements:

1. **Heat Plate**

   Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly, and cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier’s guidelines.

2. **Carriage.**

   Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

3. **General Machine.**

   Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

4. **Data Logging Device.**

   The current version of the pipe supplier’s recommended and compatible software shall be used. Data-logging device operations and maintenance manual shall be with the unit at
all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

G. Joint Recording

Each fusion joint shall be recorded and logged by an electronic monitoring device (data-logger) connected to the fusion machine. The fusion data-logging and joint report shall be generated by software developed specifically for the butt-fusion of thermoplastic pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data-logger shall be logged manually and be included in the Fusion Technician’s joint report.

H. Pipe Pull-Back and Insertion

Pipe shall be fused prior to insertion, if the site and conditions allow, into one continuous length. Carrier pipe (12-Foot Fusible C900 Water Main) shall be installed into the casing pipe (16-Foot Fusible C905 Casing) after pull-back operations, unless otherwise authorized by Engineer.

Fusion bead within casing pipe and exterior of carrier pipe shall be removed prior to inserting carrier pipe into casing. Removal of the fusion bead shall be conducted with proper bead removal equipment and be completed by the fusion technician per the manufacturer’s recommendations.

Contractor shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not bend past the pipe supplier’s minimum allowable bend radius, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.

The pipe entry area shall be graded as needed to provide support for the pipe, and to allow free movement into the bore hole.

The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.

The fusible polyvinylchloride pipe may be continuously or partially supported on rollers or other Owner- and Engineer-approved friction decreasing implement during joining and insertion, as long as the pipe is not over-stressed or critically abraded prior to, or during, installation.

A swivel shall be used between the reaming head and the fusible polyvinylchloride pipe to minimize torsion stress on the pipe assembly.

Buoyancy modification shall be at the Contractor’s sole discretion and shall not exceed the pipe supplier’s guidelines in regard to maximum pull force or minimum bend radius of the pipe. Damage caused by buoyancy modifications shall be the Contractor’s responsibility.

Once pull-back operations have commenced, the operation shall continue without interruption until the pipe is completely pulled through the bore hole.

The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, or movement and distortion of surface features. Contractor shall correct any damages caused by the Contractor’s operations.

Fittings shall be centered in place to accurate line and grade. Thrust blocks or restrained joints shall be installed as required.
Mechanical or push-on joint fittings can be used with mechanical or push-on joint pipe. The plain end of the pipe usually is provided with one or two painted gauge lines that show whether it has been properly positioned in the bell socket after assembly. The pipe manufacturer's instructions as to the location of these lines shall be followed.

When installing mechanical joint pipe, the assembly of the joint requires use of a torque wrench for the proper amount of pressure.

<table>
<thead>
<tr>
<th>SUGGESTED TORQUE</th>
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<tbody>
<tr>
<td>BOLT SIZE</td>
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<tr>
<td>5/8 inch</td>
</tr>
<tr>
<td>¾ inch</td>
</tr>
<tr>
<td>1 inch</td>
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<tr>
<td>1-½ inch</td>
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From time to time, pit-cast pipe will be found in the existing water system. Pit-cast pipe was manufactured in four classifications, each having a different outside diameter than modern-ductile or cast-iron pipe. Before making extensions, existing pipe shall be measured to determine if special transition fittings are required.

Flanged joints at fittings or valves, where required, shall be neatly fitted, made with approved gaskets, and shall be water-tight. All bolts, nuts, and gaskets shall be sized to conform to size of flange and pressure class required.

5.02.05 TRACER WIRE

Contractor shall connect by tracer wire the full length of the new water main, new service laterals, and fire-hydrant laterals. Requirements for installation and testing shall be as follows:

1. Tracer wire shall be required on all non-ferrous water mains and services.
2. Tracer Wire Installation
   (a) Open Cut installations and for pipe diameters 14-inches and smaller:
       Tracer wire shall be at a minimum No. 10 AWG annealed bare copper UF solid type wire with cross-linked polyethylene insulation minimum 30 mil thickness or subject to the approval of the Water Division Engineer. The insulation shall be blue in color. Connectors shall have a dielectric gel and must be sealed.
   (b) Horizontal Directional Drilling applications
       Tracer Wire No. 8 CCS Extra High Strength Hard Drawn 1150 lb. or approved equal, and installed for all non-metallic pipe. HDPE coating with minimum 45 mil thickness. The insulation shall be blue in color.
3. Tracer wires shall be interconnected at all pipe tees, pipe crosses, and pipe services. Splices shall be “KURNEY” (split-bolt) or “KUPLETAP”. Installation tape shall be vinyl electrical with two coats of “Scotch Kote”.
4. Tracer wire shall be placed outside of the valve riser pipe and shall be placed in the notch at the top of the valve riser pipe, as shown on the Plans and these Specifications.
5. Tracer wire shall be taped to the top of the pipe at a minimum of 5-foot intervals, and at all crosses, tees, and elbows. When taping tracer wire to pipe, wrap the tape once around the tracer wire before securing it to the pipe, then wrap the tape around the full diameter of the pipe.

After backfill and compaction, but prior to paving, continuity testing of the tracer wire and traceability of the tracer wire will be required. Contractor shall coordinate scheduling an independent tracing test and provide results to the Water Division Inspector. Any detected damages to the tracer wire shall be repaired at no cost to the City before paving will be allowed.

**5.02.06 PRESSURE TESTING**

New water mains shall be subjected to a hydrostatic pressure/leakage test for a period of 4 hours at 150 psi. Pressure testing shall be performed after all compaction of trench backfill has been completed and/or subgrade on new streets is fully compacted and ready for paving. Pipelines shall be pressure tested prior to connection to the existing water system. The water mains shall be tested as a complete system including all fire hydrants. Testing of multiple portions of a continuous run of water main shall not be accepted.

The measured pressure shall not change by ±2 psi during the test.

The pressure/leakage test shall not be made until at least 36 hours after the last concrete thrust block has been poured when Type III cement is used, or at least 7 days after the last thrust block has been poured when Type II cement is used.

Prior to starting the test, the pipeline shall be filled with water for 24 hours. During the filling of the line and before applying the specified test pressure, all air shall be expelled from the pipe. If necessary, taps shall be made as directed at the points of highest elevation and plugged upon completion of the test. The pipeline shall be slowly filled with water, and the specified test pressure applied at the point of lowest elevation by means of a pump connected to the pipe by a corporation cock. During the test, all exposed pipe, fittings, valves, hydrants, and joints will be carefully examined.

The water lost due to leakage shall be none.

Contractor shall remove and replace any cracked or defective material to the satisfaction of the Engineer, and no additional payment will be made therefor. The test shall be repeated until no defects remain. If water leakage occurs in the pipeline being tested, Contractor shall locate and repair the defective joints or fittings, and no additional payment will be made therefor. Contractor shall retest the pipeline until leakage has been eliminated.

Contractor shall be required to conduct pressure/leakage testing on the isolated system, i.e., connections shall not be made to the City’s system until all tests have passed. This will usually require that plugs and thrust blocks be used, which may not appear on the plans. Closing pieces will be laid after testing is complete. Testing against closed valves will not be allowed.

**5.02.07 FLUSHING AND CHLORINATING**

The City shall be notified a minimum of 48 hours prior to commencement of flushing and chlorination operations. Contact the Water Division Inspector at the City’s Corp Yard at 707-257-9544 to schedule flushing and chlorination of all newly installed pipeline(s).

Soil, debris, etc., shall be removed from the water lines prior to chlorination, and a flushing
plan, if required, shall be submitted for approval prior to commencement of flushing operations.

The selected chlorination method (tablet, continuous feed, slug, spray) shall comply with AWWA C651 (Disinfecting Water Mains). The pipeline shall be slowly filled to allow proper circulation of chlorination solution and be allowed to stand in accordance with the prescribed method selected.

Upon completion of chlorination, all super-chlorinated water shall be thoroughly flushed from the pipeline(s), service(s), etc., until the replacement water is proved equal to that of the water quality discharged at the supply point within the City’s water distribution system.

Super-chlorinated water shall be disposed in accordance with all City, County, and State pollutant discharge requirements. No super-chlorinated water shall be discharged into any storm drains or surface waters; discharge of super-chlorinated water into the sanitary sewer system may be granted but requires prior approval, which shall be at the sole discretion of the Napa Sanitation District (NSD).

Requests to discharge super-chlorinated water into the sanitary sewer system shall be made through the NSD Construction Inspector at (707) 258-6000 and shall be scheduled a minimum of two working days prior to any discharge into the sewer system.

Discharge(s) into the sewer system, if approved, may require additional equipment and reporting requirements, which shall be at the sole discretion of NSD.

If NSD does not grant approval to discharge into the sewer system, flushing and de-chlorination of super-chlorinated water shall be conducted in accordance with all City, County, and State pollutant discharge requirements; a flushing plan outlining the method of de-chlorination shall be provided to the City Water Division Inspector a minimum of two working days prior to commencement of flushing and de-chlorination operations.

5.02.08 BACTERIOLOGICAL TESTS

Upon successful completion of pressure testing, chlorinating, and flushing of super-chlorinated water, the pipeline shall be allowed to stand for a minimum of 24 hours prior to the first bacteriological test, which shall be scheduled with the City of Napa Water Division Inspector at least two workings days prior to the first sampling event.

Temporary sampling points within the newly installed pipeline section(s) may, or may not, be shown in the approved plans, but may be taken at blow-off locations (temporary or permanent), newly installed sample station(s), service(s), or as directed by the City Water Division Inspector.

Water samples shall be taken on only Monday, Tuesday or Wednesday. Two sampling events will be required with the first being taken a minimum of 24 hours after completion of de-chlorination and flushing; the second sampling event shall be taken 24 hours later (i.e., 48 hours after the first sampling event).

All sample sets from both sampling events must pass bacteriological testing in order to be deemed ready for connection to the City’s water system. Failure of any sample will require flushing, re-chlorination if necessary, and the initiation of a new bacteriological sampling and testing process, as prescribed above.

All portions of the City’s form as described in Section 5.02.12 shall be submitted to the City Water Division Inspector prior to connection to the City’s water system.
Final connection(s) to the City’s water system shall be scheduled at least two working days in advance, and conducted under the direct supervision of the City Water Division Inspector.

5.02.09 FINAL TIE-INS

Contractor shall contact the City to schedule tie-ins to City facilities by calling (707) 257-9521. All tie-ins shall be conducted under City inspection only after pressure testing, chlorination, and bacteriological testing is complete.

5.02.10 CITY-OWNED FACILITIES

Any City-owned materials removed shall be delivered to the City Corporation Yard, 770 Jackson Street, as directed by the City Water Division Inspector.

5.02.11 WATER CONSERVATION

All projects creating a net increase in demand on the City water system shall meet water demand mitigation (offset) requirements as specified by the Water Division per Napa Municipal Code Chapter 13.09. Current requirements may involve completion of offsite toilet retrofits, payment of an in-lieu fee, or an alternative method of equivalent water savings. Upon release of the building permit, specific offset requirements for a project are determined, and developers are notified by Water Conservation staff. In advance of building permit release, preliminary offset requirement estimates are available upon request.

