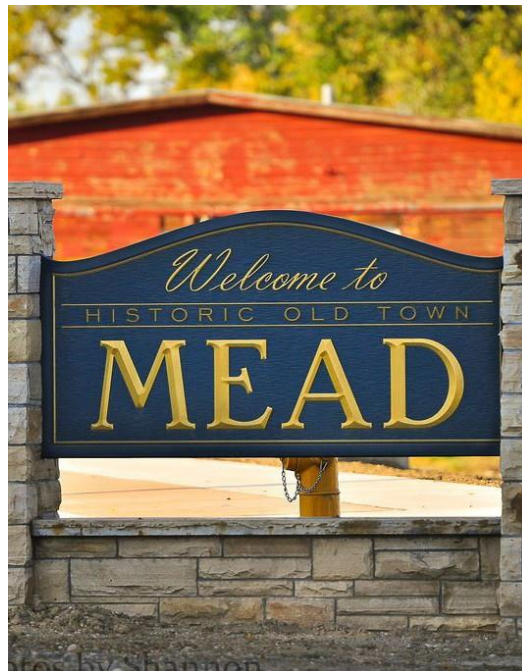




Design Standards and Construction Specifications

Effective: April 15, 2021



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Town of Mead Design Standards and Construction Specifications

CHAPTER 100 INTRODUCTION AND GENERAL PROVISIONS	3
101 INTRODUCTION	3
102 DEFINITIONS AND ABBREVIATIONS	3
103 GENERAL CONDITIONS	13
CHAPTER 200 DRAWINGS AND DESIGN REVIEW SUBMITTALS.....	17
201 CONSTRUCTION PLANS	17
202 PERMITS AND INSPECTIONS	56
CHAPTER 300 STREET AND ROADWAY DESIGN	63
301 GENERAL PROVISIONS	63
302 STREET ROADWAY DESIGN CRITERIA	63
303 PAVEMENT DESIGN ANALYSIS	72
304 TRAFFIC CONTROL DEVICES.....	78
305 CONSTRUCTION SPECIFICATIONS.....	85
306 STREET DETAILS.....	85
CHAPTER 400 SANITARY SEWER UTILITY	87
401 GENERAL PROVISIONS	87
402 GENERAL DESIGN CRITERIA – ALL SERVICE PROVIDERS.....	88
403 DESIGN CRITERIA - TOWN OF MEAD JURISDICTION	90
404 CONSTRUCTION SPECIFICATIONS.....	97
405 SANITARY DETAILS	97
CHAPTER 500 WATER UTILITY	99
501 GENERAL PROVISIONS	99
502 DESIGN CRITERIA.....	99
503 CONSTRUCTION SPECIFICATIONS.....	102
504 WATER DETAILS	102
CHAPTER 600 STORM DRAINAGE FACILITIES AND WATER QUALITY	103
601 GENERAL PROVISIONS	103
602 DESIGN CRITERIA.....	106
603 CONSTRUCTION SPECIFICATIONS.....	131
604 STORM DETAILS.....	132
CHAPTER 700 DRY AND NON-TOWN UTILITIES	135
701 GENERAL PROVISIONS	135
CHAPTER 800 LANDSCAPING, PARKS AND TRAILS	137
801 REGULATED AREAS AND DEVELOPMENT PROCESS	137
802 TRAILS, CONCRETE PATHS, AND BRIDGES	144
803 GRADING AND FINE GRADING	146
804 IRRIGATION	149
805 SEEDING.....	152
806 SODDING	153
807 CONSTRUCTION SPECIFICATIONS.....	153
808 LANDSCAPE AND IRRIGATION DETAILS	154

Town of Mead Design Standards and Construction Specifications

Tables and Figures

Table 300- 1: Street Design Criteria	67
Table 300- 2: Curb Radii Criteria	68
Table 300- 3: Minimum Acceptable Pavement Sections	72
Table 300- 4: Flexible Pavement Design Criteria	73
Table 300- 5: Pavement Strength Coefficients	78
Table 400- 1: Sanitary Sewer Slope Ranges per Pipe Size	92
Table 400- 2: Sewer Manhole Sizing for One Invert In and One Invert Out	94
Table 400- 3: Sewer Manhole Sizing Multiple Inverts In and One Invert Out	94
Table 400- 4: Sewer Drop Manhole Sizing	94
Table 600- 1: Point Precipitation Frequency Estimates in Inches	106
Table 600- 2: Recommended Percentage Imperviousness Values	109
Table 600- 3: Drainage Classification for Town of Mead Roadways	111
Table 600- 4: Minor (5-year) Storm Allowable Street Flow	111
Table 600- 5: Major (100-year) Storm Allowable Street Flow	111
Table 600- 6: Required Manhole Sizes.....	113
Table 600- 7: Summary of Channel Lining and Design Criteria	115
Table 600- 8: Minimum Design Storm Frequency by Land Use	117
Figure 600- 1:.....	133