Final requirements, in the form of toilet retrofit certificates, in-lieu fee payment, or authorized alternative method, must be met prior to final occupancy of the project.

5.02.12 CHECKLISTS AND FORMS

Checklist for Water Main Disinfection and Sampling
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Checklist for Water Main Disinfection and Sampling
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6 – SIGNALS, LIGHTING, AND ELECTRICAL SYSTEMS

6.01 GENERAL

6.01.01 DESCRIPTION

The work described in this section shall be done in accordance with Section 86 of the 2010 edition of the State Standard Specifications, the 2010 edition of the State Standard Plans, the City Standard Plans and these City Standard Specifications, unless otherwise specified.

In case of conflict between any of the contract documents, the document which takes precedence over and shall be used in lieu of such conflicting portions, shall be as specified in Section 5-1.02 of the State of California Standard Specifications.

If a discrepancy exists, the governing ranking of Contract parts in descending is:

1.1 – Project Special Provisions
1.2 – Project Plans
1.3 – Revised standard specifications
1.4 – Standard Specifications
1.5 – Revised Standard Plans
1.6 – Standard Plans
1.7 – Supplemental project information

The Design Engineer preparing plans and specifications for traffic signals shall:

1. Comply with the requirements of the latest revision of the State of California Standard Plans and Specifications, except as modified herein, for the installation and/or modification of traffic signals, highway safety lighting, and internally illuminated street name signs (IISNS). Sign(s) installation shall comply with State of California Standard Specifications, Section 56. Traffic stripes and pavement markings shall comply with State of California Standard Specifications, Section 84. All pavement marking stencils shall comply with State of California Standard Specifications, Section 85.


3. Include the following:
   Title sheet with general notes. Title sheet shall also include a note identifying the approval date of the City of Napa Standard Plans and Specifications, and all other relevant standards documents, used in designing of the project.
   Reference sheet(s) with applicable detail plans from the attachments herein. Reference sheets shall include up to eight detail plan sheets tiled two vertically and 4 horizontally on each 24-inch x 36-inch sheet.
   Civil Engineering plans for any right of way (ROW) and/or traffic signal maintenance easement.
Traffic signal plans shall include new and existing curb and gutter, right of way, maintenance easements showing all existing utilities, all traffic signal interconnect cable, and City boundary lines on both civil and traffic signal plans. All widths shall be clearly labeled and dimensioned to the centerline.

Signing and striping plans, if applicable.

Traffic control plan for vehicles, bicycles and pedestrians, if applicable.

During the design phase of the project, the Design Engineer shall be responsible for potholing proposed traffic signal pole locations (pedestrian poles excluded) to foundation depth and width, prior to completion of the plans in order to identify potential conflicts with existing substructures. A log of the work performed showing depth, width, location, and unusual obstructions in the potholes shall be provided with the plans.

6.01.02 PLANS PREPARATION

A. General

The first plan-check submittal shall be at least 80% complete. Plans not conforming to the standards herein will be returned to the design engineer for correction without further review.

The City of Napa requires the title sheet of "stand-alone" traffic signal plans to be prepared on 24-inch x 36-inch Mylar sheets with a ½ inch margin on all sides except the left side, which shall be 1½ inches. Deviations from these Specifications shall be requested from the Engineer prior to commencement of work.

All traffic signal plans shall be prepared using the latest version of AutoCAD. Prior versions of AutoCAD, released within four years of the plan submittal date, will be allowed. Provide files of completed plans in both AutoCAD and Adobe PDF format on CD-ROM disks to the City Engineer upon completion of design.

B. Plan Preparation

Plan preparation shall conform to the following requirements:

1. Signal plans shall be drawn at a 1" = 20' scale.

2. All lettering shall be 1/10-inch minimum in height when plotted or printed at full scale. The lettering size shall conform to the highest standards in order to issue legible reduced size prints.

3. Streets shall always be oriented horizontally and vertically and the north arrow positioned near the upper left-hand corner of the plan.

4. When assigning Signal Phasing, Phase 2 shall be in the northbound direction on the north-south roadway. If the streets are apparently 45 degrees to North, the designer shall request a determination from the City Engineer.

5. Squares shall be used to designate construction notes.

6. Triangles and clouding shall be used to indicate plan revisions.

7. All existing conditions shall be screened to appear lighter than the rest of the drawing.

8. Include standard traffic signal notes.

10. Detector/sensor schedule.

11. Conductor schedule.

12. A minimum of 36 inches of concrete pad shall be provided at the front of the signal cabinet and electrical service/BBS. Clearances shall be unobstructed by any above ground facilities. A retaining wall may be installed where required. The City Engineer must approve the signal cabinet location.

13. Front side of traffic signal controller cabinet should open away from the intersection and be oriented so that the operator is facing the intersection on their left. Electrical meter shall be facing the street.

14. Nearest practical Pacific Gas and Electric service vault and service handhole shall be shown on plan.

15. Utilize N.E.M.A. phasing conforming to the California MUTCD.

16. Symbols shown shall conform to State of California Standard Plans ES-1A and ES-1B.

17. Pole identification lettering shall increase clockwise around the intersection, with the Pole A being the first pole away from the controller corner.

18. All traffic signal plans shall indicate required traffic signal pole locations as referenced from BCR, ECR, and curb face.

19. Conduit run identification numbering shall start at the PG&E service point and increase sequentially clockwise around the intersection and return to the controller cabinet.

20. Signing and striping, where applicable, shall be provided on separate plan sheets, drawn at a scale of 1”=40’. Traffic striping shall be in accordance to the latest editions of the State of California Standard Plans and California MUTCD.

21. Unless otherwise physically required, an exclusive/split phase shall not be used in the phase sequence.

22. Traffic signal modifications requiring the installation of video detection cabling shall require all conductors to be removed from the conduit before pulling new cable. “Slipping” is not allowed.

23. Traffic signal modifications requiring the installation of ADA compliant Push Button Assembly cabling will require all conductors to be removed from the conduit before pulling new cable. “Slipping” is not allowed.

24. Traffic signal modifications shall match installed equipment by make and model. If the system cannot be matched, the entire system shall be replaced.

25. Maximum allowable conduit fill is 26% for new installation and 40% for existing/modified installations.

26. Intersections with any approach with a minimum of four lanes will require two video detection cameras unless one camera is sufficient as determined by the City Engineer.

27. Advance detection shall be provided on streets where the approach speeds are 30 mph or greater. Separate loops or zones shall be placed in each through lane. Advance loop setback requirements from intersections, based on posted approach speeds, are shown below.
### 6.01.03 SUBMITTALS

All product submittals shall be provided to the City, 15 calendar days prior to equipment and material orders.

The Contractor shall submit to the City, for approval, all applicable submittals including, but not limited to, name of manufacturer, manufacturer’s catalog cut sheets, schematic wiring diagrams, material descriptions, and any other material relevant. These submittals shall be approved by the City Engineer, prior to any equipment deliveries to the City. Any equipment that is delivered to the City and rejected by the City shall be removed and replaced at the Contractor’s expense.

The Contractor shall supply signed mylar 24” x 36” copies of the as built signal plans to City Engineer after completion of the project.

### 6.02 MAINTAINING EXISTING ELECTRICAL SYSTEMS

Maintaining existing electrical systems shall conform to the provisions of Section 86-1.06, "Maintaining Existing and Temporary Electrical Systems," of the State Specifications. Existing traffic signal systems shall be kept in effective operation for the benefit of the traveling public during the progress of the work, except when shut down is permitted. The traffic signal shutdowns shall be limited to the hours of 9:00 a.m. to 3:30 p.m., and shall be permitted only during the switch over from existing to new controller operation, unless prior approval is obtained from the City Staff.

Temporary standards with signal equipment may be required during modification of existing signal systems. The Contractor shall provide temporary equipment if the City Engineer deems it necessary. The cost of the temporary system shall be included in the lump sum price paid for signal modifications and no additional compensation shall be allowed.

The Contractor shall notify the City Engineer 72 hours prior to any operational shutdown of existing signal system.

Any existing equipment or devices damaged during an ongoing construction projects (examples: installation of a new traffic signal, modification of an existing traffic signal, ADA accessibility projects, street repaving projects, etc.), shall be replaced in-kind at no cost to the City. Applicable equipment includes, but not limited to signal cabinet, controller, pedestrian push buttons (PPB), accessible pedestrian signals (APS), loops, video detection systems, wiring, signal interconnect (SIC), fiber optic cabling, battery backup system (BBS), signs, signal heads, etc.

If an ongoing project requires temporary changes in striping to facilitate the work, the contractor

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<th>APPROACH SPEED (MPH)</th>
<th>SETBACK (FEET FROM LIMIT LINE)</th>
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<tr>
<td>25</td>
<td>105</td>
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<td>30</td>
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<td>345</td>
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</table>
shall be responsible for installing temporary striping. This includes temporarily covering old striping and restoring striping to the original state at no cost to the City.

The contractor shall be responsible for cleaning up and restoring the rock sump on any pull boxes (existing or new) that has been adjusted or replaced as part of the project. The contractor shall take extra care to ensure that no debris enter any conduit during construction. Full compensation for performing the work in these specifications shall be included in the prices paid for the various contract items of work and no additional compensation will be allowed.

6.03 SCHEDULING OF WORK

The initial installation and turn-on of new equipment shall be made on a Tuesday, Wednesday, or Thursday, and not a holiday. The turn-on shall be the first order of work for that day and all components of the traffic signal installation shall be functional and operating prior to turn-on.

All existing stop signs on minor and major streets (if applicable) shall be removed only on the day of successful turn on of the new signal. Temporary stop signs, changeable message boards and flashing red signal operation is required one (1) week prior to scheduled signal turn on or as directed by the Public Works Department.

Present at the time of testing shall be a representative from: the Electrical Contractor, Controller Manufacturer (when applicable), Communication System Manufacturer (when applicable), Detection System Manufacturer (when applicable), Public Works – Electrical Maintenance, and City Traffic Engineering. The contractor shall assume the responsibility of contacting and coordinating all the stakeholders as mentioned above.

If the Contractor is unable to respond to a problem that develops during the functional test, or for any reason is unable to correct the problem in a timely fashion, as determined by City staff, City crews may work on the problem. Any such work performed by the City shall not invalidate the guarantee provided for in these Specifications and shall be at the Contractor's expense.

All vehicular and pedestrian signal indications including APS systems shall remain covered with burlap or an approved equivalent during installation of new traffic signals. Those covers shall only be taken off on the day of turn on. If the turn on is not successful, all indications described above shall be covered again with burlap or an approved equivalent and remain covered until successful turn on.

Temporary stop signs shall be provided by the contractor.

The Contractor will be given one "punch list" for the contract to be completed within 30 calendar days. This will include a "compliance recheck" of the punch list. If the compliance recheck is performed, and it is found that the Contractor has not completed the punch list, the contractor shall receive an additional 15 calendar days to complete the list. The cost of subsequent compliance rechecks will be deducted from any monies due, or which may become due the Contractor.

All facilities shall be installed in a professional and workmanlike manner. Any portion of the signal system, which is not installed in a professional manner, shall be removed and reinstalled correctly to the satisfaction of the City Engineer.

6.04 CONDUITS

Conduit shall be per Section 86.2.05, "Conduit," of the State Specifications except as modified herein. Conduit should be installed by directional drilling or jacking and boring methods unless otherwise noted. The work shall include backfill and restoration per details on the plans.
Furthermore, regardless of which method is chosen, the Contractor shall pothole as needed to locate existing utilities. The Contractor shall assume all risk associated with chosen method of installation and shall fully locate and verify utilities prior to conduit installation. No additional compensation shall be allowed due to delays or changes in installation method. Conduit runs shall have no more than 360° of bends, unless authorized by the City Engineer, and shall enter the pull box vertically at 90°.

When trenching is allowed for conduit installation, the top of the horizontally installed conduit shall be a minimum of 24 inches below finished grade in the street section. Where the asphalt concrete (AC) portion of the roadway cross section is greater than 24 inches in depth, the finished height of the conduit shall be two (2) inches below the AC section. The trench shall be back filled with two inches of commercial grade sand with the remainder being 2% red oxide concrete, 2 sack sand slurry concrete.

Conduit installed in non-paved areas shall be covered with conductive plastic underground warning tape six inches above the conduit.

Schedule 40 Polyvinyl Chloride (PVC) and Schedule 80 High Density Polyethylene (HDPE) shall be used throughout the project as shown on the plans.

All conduits shall be three inches (3") minimum or otherwise as shown on the plans or specified in these standard specifications. Larger size conduit may be use subject to approval by the City Engineer. Where larger conduit is used, it shall be for the entire length of the run. No reducing couplings shall be permitted underground.

The ends of conduits in pull boxes shall have Bell Bushings and be a minimum of two inches above the surface of the rock, and between eight and ten inches below the top of the pull box.

Loop stub outs shall be two-inch (2") PVC with bell bushings on each end.

For all new signal and modified traffic signal (where new cabinet and controller will be installed) project, three (3) – 3-inch conduit shall be installed between the controller cabinet base to the adjacent home run pull boxes. Out of three conduits, one conduit shall be exclusively dedicated to run signal interconnect cable and fiber cable through a separate interconnect pull box. Splicing shall not be allowed in any of the home run pull boxes. The contractor shall install additional 2" conduits to run service conductors from controller cabinet to the service cabinet, and from home run pull box to the service cabinet.

Conduits terminating in pull boxes or in panels shall be sealed with an authorized sealing compound. Pull ropes shall be provided full length for all conduits.

Certificates of Compliance shall be furnished for all supplied materials.

6.05 PULL BOXES

6.05.01 MATERIALS

All pull boxes shall be of the Concrete style construction, or approved equal, and shall be gray in color except otherwise specified. Pull box lids shall have a non-skid surface. At locations other than adjacent to the controller cabinet, and at advance loop locations, number 6 (17” x 30") pull boxes shall be used throughout the project unless otherwise specified on the plans. All home run pull boxes adjacent to the cabinet shall be concrete flared wall style (17” x 30") or approved equal with no hold down bolts. No splicing shall be allowed in these pull boxes. Pull boxes near advance loops shall be number 5 (13” x 24") concrete style or approved equal. No bolt down lids shall be used.
Pull boxes shall be set square to face of the curb and shall be leveled with the existing grade.

6.05.02 COVER MARKING

Marking shall be clearly defined, uniform in depth, and parallel to either the long or short sides of the cover. All pull boxes containing street lighting, interconnect, or service exclusively, shall be supplied with pull box lids that accurately reflect their contents. All pull box lids shall be tier 8 and shall have the words "Traffic Signal," "Street Lighting," "Interconnect," or "Service" on the lid, and shall not be of the bolt-down type. Lids shall be protected or reversed during the course of construction. All lids damaged or scuffed from construction shall be immediately rejected and shall be replaced by the Contractor at no expense cost to the City.

6.05.03 INSTALLATION AND USE

Pull boxes in non-paved or asphalt areas shall be constructed with a minimum 4-inch deep by 12-inch-wide concrete apron. The concrete apron shall be wrapped around with a one (1) #4 rebar.

On all runs, the spacing of pull boxes shall not exceed 200 feet measured along the conduit or as shown on the plans. If required, the contractor shall install additional pull boxes to facilitate the work. On those runs exclusively for "interconnect," the spacing of pulling points or pull boxes shall not exceed 300 feet, unless otherwise directed by the City Engineer. No drain hole or grout shall be placed in the sump area.

A minimum of six inches of ¾ inch drain rock shall be placed under each pull box. All pull boxes shall be inspected and approved prior to pulling any conductors.

6.06 WIRES, CONDUCTORS AND CABLES

6.06.01 INSTALLATION

Conductors shall be per section 86.2.08 Conductors and Cables of the 2010 State Specifications except as modified herein.

Conductors shall be permanently identified as to function. Identification shall be placed on each conductor, or each group of conductors comprising a signal phase in each pull box and near the end of terminated conductors.

Identification labels shall be embossed and shall be direct labeling method. Labels shall be fastened to the conductors in such manner that they will not move along the conductors. Labeling shall be performed by mechanical methods. Labeling are required for loops, signal conductors, SIC and any other conductors within cabinet and pull box. Only poly-based lubricants shall be used. Conductors shall not be pulled into conduits until the pull boxes have been set to grade and ¾ inch aggregate installed.

Conductors shall not be pulled into conduits unless a representative from City’s Traffic Signal Section is present to observe the operation. The end of all unused conductors and cables shall be sealed.

All conductors and cables shall be pulled through the conduits with the same wire pull. Slipping of conductors shall not be allowed. Only mule tape shall be used to pull conductors. Each conduit shall be left with a mule tape.
Separate pull boxes shall be installed to accommodate splicing of loop wires including termination or as shown on the plans.

AWG #10, AWG #12 and AWG #14 conductors shall be solid with 45 mils thickness. AWG #8 conductor shall have seven (7) strands with 45 mils thickness and AWG #2 conductor shall be stranded with 60 mils thickness.

The signal conductors shall be organized in a bundle to allow for easy identification for wires and cables.

All conductors require bundling inside the cabinet shall be bundled and terminated neatly. Nylon wire tie wraps spacing shall be at 18” O/C.

Slack for each conductor shall be as shown in the following table:

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>SLACK (FEET)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Standard</td>
<td>2</td>
</tr>
<tr>
<td>Lighting Standard</td>
<td>2</td>
</tr>
<tr>
<td>Signal and Lighting Standard</td>
<td>2</td>
</tr>
<tr>
<td>Pull Box</td>
<td>6</td>
</tr>
<tr>
<td>Splice</td>
<td>3</td>
</tr>
</tbody>
</table>

6.06.03 SPlicing

Conductors shall not be spliced in the home run pull box/boxes adjacent to the controller, but shall be continued to terminals in the cabinet.

All conductors, including neutrals, shall be spliced by methods shown on State Standard Plan ES-13A. Splices shall be soldered using 60-40 rosin core solder only. Splices shall be insulated by Method "B" as described on State Standard Plan ES-13A.

Separate neutrals shall be used from terminal block to pull boxes for all vehicle, pedestrian and push button assemblies. Separate neutrals shall be used for all mast arm signal heads. No jumpers shall be allowed. All splices and terminals shall be soldered.

6.06.04 BONディング OR GROUNDING

The grounding jumper at each pole shall run continuous to the adjacent pull box attached to the bond wire using Copper C-Tap, or equivalent, compression connector and shall be soldered with 60-40 rosin core solder. All grounding wire shall be No. 8 bare stranded copper wire.

6.06.05 FIBER OPTIC CABLE

A. Description

Fiber Optic Trunk Cable shall be of loose-tube construction, twelve fiber unless otherwise specified. The optical fibers shall be single mode, or as specified by the City Engineer.
The fiber optic cable shall conform to ICEA S-87-640.

**B. Performance**

The optical performance of each single-mode fiber measured at wave lengths of both 1310 nanometers and 1550 nanometers shall have maximum attenuation of 0.4 decibels per kilometer at 1310 nanometers and 0.3 decibels per kilometer at 1550 nanometers and shall conform to TIA/EIA 49Z C4AA.

**C. Construction**

The cable shall be constructed using gel-filled, color-coded buffer tubes stranded (reverse oscillation) around a dielectric central member. The color-coded fibers shall be contained in the buffer tubes and the remaining fillers shall be natural or white in color. A layer of aramid yarn (e.g. Kevlar) shall hold the tubes in position around the central member and provide tensile strength. The color code for the fibers shall be standard colors per TIA-598-C. Water blocking shall be of the dry-tape type within the interstitial spaces, and gel within the buffer tubes.

**D. Jacket**

The filled cable core shall be covered with a black, medium density polyethylene jacket. This outer jacket shall be abrasion and crack resistant, non-nutrient to fungus, electronically non-conductive and compatible with all cable components to which it may come in contact. The jacket shall be free from holes, splits, blisters or other imperfections.

**E. End Termination Cable**

Shall be of the tight-buffered type and shall contain two single-mode fibers protected by a yellow jacket and aramid yarn (e.g. Kevlar) strength member. The length of a typical end termination cable shall not exceed 100 feet. Connectors for end termination cables shall be ST unless otherwise specified by the City Engineer.

**F. Identification**

Each length of cable shall be permanently identified by specifying the manufacturer and type of cable at intervals not greater than six feet along the outside of the outer jacket. Each length of cable shall be permanently marked with foot (or meter) markings at intervals not greater than three feet (or one meter).

**G. Reels**

The cable shall be wound on standard reels in a manner which provides access to both ends of the cable for testing while the cable is still on the reel.

**H. Installation**

Cable installation and handling procedures shall be in accordance with accepted industry standards and/or manufacturer’s recommendations and shall be performed by adequately trained and certified personnel. In all pullboxes, there shall be 10 feet minimum of extra looped cable for each cable entering or leaving the box.

**I. Splicing of Fiber Optic Cable**

Splicing of the Fiber Optic Cable shall be done by the fusion technique. All cables shall be
carefully prepared and spliced in accordance with the cable manufacturer’s recommendations. Either heat shrinkable tubing shall protect the finished splices, metal protective sleeves or by some other method approved by the City Engineer. All splices must be tested and documented after encasement. No splice shall exceed a 0.05 decibel loss.

The completed splices shall be enclosed in re-enterable splice enclosures that seal to form moisture resistant protection. The splice case or enclosure shall contain a removable splice organizer or crib that shall secure the individual fibers and protect the splices. The splice organizer shall be attached to the strength members in the fiber optic cable. There shall be adequate space inside the enclosure to hold at least three feet of buffer tubes from each cable. There shall be no splices except as authorized by the Traffic Signal Inspector. Splice enclosures shall be Corning 6C22-02 (or equivalent) unless otherwise authorized by the Traffic Signal Inspector. Fiber optic interconnect cables may only be spliced at special fiber optics splice boxes as shown on the plans. Video fiber optic cable shall be spliced in double-deep pullboxes.