Appendix A

- 31 00 00 Earthwork Specification**
- 31 25 00 Erosion and Sedimentation Control Specification**
- 32 12 00 Flexible Paving Specification**
- 32 13 00 Rigid Paving and Flatwork Specification**
- 33 01 30.7 CIPP for Sanitary Sewerage Rehabilitation Specification**
- 33 33 00 Sanitary Sewerage Utilities Specification**
- 33 40 00 Storm Drainage Systems Specification**
- 33 47 00 Landscape & Irrigation**

Appendix B

- Chapter 300 Street and Roadway Details**
- Chapter 400 Sanitary Sewer Details**
- Chapter 500 Water Utility Details**
- Chapter 600 Storm Drainage Details**
- Chapter 800 Landscape Details**

Town of Mead Design Standards and Construction Specifications

CHAPTER 100 INTRODUCTION AND GENERAL PROVISIONS

101 INTRODUCTIONS

101.1 General Provisions

- A. These regulations shall be known as the Town of Mead Design Standards and Construction Specifications for the Design and Construction of Public and Private Improvements, 2021 Edition, as may be amended from time to time by the Town and may be cited as such and shall be referred to herein as the “Standards and Specifications” or “Standards”.

101.2 Purpose

- A. The purpose of these Standards and Specifications is to provide minimum standards for safety, health, and the general welfare of the Town by regulating the design of, construction of, choice of materials used for, location of, maintenance and use of all Public and Private Improvements. These include, but are not limited to, sanitary sewer systems, water supply systems, private utility service lines for water and sewer, public and private storm drainage systems, public and private streets, landscape areas, open space, parks and recreation facilities, traffic signals and devices, public and private parking lots and appurtenances thereto. All equipment and material used in the construction of all Public and Private Improvements shall be new unless otherwise approved by the Town.
- B. These Standards and Specifications represent minimum requirements and design values. Additional requirements or higher design values, commensurate with conditions, may be required by the Town Engineer when they are in the best interest of the Town.

101.3 Scope

- A. The provisions of these Standards and Specifications shall apply to the planning, design, construction, enlargement, alteration, moving, removal, conversion, demolition, repair, and excavation of any Public or Private Improvements. These Standards and Specifications present the minimum standards for construction of Public and Private Improvements completed by Responsible Parties. These Standards and Specifications shall relate to the Town's capital improvement projects, unless otherwise noted in the contract documents. With the exception of maintenance practices, the Town shall follow these Standards and Specifications where practicable.
- B. In the case of those improvements that are required by the Town and are not specifically covered in these Standards and Specifications, the Town will require the Responsible Parties to follow applicable local, state, and federal guidelines, or standards promulgated by professional organizations. The Responsible Parties shall consult the Town Engineer for guidance on proper references.

102 DEFINITIONS AND ABBREVIATIONS

102.1 Definitions

Whenever the following terms are used in these Standards and Specifications, they shall be defined as follows:

Agreement – Any contract with the Town regarding provision by a property owner/developer for the construction of Public or Private Improvements, including but not limited to, annexation agreements, subdivision improvement agreements, and site plan agreements.

Alley – Minor or secondary way which is used primarily for vehicular services access to the back or side of properties otherwise abutting on a street.

Town of Mead Design Standards and Construction Specifications

Applicant – The owner of real property in relation to which a development or permit application has been submitted to the Town of Mead or such owner’s authorized representative(s).

Approved construction plans – Construction plans prepared in conformance with Chapter 200 of these Standards and approved by the Town of Mead.

Appurtenances – Visible, functional or ornamental objects accessory to and part of a building.

As-Built Plans – A modified version of the full set of the approved construction plans with actual physical documentation of any changes based on field measurements and certified by a Professional Engineer (PE) or Professional Land Surveyor (PLS).

Balled and Burlapped - Plant material established in the ground that is dug for transplanting with an undisturbed ball of earth containing the roots of the plant wrapped in burlap or other similar fabric.

Building – Any permanent structure built for the shelter or enclosure of persons, animals, chattels or property of any kind, which is governed by the following characteristics: is permanently affixed to the land, has one or more floors and a roof.

Building code – The set of standards that must be followed in the construction and remodeling of buildings and structures. The building code adopted by the Town is the International Building Code, in accordance Town Code Chapter 18, as may be amended from time to time.

Caliper - The diameter of the tree trunk measured six (6) inches above the ground for trees up to and including four (4) inch caliper size and 12 inches above the ground for larger sizes.

Clear Zone - The minimum width of an area adjacent to a pedestrian pathway or fire hydrant or other utility structure.

Comprehensive Plan – The Mead Comprehensive Plan, as may be amended from time to time, adopted by the Planning Commission and Board of Trustees in accordance with Section 31-23-206, C.R.S., to guide the future growth, protection and development of the Town, affording adequate facilities for housing, transportation, comfort, convenience, public health, safety and general welfare of its population.