6.06.06 SIGNAL INTERCONNECT CABLES

A signal interconnect cable must be a 6-pair type with solid, tinned, copper 22AWG conductors. The insulation for each conductor must be color-coded polypropylene with a minimum 13-mils nominal thickness. The conductors must be in color-coded, twisted pairs. The cable jacket must be black HDPE rated for a minimum of 300 V(ac) and 60 degrees C. The jacket must have a minimum nominal wall thickness of 40 mils.

6.07 SERVICE CABINET AND BATTERY BACK UP SYSTEM

The Service cabinet and Battery Back Up System (BBS) cabinet shall be a combined unit and shall be TESCO MODEL 27-222 BBS METERING or City approved equal. The combined unit shall be furnished and installed by the contractor.

The exterior of the combined cabinet shall be anodized aluminum

The interior of the combined cabinet shall be powder coated gloss appliance white.

There shall be 30amp generator plug on the outside of the BBS panel.

The Contractor shall coordinate with Pacific Gas and Electric Company for any necessary service Installation. Any fees and costs required by the utility company shall be borne by the Contractor.

The service enclosure shall also comply with the following specifications:

1. Removable back pan shall be mounted on 4 welded ¼” studs.
2. All circuit breakers shall be mounted in a vertical position, handle up for “On” handle down for “Off”.
3. Intersection safety lighting conductors shall be in a separate conduit from the home run pull box to the service cabinet.
4. The foundation of the service cabinet shall comply with the requirements of Standard Plan ES-2D.
6.08 SIGNAL CONTROLLER CABINET

6.08.01 GENERAL

The signal controller cabinet shall be a Western Systems Type “P” TS-2 Type 1 NEMA traffic signal cabinet as shown on the plans.

6.08.02 CABINET MINIMUM REQUIREMENTS

The cabinet shall be completely wired and tested to the 2003 NEMA Traffic Controller Assemblies specification with NTCIP Requirements Version 02.06 (as amended here in). In addition, and at a minimum, the following requirements shall be met:

City of Napa traffic signal cabinet specification shall supersede any applicable parts of the State of California, Department of Transportation Standard Specifications and Standard Plans. This specification shall apply to all controller cabinet types with noted exceptions.

All items not covered by these specifications shall conform to State of California, Department of Transportation Standard Specifications and Standard Plans. Traffic signal cabinets shall also comply with NEMA specifications where applicable.

The State Specifications referred to in these specifications shall mean the latest State of California, Department of Transportation, Standard Specifications, unless otherwise is indicated.

The cabinet manufacturer shall have pre-approval by the City of Napa on any cabinet that they propose to provide to the city. Said pre-approval shall have been obtained no less than 60 days prior to the closing date of the bid.

All cabinets shall be pre-approved by the City of Napa prior to bid letting.

The controller cabinet shall be furnished by the contractor or the City. The controller cabinet shall be installed by the contractor. The controller cabinet shall be equipped with all auxiliary equipment and plug-ins required to operate 8 vehicle phases, 4 pedestrian phases and 4 overlap phases (NEMA TS-2, Type 1). Solid state switching devices shall conform to the provisions in Section Solid- State Switching Devices,” of these Special Provisions and the following:

The cabinet shall be designed for 16 channel operation. Load switches 1-8 shall be vehicle phases 1-8; load switches 9-12 shall be pedestrian phases 2, 4, 6, 8; Load switches 13-16 shall be overlaps A, B, C & D. These load switch sockets shall be configured in this manor without rewiring the back side of the load-bay. BIU load switch drivers 1-16 shall be wired to appropriate load switch sockets via a terminal block located on the front side of the load bay to allow checking voltage inputs to the load switch sockets without dropping the load bay.

The cabinet shall be wired for up to a minimum of (16) channels of detection, (4) channels of Opticom™ preemption.

The use of PC boards shall not be allowed except in detector racks, SDLC interface panels or BIU cages.

The use of plug and play modules shall not be allowed, with the exception of detector rack(s).

The cabinet shall be wired to provide both a 55-pin “A” connector and a 10-pin “A” connector.
All cabinet 120VAC wires shall be 18AWG or greater, including controller “A” and MMU “A & B” cables.

Controller shall be a separate and revocable bid item. Controller is either city Supplied or purchased as a separate line item and delivered separately to Test Lab to be tested and installed into City of Napa pre-approved Cabinet and Terminal Facility.

The complete cabinet assembly with electronics shall undergo complete input/output function testing by the manufacturer before being released to the City of Napa.

The wired cabinet facility shall use the latest technology applicable and shall be 100% compliant with Section 1605 of the American Recovery and Reinvestment Act of 2009, requiring the use of American iron, steel and manufactured goods.

The cabinet assembly shall be completely manufactured in the United States of America.

6.08.03 TESTING

Prior to field installation of the traffic signal cabinet and controller, the Contractor shall deliver the controller, fully wired Type “P” TS2-Type 1 cabinet including all auxiliary control equipment required for the controller and cabinet assembly to be operational to the City of Napa Corporation Yard Electrical Division, 770 Jackson St., Napa, California for the designated 21-day operational testing period.

The Contractor shall be responsible for transport of the equipment to City’s Corporation Yard and from Corporation Yard to the project site. Deliveries shall be made on Monday through Thursday between 8:00 a.m. and 3:00 p.m. and staff can be reached at (707) 257-9588 to arrange delivery of controller and cabinet.

All shipping cartons and cabinets shall be externally labeled with the name of the final installation location.

The manufacturers of the controller and cabinet system shall certify to the City Engineer that the controller hardware and software has been thoroughly bench and operationally tested and that as a controller system, all components are operating properly.

City staff will test the controller and cabinet equipment for continuous satisfactory operation (without failure) for 21 consecutive calendar days. Delivery of controller equipment for testing shall occur a minimum of 30 calendar days prior to being picked up by the contractor for installation. If equipment is rejected, the contractor shall allow additional 30 days for retesting.

When the controller cabinet has been satisfactorily shop tested, a representative from Public Works Maintenance Department will notify the Contractor that the cabinet is available for pick up. The Contractor shall provide equipment and personnel, as necessary, to safely load and deliver the controller cabinet.

City staff will develop signal timing data sheets and will program the controller. The contractor shall install the controller at project location.

The contractor shall bear the full cost all shipping, handling, and related transportation costs associated with testing and retesting (if applicable).

6.08.04 CABINET ENCLOSURE

Cabinet shall be Western Systems “P” Cabinet, or an approved equivalent. At a minimum, the cabinets shall meet the following criteria:
1. The “P” shall have nominal dimensions of 56” high x 44” width x 25.5” depth and meet the footprint dimensions as specified in Section 7.3, table 7-1 of NEMA TS2 standards for a Type P cabinet. The cabinet base shall have continuously welded interior mounting reinforcement plates with the same anchor bolt hole pattern as the footprint dimensions.

2. Shall be fabricated from 5052-H32 0.125-inch thick aluminum.

3. The cabinet shall be double-flanged where it meets the cabinet door.

4. The top of the cabinet shall be sloped 1” towards the rear to facilitate water runoff. And shall bend at a 90° angle at the front of the cabinet. Lesser slope angles are not allowed.

5. The inside of the cabinet shall utilize “C” channel rails. (2) Welded on the back wall on 34” center and (4) welded on each side wall on 8” center with 2 5/8” between sets. The “C” channel rails on the back wall shall be 35” in length and start 5” from the bottom of the cabinet interior. The “C” channel rails on the side walls shall be 48” in length and start 5” from the bottom of the cabinet interior. Adjustable rails are not allowed.

6. Unless otherwise specified the cabinet shall be supplied with the following finishes: the interior anodized. The exterior anodized.

7. All external fasteners shall be stainless steel. Pop rivets shall not be allowed on any external surface.

8. The front handle shall be ¾” round stock stainless steel bar. All door handle mechanisms shall be interchangeable and field replaceable.

9. The main door shall contain a police door with a conventional police lock. A key shall be provided for both the cabinet lock and the police door lock. The police door shall be recessed into the main door so that the police door is flush with the main door. A closed-cell, neoprene gasket shall be bonded to the enclosure doors. The gaskets shall cover all areas where the doors contact the double flanged cabinet housing exterior and be thick enough to provide a watertight seal. A stiffener plate shall be welded across the width of the inside of the main door to prevent flexing. A main door bar stop shall be a two-position, three-point stop that accommodates open-angles at 90, 125, and 150 degrees. A louvered air entrance located at the bottom of the main door shall satisfy NEMA rod entry test requirements for 3R ventilated enclosures. Bearing rollers shall be applied to ends of door latches to discourage metal-on-metal surfaces from rubbing. The lock assembly shall be positioned so handle does not cause interference with key when opening the door.

10. A complete set of keys shall be supplied providing access to the cabinet front door and the police door.

11. The cabinet shall be equipped with a universal lock brackets capable of accepting a Best™ style lock and a Corbin #2 tumbler series lock. The cabinet shall come equipped with a Corbin #2 lock.

12. The cabinet shall be supplied with one (1) door switches that controls the cabinet interior lighting circuits.

13. All exterior seams shall be manufactured with a neatly formed continuously weld construction. The weld for the police box door shall be done on the inside of the cabinet door. All welds shall be free from burrs, cracks, blowholes or other irregularities.
14. The fan baffle panel seams shall be sealed with RTV sealant or equivalent material on the interior of the cabinet.

15. The cabinet shall be UL listed.

16. The cabinet shall come with lifting ears affixed to the upper exterior of the cabinet. These ears shall utilize only one bolt for easy reorientation.

17. The cabinet shall come with two (2) dual-ply Dustlock™ Media polyester, disposable air filter; and the filter performance shall conform to listed UL 900 Class 2 and conform to MERV-8 & ASHRAE Standard 52.2-1999. The filter element shall be secured to louvered entrance on the main door with Velcro type mounting on all four edges and a metal filter cover. The filter and metal cover shall be secured to entrance on main door by two (2) horizontally-mounted restraints.

18. All cabinet doors shall be mounted with a single continuous stainless-steel piano hinge that runs the length of the door. The hinge shall be attaching via stainless steel tamper resistant bolts.

19. All steel incorporated in the cabinet shell shall be manufactured in the United States of America and shall meet the requirements of Section 1605 of the American Recovery and Reinvestment Act of 2009.

6.08.05 LABELS

A permanent printed thermo vinyl, engraved or silk-screened label shall be provided for all terminals and sockets. Labels shall be legible and shall not be obstructed by cabinet wiring, panels or cables. All labels shall conform to the designations on the cabinet wiring prints.

6.08.06 SHELVES

The P shall come with (2) 42.5” double beveled shelves 10” deep that are reinforced welded with V channel, fabricated from 5052-H32 0.125-inch thick aluminum with double flanged edges rolled front to back. Slotted hole shall be inserted every 7” for the purpose of tying off wire bundles.

6.08.07 CABINET LAYOUT

The shelves shall be populated as follows:

1. The controller monitor and power supply shall be placed on the first or bottom shelf. The one (1) detector racks shall be placed on the top shelf.