Connecting Walkways – Any street sidewalk or any walkway that directly connects a building entrance to the street sidewalk and connects other origins and destinations for pedestrians, including but not limited to commercial establishments, schools, parks, dwellings, work places and transit stops, without requiring pedestrians to walk across parking lots or driveways, around buildings or following parking lot outlines which are not aligned to a logical route.

Conditional Acceptance – Acknowledgment in accordance with Section 202.8 of these Standards.

Contractor – An individual, partnership, corporation, subcontractor or other legally formed entity or organization that undertakes to construct, install, alter, move, demolish, repair, replace, excavate or add to any Public or Private Improvements covered by these Standards and Specifications.

Crosswalk – Pathway delineated for pedestrians to cross a street.

Cul-de-sac – A local street with only one outlet and having the other end for the reversal of traffic movement.

Days - Calendar days, unless otherwise specified.

Deciduous - A plant with foliage that is shed annually.

Town of Mead Design Standards and Construction Specifications

Detention Basin – A man-made or natural water collection facility designed to collect surface and subsurface water in order to impede its flow and to release the same gradually at a rate not greater than that prior to the development of property, into natural or manmade outlets.

Developer - See Applicant.

Development – The carrying out of any building activity or mining operation, the making of any material change in the use or appearance of any structure or land or the dividing of land into two or more parcels. When appropriate in context, development shall also mean the act of developing or the result of development.

Land Use Code - Chapter 16 of the Town Code established in accordance with the Comprehensive Plan for the purpose of promoting the health, safety, morals, and the general welfare of the Town in connection with development.

Development Plan – The written and graphical documents that detail the provisions for development of a PUD. These provisions may include, and need not be limited to, easements, covenants and restrictions relating use; location and bulk of building and other structures; intensity of use or density of development; utilities, private and public streets, ways, roads, pedestrian areas, and parking facilities; common open space; and other public facilities.

Dripline - A vertical line extending downward from the tips of the outermost branches of a tree or shrub to the ground.

Drive Aisles – The lanes in a parking lot devoted to the passage of vehicles, as opposed to the parking stalls. The term drive aisle does not include lanes used only or primarily for drive-in customer service.

Driveway – A constructed vehicular access serving one or more properties and abutting a public or private road.

Dwelling – A building used exclusively for residential occupancy, including single-family dwellings, two family dwellings and multi-family dwellings.

Easement – A right to land generally established in a real estate deed or on a recorded plat to permit the use of land by the public utility, a corporation or particular persons for specified uses.

Evapotranspiration - A measure of water depletion from the soil due to evaporation from the soil surface and transpiration through plant foliage.

Evergreen - A plant with foliage that persists and remains green year-round.

Final Acceptance – The acknowledgement by the Town that the warranty period has expired and there are no outstanding items to be corrected, in accordance with Section 202.9 of these Standards and any applicable agreement.

Floodplain or Flood Hazard Area – Areas which have been designated by the Board of Trustees, the Colorado Water Conservation Board or FEMA as susceptible to flooding.

Floodway – The channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot.

Geologic Hazards – Unstable or potentially unstable slopes, undermining, faulting, landslides, rockfalls, flood, wildfire or similar naturally occurring features or soil conditions or natural features unfavorable to development.

Town of Mead Design Standards and Construction Specifications

Grade - The average of the finished ground surface elevations measured at the highest and lowest exterior corners of a structure; or the slope of a road, street or other public way, or the slope of the ground surface elevations.

Grade, Finished – The final elevation of the ground surface after development.

Grade, Natural – The elevation of the ground surface in its natural state before man-made alterations.

Grading - The act of excavating or filling or combination thereof which changes the existing topography.

Ground Cover - Living plant material, other than turf grass, normally reaching an average maximum height of not more than 24 inches at maturity and which grows or spreads in such a manner as to provide continuous plant coverage. Annuals, herbaceous perennials, weeds, mulches and deciduous tree canopies are not ground cover.

Ground Cover, Woody - Evergreen perennial and sub-shrub plant material such as Mahonia depends, Vinca Minor, and Euonymus Fortunei 'Coloratus' that satisfies Tree Equivalent requirements.

Hardscape - Non-living site improvements at the ground plane such as pavement, walkways, parking areas, and other similar improvements as determined by the Town.

Improvements – Both public and private improvements as defined herein.

Impermeable Surface – An area of land that does not allow the penetration of water or liquid to dissipate into the underlying soil due to man-made coverings over the soil (examples may include, but are not limited to, asphalt paving, concrete paving, roofs, etc.)

Infrastructure – Those man-made structures which serve the common needs of the population, such as: potable water systems; wastewater disposal systems; solid waste disposal sites or retention areas; storm drainage systems; electric, gas or other utilities; bridges; roadways; bicycle paths or trails; pedestrian sidewalks, paths or trails; and transit stops.

Inspector – The Town Engineer or the authorized representative of the Town Engineer assigned to make detailed inspection of construction work to ensure compliance with these Standards and Specifications and the plans as approved by the Town.

Irrigation Controller – A fully automatic, electrically operated mechanism used to regulate the timing of irrigation valve operations.

Irrigation System – An artificial watering system designed to transport and distribute water to landscape plant material.

Landowner – Any owner of a legal or equitable interest in real property, and including the heirs, successors and assigns of such ownership interests.

Landscape - Any combination of living plant material, such as trees, shrubs, plants, vegetation ground cover or turf grasses, and may include structural features such as walkways, fences benches, works of art, reflective pools, fountains or the like. Landscaping shall also include irrigation systems, mulches, topsoil, soil preparation, revegetating or the preservation, protection and replacement of existing trees.

Landscape Area - The land area within a lot or property not comprised of buildings and hardscape and that is planted with cultivated vegetation at the ground plane. Landscape Area does not include

Town of Mead Design Standards and Construction Specifications

bare dirt or weeds. Areas dedicated to edible plants such as orchards or vegetable gardens may be included in the calculation of Landscape Area as approved by the Town.

Landscape Area, Private Common - A Landscape Area within a development owned and maintained by an owner's association or Title 32 special district.

Landscape Canopy - The upper vegetative cover of a tree or plant material grouping and may also be referred to as "overstory".

Landscape Fabric - A porous geotextile fabric installed below mulch.

Landscape Mitigation Plan - A plan for the replacement of plant material that is removed, destroyed or otherwise negatively affected by the development of a property.

Landscape Plan - A plan drawn to scale that shows the layout of all landscape components and their specifications for a site.

Lane – A private street; a portion of a roadway delineated for a single line of vehicles; or a secondary means of access to the abutting lots not intended for general traffic circulation.

Lot –A designated parcel, tract or area of land established by plat or subdivision of at least a sufficient size to meet minimum requirements for use, street frontage coverage and area, and to provide required yards and other open spaces in the zoning district in which the lot is located and which has direct access to a public or private street.

Moderate Water Demand Landscape – Landscape areas that require approximately 50-75% of Reference Evapotranspiration, or 10-14 gallons per square foot per average year.

Mulch - Nonliving organic wood, rock or stone materials used in the landscape industry to cover bare ground, to provide a protective covering around plants and to retard erosion, retain soil moisture, reduce weed growth, and maintain even soil temperatures.

Open Space - Open space means any land or water area with its surface open to the sky, which serves specific uses of: providing park and recreation opportunities; conserving natural areas and environmental resources; structuring urban development form; and protecting areas of agricultural, archeological or historical significance. Open space shall not be considered synonymous with vacant or unused land but serves important urban functions. Usable open space shall exclude areas used for off-street parking, off-street loading, service driveways, areas less than thirty (30) feet in width, drainage swales and setbacks from oil and gas wells and their appurtenances, or other hazards to the public. Credit toward the *open space* dedication requirements (including, up to fifty percent (50%) of the total acreage allocated to drainage facilities) will be considered on a case-by-case basis by the Board of Trustees at the time of platting. Refer to Town of Mead Municipal Code for additional requirements.

Owner - Any individual, corporation, partnership, or other legal entity holding title to real property which is the subject of improvements covered by these Standards and Specifications, including Public Improvements.

Parcel – A tract or plot of land.

Park – An area open to the general public and reserved for recreational, educational or scenic purposes.

Parking Garage – An off-street parking area within a building.

Parking Lot – An off-street parking area or vehicular use area.

Town of Mead Design Standards and Construction Specifications

Phase – A portion of property that is being platted and engineered for development at the same time.

Plan – The maps and supporting documentation for a development which includes, but is not limited to, lots, blocks, easements, right-of-way, pedestrian ways, park and school sites, open space areas and conservation areas in accordance with the requirement of this code.

Planned Unit Development – A project of a single owner or a group of owners acting jointly, involving a related group of residences, business or industries and associated uses. Planned as a single entity, the project is subject to development and regulations as one land-use unit rather than as an aggregation of individual buildings located on separate lots. The Planned Unit Development includes usable, functional open space for the mutual benefit of the entire tract and is designed to provide variety and diversity through the variation of normal zoning and subdivision standards so that maximum long-range benefits can be gained and the unique features of the development or site are preserved and enhanced while still being in harmony with the surrounding neighborhood. Approval of a Planned Unit development does not eliminate the requirements of subdividing and recording a plat.

Planning Area Boundary – The area surrounding the Town that the Town will consider annexing and developing. The Planning Area Boundary is delineated on the Future Land Use Map in the Mead Comprehensive Plan.

Plant Material Protection Zone - An area fenced off from use during construction to protect plant material from potential damage.

Plat – A map of certain described land prepared in accordance with the requirements of the Town Code and Section 38-51-106, C.R.S, as an instrument.