2. The roll out drawer and LED light shall be mounted under the bottom shelf just left of center.

3. Load bay shall be mounted on the back wall with 7” of clearance to the bottom of the cabinet.

4. The detector panel for all field inputs shall be mounted on the lower left wall.

5. The load resistor panel shall be mounted on the lower left wall under the bottom shelf.

6. The SDLC and power supply interface panels shall be mounted on the left wall between the middle and bottom shelves.
7. The power panel shall be mounted on the lower right wall.
8. The Actelis switch shall be mounted on the right wall above the power panel.
9. The 120VAC six position power strip shall be mounted on the right wall, at the top of the “C” channel.

6.08.08 VENTILATING FANS

The cabinet shall be provided with one (1) finger safe fan mounted on the right and left sides of the cabinet plenum and shall be thermostatically controlled (adjustable between 32°-140° Fahrenheit). The safe touch thermostat, fuse holder and power terminal block(s) shall be din rail mounted on right side of cabinet plenum.

6.08.09 COMPUTER SHELF

A slide-out computer shelf 16” length by 12” width by 2” depth shall be installed below the middle shelf underneath the controller. The shelf shall be mounted just right of center so that controller cables will not interfere with the operation of the shelf when equipment is installed. The shelf shall have a hinged cover that opens from the front and shall be powder-coated black. It shall be a General Devices Part # VC4080-99-1168. The door when fully extended shall hold up to 50-lbs.

6.08.10 CABINET LIGHT ASSEMBLY

The cabinet shall have two (2) LED lighting fixture with 15 high power LEDs using a cool white color emitting 300lm min @ 12VDC/750mA. The LED shall be a Rodeo Electronics TS-LED-05M02. The LED fixture shall be powered by a Mean Well class 2 power supply LPV-20-12 that shall be mounted on the inside top of the cabinet near the front edge. The cabinet light circuit shall be designed so a second LED fixture will be installed in the cabinet without the need a of a second power supply. It shall be attached under the cabinet drawer so that it remains stationary when drawer is extended. An on/off switch that is turned on when the cabinet door is opened and off when it is closed shall activate the lighting fixture(s) power supply.

6.08.11 CONVENIENCE OUTLET

The cabinet shall be wired with one (1) convenience outlet with a ground fault interrupter (GFI) and one (1) six position power strip outlet without ground fault interrupters. The ground fault outlet (GFI) shall be mounted on the right side of the cabinet on or near the power panel. The power strip outlet shall be mounted on the right side at the top of the “C” channel. No outlets shall be mounted on the door. The GFI power shall be fed through the auxiliary breaker (CB2). The power strip shall be fed through an EDCO SHP300-10 transient voltage suppressor located on the cabinet power panel. There shall be a 2-position terminal block on the power panel, between the power strip and the EDCO SHP300-10 for easy replacement.

6.08.12 AUXILIARY PANEL

The cabinet shall include an auxiliary switch panel mounted to the interior side of the police panel compartment on the cabinet door. The panel shall be secured to the police panel
compartment by (2) screws and shall be hinged at the bottom to allow access to the soldered side of the switches with the use of only a Phillips screwdriver. Both sides of the panel shall be silkscreened. Silk-screening on the backside of the switch panel shall be upside down so that when the panel is opened for maintenance the silk-screening will be right side up. All the switches shall be protected by a hinged see-through Plexiglas cover.

At a minimum, the following switches shall be included:

**A. Controller ON/OFF Switch**

There shall be a switch that renders the controller and load-switching devices electrically dead while maintaining flashing operations for purpose of changing the controller or load-switching devices. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

**B. Signals ON/OFF Switch**

There shall be a switch that renders the field signal displays electrically dead while maintaining controller operation for purpose of monitoring controller operations. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

**C. Stop Time Switch**

There shall be a 3-position switch labeled “Normal” (up), “Off” (center), and “On” (down). With the switch in the “Normal” position, a stop timing command shall be applied to the controller by the police flash switch or the MMU (Malfunction Management Unit). When the switch is in its “Off” position, stop timing commands shall be removed from the controller. The “On” position shall cause the controller to stop time. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

**D. Technician Flash Switch**

There shall be a switch that places the field signal displays in all red flashing operation while the controller continues to operate. This flash shall have no effect on the operation of the controller or MMU. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

**E. Pedestrian Test Switches**

Four (4) pedestrian phase inputs shall have momentary pushbutton test switches with black caps. With the switch pushed a true input shall be applied to the controller. When released the true input shall be dropped. These switches shall be labeled 2, 4, 6 and 8.

**F. Preempt Test Switches**

Six (6) preempt inputs shall have momentary pushbutton test switches with red caps. With the switch pushed a true input shall be applied to the controller. When released the true input shall be dropped. These switches shall be labeled 1, 2, 3, 4, 5 and 6.

**6.08.13 POLICE PANEL**

Behind the police panel door there shall be switches for use by emergency personnel. The wiring for these switches shall be accessible when the auxiliary panel is open. The following switches shall be included;
A. Flash Switch

There shall be a switch for the police that puts the cabinet into flashing operations. The switch shall have two positions, “Auto” (up) and “Flash” (down). The “Auto” position shall allow normal signal operation. The “Flash” position shall immediately cause all signal displays to flash as programmed for emergency flash and apply stop time to the controller. When the police flash switch is returned to “Auto”, the controller shall restart except when the MMU has commanded flash operation. The effect shall be to disable the police panel switch when the MMU has detected a malfunction and all controller and MMU indications shall be available to the technician regardless of the position of the police flash switch. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

B. Signals ON/OFF Switch

There shall be a switch that renders the field signal displays electrically dead while maintaining controller operation for purpose of monitoring controller operations. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

6.08.14 MAIN PANEL CONFIGURATION (LOAD-BAY)

The design of the panel shall conform to NEMA TS2 Section 5, Terminals and Facilities, unless modified herein. This panel shall be the termination point for the controller unit (CU) MSA, (MMU) MSA & B cables, bus interface units 1 & 2 (BIU) and field terminal facilities. The terminal and facilities layout shall be arranged in a manner that allows all equipment in the cabinet and all screw terminals to be readily accessible by maintenance personnel.

The load-bay shall be fully wired and meet the following requirements:

1. The load-bay shall have the following dimensions; constructed from aluminum with a nominal thickness of 0.125”, a maximum height of 19” and maximum width of 38” including attached wiring bundles.

2. The entire assembly shall roll down and provide access to all of the back of panel wiring. All solder terminals shall be accessible when the load-bay is rolled down. The assembly shall be able to roll down without requiring other components, cables or switches to be removed.

3. The load-bay shall be designed so that all other cabinet screw terminals are accessible without removing cabinet electronics.

4. All the controller (CU) and malfunction management (MMU) cables shall be routed through the back of the load-bay so that they will not be subject to damage during load-bay roll down.

5. The top of the load-bay panel shall attach directly to “C” channel and detach without the use of tools or loose hardware for roll down purpose.

6. The load-bay shall be balanced such that it will not roll down when the top of the load bay is detached from the “C” channel, even when fully loaded with BIUs load switches, flasher and flash transfer relays.

7. The load-bay facility shall be wired for 16 channels. Load switch(s) 1-8 shall be vehicle phases 1-8; load switch(s) 9-12 shall be pedestrian phases 2, 4, 6 & 8; load switches 13-16 shall be overlaps A, B, C & D. Load switches 1-8 & 13-16 shall be routed through a flash transfer relay.
8. (16) Load switch sockets in one row, spaced on 2” center per NEMA TS2 section 5.3.1.2, figure 5-2.
9. (6) Flash transfer relay sockets.
10. (1) Flasher socket.
11. All load switches and flasher shall be supported by a bracket extending at least ½ the length of the load switch.
12. (2) Bus interface unit rack slots for BIU’s 1 and 2. The load-bay must have space available for a 3rd BIU. All of the cabinet BIU’s shall fit into one rack in the top left corner of the load-bay. Multiple racks are not allowed.
13. BIU wires connection to the PCB shall be two (2) 34 pin connectors. These connectors shall have locking latches.
14. All BIU wiring shall be soldered to backside of a screw terminal. The screw terminals provide access to all functions of BIUs.
15. Wiring for one Type-16 MMU. All MMU wiring shall be soldered to backside of a screw terminal. The screw terminals provide access to all functions of the MMU.
16. All 24 VDC relays shall have the same base socket, but it shall be different from the 115VAC relays.
17. All 115VAC relays shall have the same base socket, but it shall be different from the 24VDC relays. (not applicable to flash transfer relays)
18. Shall have a relay that drops +24VDC to load switches when the cabinet is in flash.
19. The load bay shall have terminals to access the flash circuits 1 and 2.
20. There shall be a wire between the pedestrian yellow field terminals and another terminal on the load bay. The MMU channel 9-12 yellows shall terminate next to said pedestrian yellows terminal.
21. The load-bay shall be silkscreened on both sides. Silkscreen shall be numbers and functions on the front side, and numbers only on the back side. The back side shall have labels upside down, so when load bay is rolled down labels will be right side up.
22. Field wiring terminations shall be per channel across the bottom of the load-bay. Each channel shall have 3 terminations corresponding to the appropriate vehicle phase Red, Yellow and Green. Default wiring shall be starting with green, left to right vehicle phases 1-8, pedestrian phases 2, 4, 6 & 8 and overlap channels A, B, C & D following the order of the load switches. Field terminals shall be #10 screw terminal and be rated for 600V.
23. All cable wires shall be terminated. No tie-off of unused terminals will be allowed.
24. Shall be 100% manufactured in the United States of America

All wiring shall conform to NEMA TS2 Section 5.2.5 and table 5-1. Conductors shall conform to military specification MIL-W-16878D, Electrical insulated high heat wire, type B. Conductors #14 or larger shall be permitted to be UL type THHN. Main panel wiring shall conform to the following colors and minimum wire sizes:

- Vehicle green load switch output: 14 gauge brown
- Vehicle yellow load switch output: 14 gauge yellow
- Vehicle red load switch output: 14 gauge red
Pedestrian Don’t Walk switch 14 gauge orange
Pedestrian Walk switch 14 gauge blue
Pedestrian Clearance load switch 14 gauge yellow
Vehicle green load switch input 22 gauge brown
Vehicle yellow load switch input 22 gauge yellow
Vehicle red load switch input 22 gauge red
Pedestrian Don’t Walk input 22 gauge orange
Pedestrian Walk input 22 gauge blue
Pedestrian Clearance input 22 gauge yellow

Logic Ground 18 gauge white with red tracer
+24V DC 18 gauge red with white tracer
+12V DC 18 gauge pink
AC+ Line 14 gauge black
AC- Line 14 gauge white
Earth Ground 16 gauge green

AC line (load bay) 12/14 gauge black
AC neutral (load bay) 12/14 gauge white
Controller A cables 22 gauge blue with the exception of power wires (AC+ Black, AC- White & Earth Ground Green) These wires shall be 18AWG

MMU A & B cables 22 gauge orange with the exception of power wires (AC+ Black, AC- White & Earth Ground Green Start Delay Relay Common Black, Normally open Black & Normally Closed Black) These wires shall be 18AWG

Four conductors will supply alternating current (AC) power to the load switch sockets. The load switch sockets shall be supplied 1-4, 5-8, 9-12 & 13-16 by each conductor.

The field terminal blocks shall have a screw Type No. 10 post capable of accepting no less than 3 No. 12 AWG wires fitted with spade connectors. Four (4) 12-position terminal blocks shall be provided in a single row across the bottom of the main panel. Spade lugs from internal cabinet wiring are not allowed on field terminal screws. There shall be a second row of three (3) 12-position terminal blocks with screw type #10 above the field terminal blocks. These blocks shall operate the flash program. It shall be changeable from the front of the load bay.

The power terminal blocks shall have a screw Type No. 10 post capable of accepting no less than 3 No. 12 AWG wires fitted with spade connectors. One (1) 12-position terminal block shall be provided vertically on the right side of the load bay. The placement of the power terminal block on any other panel shall not be allowed.

All load switches, flasher, and flash transfer relay sockets shall be marked and mounted with screws. Rivets and clip-mounting is unacceptable.

Wire size 16 AWG or smaller at solder joints shall be hooked or looped around the eyelet or terminal block post prior to soldering to ensure circuit integrity. All wires shall have lugs or terminal fittings when not soldered. Lap joint/tack on soldering is not acceptable. All soldered connections shall be made with 60/40 solder and non-corrosive, non-conductive flux. All wiring shall be run neatly and shall use mechanical clamps and conductors shall not be spliced.
between terminations. Cables shall be sleeved in braided nylon mesh and wires shall not be exposed.

6.08.15 LOAD-BAY AND PANEL WIRE TERMINATION

All wires terminated behind the main panel or on the back side of other panels shall be SOLDERED. No pressure or solder-less connectors shall be used. Printed circuit boards shall only be used on the load bay where connecting to the bus interface units (BIU).

6.08.16 CABLES

All wire cable bundles shall be encased in flex or expandable braided sleeving along their entire free length.

All SDLC cables shall be terminated on both ends, securely terminated to the SDLC interface panel with screw type connection and professionally routed in the cabinet interior to easily reach the load bay, controller, malfunction management unit and detector racks. All SDLC connectors shall be fully populated with 15 pins each.

6.08.17 FLASHING OPERATION

All cabinets shall be wired to flash for all vehicle channels. Flashing operation shall alternate between the used vehicle phases 1, 3, 5, 7, OLA & OLC and 2, 4, 6, 8, OLB & OLD. Flash programming shall be either red, yellow or no flash simply by changing wires on the front of the load-bay.

6.08.18 DETECTOR RACKS

At a minimum, the cabinet shall be wired to accommodate (16) channels of detection. The detector rack shall support (16) channels of loop detection, (1) Buss Interface Unit (BIU) and (4) channel of Opticom™. The rack shall be capable of using both two channel or four channel detection devices or Opticom™ cards. The loop cabling shall be connected via a 37 pin DB connector using spring clips. The Opticom cable shall be connected via a 24 pin connector using locking latches. The power cable shall be a 6 pin connector. All power wires shall be 18AWG. The addressing of detector racks shall be accomplished via dipswitches mounted to the PCB. There shall be the capability to turn off the TS2 status to the BIU for the uses of TS1 detector equipment via dipswitches mounted to the PCB. There shall be a 34 pin connector using locking latches that breaks the output from the detector to the input of the BIU, there shall also be +24VDC and logic ground on this connector. All racks shall have space at the bottom front for labeling. All racks shall be designed for horizontal stacking. Separate racks for detection and preemption are not allowed.

6.08.19 DETECTION PANEL

The detection panel shall support (16) channels of vehicle detection, (4) channels of emergency vehicle preemption detection, (4) channels or pedestrian detection and (4) pedestrian returns on a single panel. The loop wires shall be a 22AWG twisted pair, color coded as follows. Channel one brown, channel two red, channel three orange and channel four yellow. One of the twisted pair wires of all colors shall have a white tracer and land on
the second position terminal of each loop. The emergency preempt wires shall be color coded as follows. +24VDC orange, preempt inputs yellow and ground blue. This panel will be mounted on the left side of the cabinet below the bottom shelf. The panel shall also include a (19) position solid aluminum, tin plated neutral and ground buss bars with raised slotted & torque style screws heads. They shall be mounted vertically at the bottom of the panel.

6.08.20  POWER SUPPLY INTERFACE PANEL

The power supply interface panel shall include terminations for all the cabinet power supply inputs and outputs. It shall have a protective plastic cover. This panel shall be mounted on the left wall of the cabinet.

6.08.21  SDLC INTERCONNECTION PANEL

The SDLC hub shall have at a minimum 9 connections. The cable shall be secured by screws. One connector shall have blocks for securing the cable with spring clips. This is for the purpose of connecting/disconnecting a cable quickly and easily.

6.08.22  SUPPLEMENTAL LOADS

There shall be a supplemental load panel with (4) 2.5K-ohm, 10-watt panel mount resistor. One side terminated to a (4) position terminal block tied to neutral. The other side terminated to another (4) position terminal block. This block shall be left open for future loading in the cabinet.

6.08.23  SERVICE SURGE SUPPRESSION

The cabinet shall be equipped with an EDCO model SHP300-10 or approved equivalent surge arrestor mounted on the power panel. Power to all cabinet electronics equipment and power strip shall come through this surge suppression circuit.

6.08.24  POWER PANEL

The power panel shall handle all the power distribution and protection for the cabinet and shall be mounted in the bottom right side of the facility. All equipment shall be mounted on a 12" x 17" silkscreened aluminum panel and include at a minimum the following equipment:

1. A 50-amp main breaker shall be supplied. This breaker shall supply power to the load bay, load switches and auxiliary panel. It shall also power via the EDCO SHP300-10 the controller, MMU, power supply, detector racks, convenience outlet & power strip.
2. A 20-amp auxiliary breaker shall supply power to the fan, light and GFI.
3. A 50-amp, 125 VAC radio interference line filter.
4. A normally open, 50-amp, solid-state relay. The relay shall have a green LED light that is on when energized. (No Mercury Contactors shall be allowed)
5. One see-through Plexiglas cover on stand-offs to protect maintenance personnel from AC line voltages. The cover shall also cover the top of the panel to prevent items from
falling into electronics. This shall be removable by loosening screws but without removing screws.

6. Two (19) position solid aluminum, tin plated neutral buss bar with raised slotted & torque style screw heads.

7. One (19) position solid aluminum, tin plated ground buss bar with raised slotted & torque style screw heads.

8. Two MOVs shall be terminated on the 120AC in field terminal. One tied between line and ground, the other between neutral and ground.

**6.08.25 UNUSED RED JUMPERS**

The cabinet shall be equipped with eight (8) unused red jumpers.

**6.08.26 LOAD SWITCH**

The cabinet shall come with (16) load switches. All load switches shall be cube type and have LED indications for both the input and output side of the load. The load switches shall be PDC model SSS-87I/O.

**6.08.27 FLASHER**

The cabinet shall come with (1) flasher. The flasher shall be cube type and have LED indications. The flasher shall be PDC model SSF-87.

**6.08.28 FLASHER TRANSFER RELAY**

The cabinet shall come with (6) heavy duty flash transfer relays. The relays shall be Detrol Controls model 295.

**6.08.29 BUS INTERFACE UNIT (BIU)**

The cabinet shall come with (3) bus interface units (BIU), (2) T&F, (1) detector racks. These shall meet all the requirements of Section 8 of the NEMA TS-2 2003 standards. In addition, all BIUs shall provide separate front panel indicator LED’s for DC power status and SDLC Port 1 transmit and receive status. The (BIU)’s shall be Eberle Design, Inc. model BIU700.

**6.08.30 POWER SUPPLY (PS)**

The cabinet shall come with a shelf mounted cabinet power supply meeting at minimum TS 2-2003 standards. It shall be a heavy-duty device that provides +12VDC at 5 Amps / +24VDC at 2 Amps / 12VAC at .25 Amp, and line frequency reference at 50 mA. The power supply shall provide a separate front panel indicator LED for each of the four outputs. Front panel banana jack test points for 24VDC and logic ground shall also be provided. The power supply shall provide 5A of power and be able to cover the load of four (4) complete detector racks. The (PS) shall be Eberle Design, Inc. model PS250.
6.08.31 PRE-EMPTION - OPTICOM

The cabinet shall come with (1) 4-channel rack mounted Opticom™ phase selector. This device shall be capable of receiving encoded signals from Opticom series 700 emitters and detectors. The Opticom™ phase selectors shall be Global Traffic Technologies model 764.

The Contractor shall furnish and install required optical detectors, rack(s), four (4) multimode phase selectors and cables, etc., (complete and operable) as shown on the plans and according to the manufacturer’s recommendations.

All optical detectors shall be mounted on the MAS signal heads. Mounting shall comply with the requirements as specified in 2015 Standard Plan ES-4E. The City Engineer will mark the optical detector location for the Contractor. The Contractor shall notify the City Engineer at least 48 hours prior to installing the optical detector.

Mounting of the optical detector on a ¾ inch diameter conduit stub shall conform to the following:

1. Type 1 Standards, if necessary, retrofit signal framework and hardware.
2. Optical detectors shall be 3M, Type 721 or approved equal, and shall be compatible with the City’s requirements.
3. Cable shall be Opticom Model 138 detector cable including Opticom span wire clamp or approved equal, and shall be installed with six feet of slack in controller cabinet and pull boxes. The cable shall not be spliced.
4. Optical cables shall be labeled in the controller cabinet and in the pull boxes adjacent to the signal standards with appropriate phase designations.
5. Multimode phase selector shall be “Opticom “Model 764” or approved equal.

The City will test the optical system. Tests will be performed at a distance between 300 feet to 1,800 feet between the emitter and the detector being tested.

6.08.32 MANUALS & DOCUMENTATION

The cabinet shall be furnished with (3) complete sets of cabinet prints. All cabinet wiring, and layout shall come on (1) E1 size sheet, multiple pages shall not be allowed. Upon request (1) CDROM with AutoCAD v2008 cabinet drawing for the cabinet wiring.

6.09 CONTROLLER CABINET EQUIPMENT

6.09.01 GENERAL

This section shall include the installation of:

1. Intellight YTC-XN_2 TS-2 type 1 traffic signal controller,
2. EDI MMU2-16LEip Malfunction Management Unit,
3. Actelis ML688 network element,
4. Miovision Video Detection System,
5. or as otherwise indicated on the project plans.
6.09.02 CONTROLLER REQUIREMENTS

Intelight YTC-XN_2 Controller shall be used and must include:

1. Intelight’s newest Local Intersection software (Maxtime) and Intelights newest central system licensing (MaxView)

The entire controller assembly shall be warranted to be free from defects from workmanship and material for one (1) from the date of turn-on by the manufacturer. Any parts found to be defective within the warranty period shall be replaced free of charge by the contractor.

6.09.03 TRAFFIC SIGNAL CONTROLLER SOFTWARE

The Contractor shall install the latest version of Intelight’s local intersection software in the Intelight controllers to be compatible and completely functional with City’s MaxView central traffic signal controller communication software prior to delivering controller to the City for testing.

The Contractor shall provide licenses, which include the basic support and integration for use of this software.