Person – An individual firm, organization, corporation, partnership or other legal entity including Contractors or subcontractors authorized to act on behalf of an owner.

Private Improvements - Improvements under private ownership or control and/or maintained by the private owners, including but not limited to, portions of water systems, sewer systems, street systems and storm drainage systems, the construction of which are governed by these Standards and Specifications.

Project – The development project undertaken by an Applicant/Owner.

Property – All real property subject to land use regulation by the Town.

Property Lines – The boundary of any lot, parcel or tract as the same is described in the conveyance of such property to the owner and does not include the streets or alleys upon which said lot, parcel or tract abuts.

Public areas – Streets, parks, open spaces and other property designated or described as for public use on a map or plat of the Town and fee title is vested in the Town, other public body or a special district as defined in Section 32-1-103, C.R.S.

Public Facilities – Those constructed facilities, including but not limited to transportation systems or facilities, water systems or facilities, wastewater systems or facilities, storm drainage systems or facilities, fire, police and emergency systems or facilities, electric, gas, telecommunication utilities or facilities and publicly owned building or facilities.

Public Improvements - Improvements under the ownership or control of the Town or other public entity and maintained by the Town or other public entity including but not limited to the components of the water system, sewer system, street system, park and open space system, and storm

Town of Mead Design Standards and Construction Specifications

drainage system covered by these Standards and Specifications. The term also includes similar improvements being built in connection with a subdivision that are intended to be dedicated to the Town or other public entity.

Public Open Space – An open space area conveyed or otherwise dedicated to the Town, Title 32 special district, state or County or other public body for recreational or conservation uses.

Public Use – Uses which are owned by and operated for the public by the Town, Title 32 special district, County, state or federal governments or by school districts.

Public Utility – A common carrier supplying electricity, wire telephone service, natural gas, water, wastewater or storm water service or similar public services, but shall not include railroads or other forms of rail mass transit or depots or terminals supporting the same, or wireless telecommunication facilities.

Rain Sensor or Rain Shutoff Device - A device connected to an irrigation controller that overrides scheduled irrigation when significant precipitation has been detected.

Responsible Party – The Applicant and/or Owner, as applicable, obligated to construct or cause to be constructed Public and/or Private Improvements as part of a development.

Right-of-way – Real property occupied or intended to be occupied by a street, crosswalk, railroad, road, electric transmission line, oil or gas pipeline, water main, sanitary or storm sewer main or other public use relating to vehicular, pedestrian, or equestrian movement, including public utilities located or intended to be located therein. Right-of-way is separate and distinct from lots or parcels adjoining such right-of-way.

Service Area - An area, whether inside or outside Town limits, that receives water and/or sanitary sewer utility service from the Town of Mead or other provider

Soil Amendment - Organic and inorganic materials added to soil to improve texture, nutrients, moisture holding capacity, and infiltration rates.

Stop Work Order – Official written notice from the Town to cease any and all construction or development activities on a site or lot due to a violation of, including but not limited to, the approved construction plans, the Town Code, the Standards and Specifications, building code, or storm water runoff regulations. This notice may include restrictions on issuance of building permits, certificates of occupancy, and additional provisions of utility services until the identified violations are corrected and approved by the Town.

Street Tree - A tree planted within the street right-of-way between the curb or edge of road and the adjoining property line to provide shade and spatial definition, and to enhance the street environment.

Surety - Performance, labor and material payment bonds, irrevocable letters of credit, cash, and other instruments of security furnished to the Town by the developer.

Tree Equivalent – One (1) balled and burlapped two (2) inch caliper or six (6) foot tall clump deciduous tree or six (6) foot tall evergreen tree or ten (10) No. 5 container size evergreen or deciduous shrubs or twenty (20) No. 1 container size woody, evergreen perennial ground covers or ornamental grasses or other substitutions as may be allowed in the Development Permit process.

Town - Town of Mead, Colorado, or the area within the territorial limits of the Town of Mead, Colorado, and such territory outside of the Town over which the Town has jurisdiction or control by virtue of any constitutional or statutory provision.

Town of Mead Design Standards and Construction Specifications

Town Code - The latest, officially adopted version of the Town of Mead Municipal Code.

Town Engineer –The Town of Mead Town Engineer or an authorized designee.

Turfgrass (Turf) – A continuous ground cover of improved grass plants growing intimately with an upper soil stratum of intermingled roots and stems.

Vegetation - Plants in general or the sum total of plant life in an area.

Warranty Period - Guaranty period in accordance with Section 202 of these Standards and any applicable agreement(s).

Wetland – An area defined and controlled by the Army Corps of Engineers that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support vegetation, and that under normal circumstances, will support a prevalence of vegetation typically adapted for life in saturated soil conditions.

Work – Activity conducted in connection with construction of Public and/or Private Improvements, including but not limited to the erection, demolition, assembling, altering, installing, or equipping of buildings, structures, roads, infrastructure, or appurtenances thereto, including land clearing, grading, excavating, and filling.

102.2 Abbreviations and Acronyms

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Content
AC	Alternating Current
ACI	American Concrete Institute
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
AISC	American Institute of Steel Construction
ALCC	Associated Landscape Contractors of Colorado
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATSSA	American Traffic Safety Services Association
AWWA	American Water Works Association
AWG	American Wire Gauge
BMP	Best Management Practice
CBR	California Bearing Ratio
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CDPS	Colorado Discharge Permit System
cfs	cubic feet per second

Town of Mead Design Standards and Construction Specifications

CP	Colorado Testing Procedures
CP-L	Colorado Lab Testing Procedures
CPSC	Consumer Product Safety Commission
CRS	Colorado Revised Statute
CUHP	Colorado Urban Hydrograph Procedure
CWCB	Colorado Water Conservation Board
DIP	Ductile Iron Pipe
DRC	Dry-Rodded Condition
DU/Ac	Dwelling Units per Acre
EDLA	Equivalent Daily Load Application
EGL	Energy Grade Line
ESAL	Equivalent Single Axel Load
ET	Evapotranspiration
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHA	Federal Housing Administration
fps	Feet per second
Gal	gallons
gpd	Gallons per day.
gpm	Gallons per minute.
GRC	Galvanized Rigid Conduit.
GVW	Gross Volume Weight
HDPE	High Density Polyethylene
HGL	Hydraulic Grade Line
HMA	Hot Mix Asphalt
IMSA	International Municipal Signal Association
IPC	International Plumbing Code
IPEMA	International Play Equipment Manufacturers Association
ISA	International Society of Arboriculture
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
LABCAT	Laboratory for Certification of Asphalt Technicians

Town of Mead Design Standards and Construction Specifications

Lbs	pounds
PLS	Professional Land Surveyor
MAPC	Manual of Accident Prevention in Construction
MGD	Million gallons per day
MHFD	Mile High Flood District
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PC	Point of Curvature
PCC	Portland Cement Concrete
PE	Professional Engineer
PG	Performance Grade
PI	Point of Intersection
PRC	Point of Reverse Curve
PRV	Pressure Reducing Valve
psi	Pounds per square inch
PT	Point of Tangency
PUD	Planned Unit Development
PVC	Polyvinyl Chloride
RAP	Reclaimed Asphalt Pavement
RCP	Reinforced Concrete Pipe
ROW	Right-of-way
RPS	Roller Pass Study
SDR	Standard Dimension Ratio
sf	Square Foot
SZFL	School Zone Flashing Light
SMA	Stone Mastic Asphalt
SN	Structural Number
SUE	Subsurface Utility Engineering
SWMP	Stormwater Management Plan

Town of Mead Design Standards and Construction Specifications

UL	Underwriters Laboratories, Inc.
UDFCD	Urban Drainage and Flood Control District
USGS	United States Geological Survey
USACE	United State Army Corps of Engineers
USDCM	Urban Storm Drainage Criteria Manual
VCA	Voids in the Coarse Aggregate
VFA	Voids Filled with Asphalt
VMA	Voids in the Mineral Aggregate
VTM	Voids in the Total Mix
WMA	Warm Mix Asphalt
WQCD	Water Quality Control Division

102.3 Terms

- A. Whenever, in these Standards and Specifications, the words "as ordered", "as directed", "as required", "as permitted", "as allowed", or words or phrases of like meaning are used, it shall be understood that the order, direction, requirement, permission, or allowance of the Town is intended.
- B. Similarly, the words "approved", "reasonable", "suitable", "acceptable", "properly", "satisfactory", or words of like meaning, unless otherwise specified herein, shall mean approved, reasonable, suitable, acceptable, proper, or satisfactory in the judgment of the Town.
- C. Whenever, in these Standards and Specifications, the words "Town Engineer" are used, it shall be understood that the Town employee named therein shall be whoever is designated by the Town Manager or Town Engineer.
- D. "Shall" indicates a mandatory action or provision, and "may" indicates a permissive action or provision.
- E. Terms not otherwise defined herein shall have the meaning set out in the Town Code.

103 GENERAL CONDITIONS

103.1 Authority by the Town

- A. Engineering and Landscaping Services:

The developer shall procure at its sole expense all engineering and landscaping services necessary and appropriate in conjunction with the development of the property, which shall fully conform to the Town's applicable ordinances, and these Standards and Specifications. Professional services shall be performed by engineers, surveyors, landscape architects, or other professionals duly licensed by the State of Colorado as may be appropriate.

- B. The Responsible Party shall pay all installation charges for water, sanitary, sewer, lighting, communications, electric, and/or gas services required by the appropriate service provider for the property/project. Payment for street lights shall be made in a timely fashion to assure that street lights within and adjacent to residential lots are installed prior to request for certificate of occupancy of the adjacent lots. At the discretion of the Town Engineer the Town may

Town of Mead Design Standards and Construction Specifications

withhold inspections and/or Conditional Acceptance if the street lights have not been installed prior to certificate of occupancy.