6.09.04 MALFUNCTION MANAGEMENT UNIT (MMU)

The MMU shall be an Eberle Design, Inc. model MMU2-16LEip. The cabinet shall come with this MMU that meets all the requirements of NEMA TS2-2003 while remaining downward compatible with NEMA TS1. It shall have (2) high contrast LCD displays and an internal diagnostic wizard. It shall come with a 10/100 ethernet port. It shall come with software to run flashing yellow arrow operation.

6.09.05 FIBER / COPPER / ETHERNET NETWORK ELEMENT AND SWITCH

The cabinet shall come with a Actelis ML688 or ComNet CNGE3FE8MSPOE (and applicable power supply, cables and modules for specific location) switch that meets all the requirements below.

Each network element will have the option to support an additional optical interface operating up to a 100Mbps or 100/1000 Mbps line rate. The optical port upgrade option will be available via a SFP optical plug in module and be capable of working in conjunction with both high speed links (East and West). In addition, should the network be upgraded to fiber backhaul, the system must be able to support the fiber connection while continuing to provide existing Ethernet services over existing hardware, thus allowing for a fiber upgrade without replacing the existing hardware.

The traffic interconnect network elements shall be contractor furnished and shall be installed at locations as shown on as shown on the project plans.

6.09.06 VIDEO DETECTION SYSTEM (VDS)

Video Detection System shall be a Miovision Multimodal or GridSmart GS2 or Iteris Vantage Vector Hybrid.
The system shall have a modular electrical design and use Ethernet to connect and network with the different system components. Streaming video images, alerts, and data shall be transmitted from the field back to a Traffic Operations Center (TOC) via the systems client software and to the cloud by using any or combination of the following:

- Fiber optic
- Microwave
- WAN
- TCP/IP
- Internal modem/ cell modem
- Any other means of commonly used communication practices and standards for digital content and information.

The video client software shall provide graphical user interfaces between the administrator(s) and permissioned users of the system and the sensor(s) itself. The software shall allow the user to conduct maintenance, monitor information relayed from the sensor(s), and provide access to real-time data, system and user defined alerts, and access to historical data collected by the sensor(s). The client software shall be installed across a network of computers. One or more users will be able to access VDS simultaneously.

Each system will include client software for detecting, counting and reporting the vehicle’s entrance and exit of the intersection. The system will also include software for communicating with the traffic controllers and other electronic devices.

The client software shall be included with each system and should be downloaded and run on any personal computer with a Windows 7 or newer operating system. The client software at minimum should include management tools to perform the following:

- View, diagnose, configure, and reset individual sensor outputs
- View the status of inputs to enable setup and troubleshooting in the field
- Configure and view calls and phases
- The ability to create and define, as well as edit, vehicle zones, road masks, object masks, and pedestrian zones by drawing arbitrary shaped polygons using a computer
- View the site’s configuration history
- Publish and revert back to previous configuration
- View video and images from the sensor within the software’s interface
- Optionally access and use an API that is documented online and that uses HTTP
- Provide System Alerts for diagnostic and administrative events

The system shall provide data packages that provide count data, access to real time data, and system and user defined alerts. The count data shall be accessible from the processor or from the cloud. The count data will include; turning movement counts, length based vehicle classifications, volume, occupancy on green, occupancy on red, percent of arrivals on green, percentage of arrivals on red.

All reports should be exportable and downloadable in; PDF, Excel, RTF, TIFF, Web Archive

The alerts/notifications package provided shall include at least; wrong way vehicle detection, loss of visibility event and volume exceeded.
6.09.07 DOCUMENTATION

Two (2) manuals shall be supplied for all equipment and components of the system. Documentation shall be supplied explaining the operation of all system features. Additionally, the contractor shall provide two (2) laminated copies (8.5” x 11”) of the signal phasing plan to City Engineer.

6.09.08 TECHNICAL ASSISTANCE & BACK-UP SERVICES

The manufacturer’s representative shall provide the City with a California telephone number for the ordering of replacement parts that are required and for providing technical advice to City personnel. The manufacturer shall have on hand at this number a complete file of the City’s equipment, including all serial numbers pertinent to this project. The manufacturer shall have available at the telephone number a person with competence in parts, nomenclature and functional characteristics of the City’s signal controller equipment. This person shall be able to provide descriptions, part numbers, prices and availability of the City’s requirements. A fully qualified electronics technician with the capacity to expertly advise on all matters relating to the City’s equipment shall be available immediately, or by return telephone call within 24 hours (normal work days only, holidays and weekends accepted). There shall be no charge to the City for any advice or information provided in this matter.

6.10 POLE STANDARDS

6.10.01 STANDARDS, STEEL PEDESTALS AND POSTS

All traffic signal standards shall be per Caltrans 2010 Revised Standard Plans Electrical Systems unless otherwise specified.

The identification number shall be stamped on the top of the base plate with minimum ½ inch characters in lieu of the riveted stamped identification number on the shaft above the handhole as described on the State Standard Plan ES-7M.

Traffic signal poles shall be set back from face of curb no less than 36 inches to face of standard or pole, and the base plate installed parallel to the flow (direction) of traffic unless otherwise specified by the City Engineer. All poles shall be leveled using a level. All signal poles and signal standards shall be galvanized except downtown area.

Within the downtown area (as defined in the Downtown Napa Specific Plan) all signal poles and signal standards shall be painted Black (minimum two coats). Outside of downtown area, all signal poles and signal standards shall be galvanized.

All holes drilled for wire entry (i.e. pedestrian and vehicle terminal compartments, and APS/pedestrian push button) shall be filed to remove all sharp edges. Any incorrectly drilled or otherwise damaged poles must be repaired by a certified welder to the manufacture’s specifications at the expense of the contractor.

Signal mast arms shall not have a negative angle. If so, the contractor shall contact the manufacturer and correct the negative angle issue.

Signal standard Type 1-B shall not be used.
6.10.02 FOUNDATIONS

Schedule 40 PVC or Schedule 80 PVC with bell bushings shall be used in all cabinet and pole foundations. A 5/8 inch, 10-foot ground rod shall be installed in the controller cabinet foundation and service cabinet foundation.

Type “P” TS-2 Type 1 NEMA cabinet foundation shall have a 32”x48”x24” recessed area for all conductors. Edges/corners of the foundation shall use chamfer strip.

Exposed portions of the foundation to present a neat appearance and shall be true to line and grade. The top of the foundation posts and standards shall be finished to curb or sidewalk grade except special foundations or as directed by the City Engineer. Forms shall be rigid and securely braced in place. Conduit ends and anchor bolts shall be placed in proper position and to proper height. Anchor bolts shall be installed a maximum of 1:40 from vertical and shall be held in place by rigid top and bottom templates. The bottom template shall be made of steel and shall be at least ½ inch thick. The bottom template shall provide proper spacing and alignment of anchor bolts near the embedded bottom end and shall be installed before placing footing concrete.

The mortar shall be no thicker than thickness of the highest leveling nut/nuts leveling plus or minus ½”. The highest leveling nut shall be set to grade.

The controller cabinet pad and service enclosure shall have a concrete walk access to it from the existing sidewalk.

6.11 HEADS

6.11.01 PURPOSE

Until ready for use, signal faces shall be securely covered so that no signal indications are visible. A flash hole no larger than one inch in diameter may be placed in front of each lens. Traffic signal heads shall be of aluminum construction with dark green. Pedestrian signal housing shall be of aluminum construction with dark green. Mounting hardware shall be as per State Standard Plan (ES-4A), unless otherwise indicated on the Project Plans.

Terminal compartments, Mast Arm Side (MAS) mount, curved washers, and slip fitters shall be bronze. Traffic signal frameworks, heads, framework, pedestrian housings, clamshell, and pedestrian button housing shall be factory powder coated dark green and all shall be furnished and installed by the Contractor.

"Knock Out" type seals are not acceptable for sealing unused pipe thread connections to terminal compartments, or top/bottom of signal heads. Connections shall be sealed with threaded fittings with a rubber gasket, or by the use of an "ornamental cap" designed for such purpose.

The Contractor shall exercise care at the time the signal heads are installed to ensure that the gaskets provided for the mounting of the heads are installed on the outside of the housing to provide a watertight seal. Gaskets shall not be placed on the inside of the housing.

All back plates shall be louvered with 5-inch border and shall be aluminum, unless otherwise indicated on the Project Plans. All back plates shall be powder coated fat black or matte black.

Signal visors shall be aluminum (12” diameter X 12” depth), shall be tunnel type and shall be powder coated fat black or matte black.
Signal heads and framework, as a unit, shall be installed by the Contractor at the job site. Extreme care shall be taken by the Contractor's workers during the installation of the signals, frame works, and heads. Any scarred marks or cosmetic damage to the equipment caused from tools or installation processes shall be cause for rejection and shall be replaced at the expense of the Contractor.

6.11.02 LIGHT Emitting Diode (LED) SIGNAL MODULES

The purpose of this specification is to provide the minimum performance requirements for 12 inch circular (ball and arrow), "walking person", "upraised hand" icons and 16X18 inch countdown pedestrian signal modules. This specification refers to definitions and practices described in "Vehicle Traffic Control Signal Heads (VTCSH): Light Emitting Diode (LED) Circular Signal Supplement", "Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement" and "Pedestrian Traffic Control Signal Indicators" (PTCSI): Light Emitting Diode (LED) Signal Modules, as published by The Institute of Transportation Engineers. They may be purchased online from www.ite.org. The contractor shall furnish and install all LED modules as shown on the plans.

A. General

Referenced vehicle type LED modules shall fit in all standard, incandescent vehicle traffic signal housings.

The modules may be used for the replacement of the reflector, socket, gasket, and lens assembly of existing warranty expired LED vehicle signal indication or may be used for new installations.

Each module shall consist of smooth lens with the same appearance and color as incandescent lenses.

Each module shall have a rigid housing for protection in shipping, handling and installation.

Each module shall have a one-piece neoprene gasket.

The power supply shall be integral to the LED module and shall be one piece.

Lens type for green, yellow and red vehicular indications (ball and arrow) shall be tinted. LED modules covered by this specification include the following types and all modules shall be “GE LED” type or approved equal.

12 inch Circular Red
12 inch Circular Yellow
12 inch Circular Green
12 inch Circular Red Arrow
12 inch Circular Yellow Arrow
12 inch Circular Green Arrow
16"X18” Countdown Pedestrian Modules

Contractor shall provide exact catalog number for each module provided.
B. Identification and Labeling

Each individual LED signal module shall be identified for Warranty purposes and clearly marked with:

- Manufacturer's name
- Date of manufacture
- Nominal operating voltage
- Unit serial number
- Operating voltage
- Power consumption in Watts. No indication may exceed 20 watts
- Manufactured in Conformance with the ITE LED Circular Signal Supplement, June 27, 2005
- Manufactured in Conformance with the ITE LED Vehicle Arrow Traffic Signal Supplement, July 1, 2007
- Manufactured in Conformance with the ITE LED Pedestrian Traffic Signal Modules, August 4, 2010

C. Certification and Testing Standards

All 12-inch circular LED Signal Indications shall fully and completely comply with all sections of ITE VTCSH LED Circular Supplement specifications dated June 27, 2005.