C. Variances

Whenever there are practical difficulties involved in carrying out the provisions of these Standards and Specifications, the Town Engineer may grant variances for individual cases, provided that The Town Engineer shall first determine that a specific reason exists making these procedures impractical and that the variance is in conformance with the intent and purpose of these Standards and Specifications, and providing that such variance does not lessen any design requirement or any degree of integrity and shall result in a level of safety, service and quality equal to or greater than that intended by the application of the Standards and Specifications minimum requirements. The Responsible Party shall provide a written request for variance, and if approved by the Town, a variance will be issued in writing by the Town Engineer, stating what the variance is and why it is being granted.

D. Alternate Materials and Methods of Construction

1. The provisions of these Standards and Specifications are not intended to prevent the use of any material or method of construction not specifically prescribed by these procedures, provided any alternate in the Standards and Specifications is approved in writing by the Town Engineer, and thus authorized by the Town.
2. The Town Engineer shall require that sufficient evidence or proof be submitted to substantiate any request that may be made regarding the alternate method or material. The details of any action granting approval of an alternate shall be recorded and filed with the Town.

E. Tests

1. The Responsible Party shall employ at its sole expense a professionally qualified, independent third-party testing company to perform all testing of materials or construction that may be required by the Town to ensure compliance with these Standards and Specifications. The Responsible Party shall furnish the Town with certified copies of test results and agrees to release and authorize full access to the Town and its designated representatives to all work-up materials, procedures, and documents used in preparing the test results.
2. Whenever there is insufficient evidence of compliance with any of the provisions of these Standards and Specifications or evidence that any material or construction does not conform to the requirements herein, The Town Engineer may require that the Responsible Party, at its expense, shall provide test results to establish compliance. Such tests shall be as specified by these Standards and Specifications or by other recognized test standards approved by The Town Engineer. If there are no recognized and accepted test methods for the proposed alternate, The Town Engineer shall determine test procedures. All tests shall be made by an agency approved prior to testing by The Town Engineer.

F. Organization and Enforcement

1. The Town shall have the power to enforce all provisions of these Standards and Specifications.

G. Control of Work

1. Authority of Town Engineer

The Town Engineer shall resolve all questions which arise as to the quality and acceptability of materials furnished, work performed, interpretation of applicable plans and

Town of Mead Design Standards and Construction Specifications

specifications, including approved a construction plans, and acceptable fulfillment of the requirements of these Standards and Specifications.

2. Authority and Duties of Inspector

- a. Inspectors are authorized to inspect all work completed and all material furnished. Inspections may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. The Inspector is not authorized to revoke, alter, or waive any requirements of these Standards and Specifications. The Inspector shall notify the Responsible Party of any failure of the work or materials nonconformity of these Standards and Specifications. The Inspector shall have the authority to reject materials until any questions at issue can be resolved by the Town Engineer.
- b. The Inspector shall, in no case, act as foreman or perform other duties for the Responsible Party or interfere with the management of the work done by the Responsible Party. Any statements made by Inspector shall not be construed as binding upon the Town in any way or release the Responsible Party from fulfilling applicable requirements of these Standards and Specifications.
- c. The presence or absence of the Inspector shall not relieve, in any degree, the responsibility or the obligation of the Responsible Party to follow these Standards and Specifications.
- d. The Town Engineer, or an authorized designee, shall, at all times, be provided reasonable and safe access to inspect the work whenever it is in preparation or progress.

3. Responsible Party's Responsibility for Work:

In case of suspension of work for any cause whatsoever, the Responsible Party, before leaving the job site, shall take such precautions as may be necessary to prevent damage to the work, provide for proper drainage and erect any necessary barricades, signs, or other facilities, at the Responsible Party's expense, as required by applicable standards.

4. Removal of Unacceptable Work:

Work that does not conform to applicable plans, including approved construction plans, and these Standards and Specifications, and results in an inferior or unsatisfactory product, shall be considered unacceptable work. Unacceptable work, whether the result of poor workmanship, poor design, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final approval of the work. This expense includes total and complete restoration of any disturbed surface to original or better than the original condition which existed before the repairs or replacement, regardless of improvements on lands where the repairs or replacement are required.

5. Requirements of Other Jurisdictions:

Where proposed construction will affect other agencies or utility providers such as CDOT, adjacent cities and counties, railroads, ditch companies, Xcel, United Power, Little Thompson Water District, Longs Peak Water District, St. Vrain Sanitation District, or other public entities or service providers, said construction shall be subject to the review and approval of applicable entities. Generally, where more than one requirement is imposed, the more restrictive requirement shall govern. Exceptions must be authorized by the Town Engineer in writing.