All 12-inch Arrow LED Signal Indications shall fully and completely comply with all sections of ITE VTCSH LED Vehicle NTOW Traffic Signal Supplement dated July 1, 2007.

All 16 inchX18 inch Countdown Pedestrian Signal Modules shall fully and completely comply with all sections of ITE PTSCI LED Pedestrian Traffic Signal Module Specifications dated August 4, 2010. Modules shall be fully compliant with CAMUTCD 2003 Section 4E.07 and be fully preemption compatible. The modules shall include a 6" visor. The modules shall countdown the flashing "Don't Walk" prior to clearance interval and shall fit into existing 16" traffic signal housing built to PTSCI standards without modification to the housing. They shall require no special wiring or electronic modules to operate.

All indications shall be tested to be in full compliance to all sections of the ITE VTCSH & PTSCI standards without exceptions and reports for each module shall be provided by the third-party tester. Test report must list the LED manufacturer's model number and the model number must match the bid model number.

D. Optical Visibility

All LED Arrow modules shall be OMNI-DIRECTIONAL. That is, an LED traffic signal module that provides the same luminous intensity signal to the driver regardless of the orientation of the arrow icon or placement of the circular indication.

E. Warranty

ALL LED traffic signal modules supplied shall be warranted for five (5) years against manufacturing defects.

Failures due to acts of God, abuse, and accidents are excluded from warranty coverage.

Vendors expressly warrant that all modules furnished shall be new, and shall be free from defects in material or workmanship.
Vendor shall replace or correct defects if any modules not conforming to the foregoing warranty promptly, without expense to the City, when notified of such non-conformity by the City.

In the event of failure of Vendor to correct defects in or replace non-conforming modules promptly, City, after reasonable notice to the Vendor, may take such corrections or replace such modules and charge Vendor for the cost incurred by the City in doing so.

For each defective module returned, one new module shall be returned to the City. Vendor shall pay shipping for both ways for modules found to be defective and under warranty.

Warranty shall commence from date of receipt of the modules by the City.

6.12 PEDESTRIAN PUSH BUTTONS (PPB)

6.12.01 PEDESTRIAN PUSH BUTTON ASSEMBLIES

Pedestrian push button assemblies shall comply with the following requirements:

1. Push button shall be “Polara Bulldog III” or approved equivalent.
2. Shall meet or exceed all ADA and CAMUTCD-2014 accessibility guidelines.
3. Shall have 2” (minimum) activator button.
4. Shall be furnished and installed by the contractor with all required fixtures and accessories to operate in momentary or latching mode.
5. Operating temperature range: -34° C to +74° C (-30° F to +165° F) • Operating force of less than 2.5 lbs. and a minimum release force of 3 lbs.
6. Telescoping, tamper-proof design.
7. Stainless steel plunger and components.
8. Dustproof, water resistant switch tested to 10 million cycles.
9. Shall require no additional wiring to each button (only two wires).
10. Powder coated black finish on switch housing unless otherwise specified by the City Engineer.

6.12.02 PEDESTRIAN PUSH BUTTON 5X7 FRAME ASSEMBLY

The following requirements shall apply:

1. House pedestrian push button cap and switch and most brands of pedestrian push buttons.
2. House a standard 5” x 7” pedestrian push button sign
3. Manufactured of die cast aluminum.
4. Provide with Philips head mounting screws.
5. Powder coated black
6. Fits traffic signal poles and pedestrian push button posts with diameter of 2-1/2” or greater.
6.13 INTERNALLY ILLUMINATED STREET NAME SIGNS

Each Internally Illuminated Street Name Sign shall be NuArt LED Edge Lit IISNS sign that is detailed in City Standard Plan ES-12. IISNS shall be installed per Caltrans ES-7P on the shaft of the mast arm. IISNS shall be furnished and installed by the Contractor.

Internally illuminated street name sign (IISNS) fixtures shall be 22-inch height and 72-inch or 96-inch length.

Fixtures shall have two street name panels with lettering background overlay shall be 3M ElectroCut Film Series 3630-126 (Emerald Green).

Panels shall be covered with 3M 1160 premium protective overlay film. Panels shall have powder coated black aluminum frames compatible with approved fixtures. Design specifications for the IISNS panels are shown on the City Standard Plan E-12. Text font shall be “ClearView; 3W 8” upper case street name and 2W 4” upper case street suffix. Each panel shall have only one street name in a single line of text, unless otherwise approved by the City Engineer. When opposing approaches have different street names, unique street name panels shall be used for each side of the intersection. The unique street name panel shall contain an arrow for the associated street. Street names placed on signs shall be approved through the City Public Works Department before panels are ordered and installed.

Type IV photoelectric control shall be provided on each IISNS fixture. The IISNS shall be illuminated by a solid-state high flux/high output ultra-high brightness white LED light engine panel.

The standard housing width will be a nominal 2.63” wide and 22” high (actual height 21.25”). Standard lengths are 72” and 96”.

The complete fixture maximum weight will be as follows:

72” x 22”: 53lbs 96” x 22”: 65lbs

Lettering to be centered horizontally and vertically. A ½” white border will show around the entire perimeter of the sign panel after installed in the sign housing.

6.14 CAMERAS

The system should have at least one downward-facing fisheye sensor capable of seeing the center of the intersection and have an omnidirectional line of site to track vehicles entering and exiting the intersection. Other required features shall include the following:

1. Color images outputted into digital format as MJPEG images
2. Horizontal resolution of at least 2580 lines and vertical resolution of at least 1920 lines.
3. A five (5) megapixel CMOS camera with an active-pixel sensor (APS)
4. Camera lens shall not require adjustment and is always in focus
5. A thermostatically controlled heater residing inside the enclosure to reduce the effects of ice and condensation
6. Any plastics used in the enclosure shall have ultraviolet inhibitors
7. A waterproof and dust tight aluminum enclosure
6.15 SIGNS

Traffic signs on signal masts and arms shall be furnished and installed by the contractor. Installation shall be per Section 56 Signs of the Standard Specifications. Signs shall be 0.125" thick and shall be sized for a conventional road or as shown on the project plans. All sign sizes are subject to approval by the City Engineer. Sheeting shall be 3M Diamond Grade – DG3 with VIP legend and include 3M 1160 premium protective overlay film.

Existing signs on traffic signal poles or mast arms shall be removed or covered when they become obsolete or convey a message that misguides or misdirects traffic as directed by the City Engineer.

6.16 VEHICLE SPEED FEEDBACK SIGNS

Each Vehicle Speed Feedback Sign (VSFS) shall be Carmanah solar SpeedCheck-15 and shall be approved per location by City Engineer. VSFS shall be furnished and installed by the contractor as shown on the plans. VSFS shall be installed 2010 Caltrans ES-7B Type 1A poles and base.

Each 15” radar speed sign shall consist of a display enclosure that houses the LED boards, controller, radar, Bluetooth, and shall be available in DC or AC power options. Each 15” radar speed sign shall include a static sign mounted to the display enclosure. The 15” radar speed sign shall be pre-wired to the maximum extent possible. The 15” radar speed sign shall conform to all MUTCD provisions contained in Chapter 2L Changeable Message Signs for color, dimensions, and layout and Chapter 2B.13 for speed limit regulatory signs.

Detailed solar simulations shall be provided as evidence that the 15” radar speed sign is capable of meeting the performance requirements at a specific location. Solar Simulations shall be composed of three calculations: Energy Balance, Array-to-Load Ratio (ALR), and Autonomy. The manufacturer or bidder shall provide a detailed analysis of these three calculations in an “Energy Balance Report.”

The battery cabinet shall house one sealed 12-volt valve-regulated AGM lead-acid maintenance-free battery. The battery shall be equipped with a fast-acting 7-amp cartridge fuse on the positive lead.

The battery, in conjunction with recommended 15” radar speed sign performance, shall be designed for a demonstrable service life of 5 years.

Included with installation shall be manufacture’s software for data collection and reporting on the date, speed and time of vehicles, the number of daily vehicles, average daily volume, posted speed, average speed, vehicles within user-specified percentiles (typically 50th and 85th percentiles), and percent compliance. The software shall also filter and windowing of data for analysis.

6.17 RECTANGULAR RAPID FLASHING BEACONS (RRFB)

Each RRFB shall be a Carmanah Model R920-E and shall consist of a self-contained solar engine that houses the charge controller, flash controller, on-board user interface, wireless communications, batteries and solar panel. Each RRFB shall include either one or two light bars. The RRFB shall conform to all provisions of the MUTCD, Interim Approval IA-21 including WW+S flash pattern. The RRFB shall be pre-wired to the maximum extent possible. The RRFB shall also offer sufficient interior space to house third-party equipment and associated cabling and connectors.
The initial duration of an RRFB system shall be set to the following times during installation:

- 20sec – at 40-50ft wide streets with a posted/prima facie speed limit of 25-30mph
- 25sec – at 40-65ft wide streets with a posted speed limit above 30mph
- 30sec – at 65+ft wide streets without a median island

This initial setting does not restrict any engineering judgement of timing adjustments made after installation.

Detailed solar simulations shall be provided as evidence that the RRFB is capable of meeting the performance requirements at a specific location. The manufacturer or contractor shall provide a detailed analysis of these three calculations in an “Energy Balance Report.”

Mounting adapter hardware for the RRFB shall be available for the following configurations:

- Type 1A pole per Caltrans 2010 RSP ES-7B
- 2.5” Perforated Square Pole Mount

RRFB shall be mounted to a 13-15ft Type 1-A pole per 2010 Caltrans RSP ES-7B unless otherwise approved by City Engineer.
7 – SOLID WASTE, RECYCLABLE MATERIALS & COMPOSTABLE

7.01 GENERAL SERVICE REQUIREMENTS

The Napa Municipal Code (NMC) requires all residents, businesses and multi-family complexes within the City of Napa to subscribe to solid waste and recycling service offered by the City’s Authorized Contractor unless they are exempted from those requirements (NMC Section 5.60.160, Garbage Collection & Disposal). The service must adequately collect all MSW, recyclable materials and compostables that may be generated by a business or multi-family complex. All three of these categories require separation into different containers and all containers must be properly stored in an enclosure that meets the building requirements and environmental/safety regulations.

7.02 SOLID WASTE, RECYCLABLE & COMPOSTABLE MATERIALS ENCLOSURES

The Solid Waste, Recyclable Materials & Compostables Enclosure Standards dated January 2022 apply to projects/permits with a paid submittal of an application for City review dated on or after January 6, 2022. This includes applications for Significant Additions and Significant Remodels of existing commercial and business establishments and existing multi-family complexes as defined in these Standards.

Projects and permits with a paid submittal of an application for City review dated on or after October 21, 2008, and prior to January 6, 2022, are required to comply with the earlier version of the Standards titled “Solid Waste and Recycling Enclosure Standards” adopted by the City Council on October 21, 2008 (Napa Resolution R2008-185).

The January 2022 Solid Waste, Recyclable Materials & Compostables Enclosure Standards can be found on the following site: WWW.CITYOFNAPA.ORG/832/ENCLOSURE-STANDARDS-UPDATE