103.2 Utility Location Requirements for Design

- A. Per the provisions of the Colorado Revised Statutes Section 9-1.5-101, et seq. (also referred to as Colorado Senate Bill 18-167), projects that meet all of the following four (4) criteria are

Town of Mead Design Standards and Construction Specifications

required to meet Quality Level B for design utility locations as identified in the subsurface utility engineering (SUE) standard ASCE 38.

1. Project involves a construction contract with a public entity.
 2. Project involves primarily horizontal construction and does not involve primarily the construction of buildings.
 3. Anticipated excavation footprint exceeds two (2) feet in depth and is a contiguous 1000 square feet (excluding fencing and signing projects) OR involves utility boring.
 4. Project requires the design services of a licensed PE.
- B. For all projects that fall under SUE the following requirements must be initiated as part of the project design.
1. A thorough subsurface utility engineering investigation that takes the results of any comprehensive geophysical services for known and unknown utilities and integrates the results of the geophysics with existing records and physical evidence in a risk-based depiction
 2. Test holes where needed for utility locations
 3. Utility location data that is transmitted to the Design Engineer in order to make informed design decisions and the Quality Level of each utility is marked on the construction plans in conformance with Section 201 of these Standards.
 4. All of the utility investigation must take place under the direct responsible charge of a licensed Professional Engineer with training and a working knowledge of surface geophysics, engineering surveying, utility construction and design principles, utility conflict identification resolution, and utility risks as they pertain to the project.
- C. The Standards and Specifications are not intended to alter the requirements of or to conflict with the Colorado Revised Statutes Section 9-1.5-101, et seq.

Town of Mead Design Standards and Construction Specifications

CHAPTER 200 DRAWINGS AND DESIGN REVIEW SUBMITTALS

201 CONSTRUCTION PLANS

201.1 Purpose Statement

In addition to any other requirements for the issuance of a construction permit pursuant to the Town Code, the Responsible Party shall submit to the Town Engineer, prior to or contemporaneously with the application for construction permit, plans, engineering calculations, traffic reports, stormwater reports, utility reports, geotechnical reports and other data as required to allow the Town Engineer to determine compliance with these Standards and Specifications. All such reports, plans, computations, and specifications shall be prepared and designed by a professional engineer licensed in the State of Colorado, in accordance with the rules and laws of the Colorado Board of Registration of Professional Engineers. All park construction plans shall be prepared and designed by a professional landscape architect.

The Town Engineer may waive the submission of plans, calculations, or other analysis, if in the Town Engineer's judgment, the nature of the work applied for is such that reviewing of plans is not necessary to obtain compliance with these Standards and Specifications.

201.2 Construction Plan Requirements

Construction plans shall be checked for conformance with Town minimum design standards prior to approval by the Town. This approval shall be for conformance to Town design standards and other requirements; engineering and landscaping design or needs shall remain the responsibility of the professional design engineer or landscape professional. Construction plans and all required reports shall be submitted in an electronic format to the Town Engineer for review. The drawings shall be submitted in "pdf" format. Once all review comments have been addressed and the plans are final, four (4) sets of plans, signed and sealed by a professional engineer, or as appropriate by a landscape architect, shall be submitted and retained. One (1) set of construction plans shall be 24" x 36" in size and three (3) sets shall be 11"x17" in size. The approval of all required reports and construction plans is valid for one (1) year.

A. General Requirements

1. Plans and specifications shall be drawn to scale and shall have sufficient clarity to indicate the location, nature, and extent of the work proposed and show in detail that it shall conform to the provisions of these Standards and Specifications and all relevant laws, ordinance, rules and regulations.
2. The following items shall be shown on all plans:
 - a. Cover Sheet, including Title Block (lower right-hand corner preferred).
 - b. Scale (1"=50' horizontal and 1"=5' vertical for plans and profiles are a minimum).
 - c. Legend including all line types and symbols.
 - d. Revision number and date.
 - e. Name of professional engineer or landscape architect and firm.
 - f. Professional engineer's (PE) number, signature, landscape architect as applicable, and stamp.
 - g. Town of Mead General Notes.
 - h. Drawing number(s).
 - i. Horizontal and vertical coordinate systems
3. Town of Mead Waiver Statement: The following statement shall be included on the cover page of all plan sets:

Town of Mead Design Standards and Construction Specifications

a. TOWN OF MEAD WAIVER STATEMENT

ALL WORK SHALL BE CONSTRUCTED TO THE TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS. THESE PLANS HAVE BEEN REVIEWED BY THE TOWN OF MEAD FOR CONCEPT ONLY AND GENERAL CONFORMANCE WITH THE TOWN'S STANDARDS AND SPECIFICATIONS. THE REVIEW BY THE TOWN OF MEAD DOES NOT IMPLY RESPONSIBILITY BY THE TOWN OF MEAD OR THE TOWN ENGINEER FOR ACCURACY AND CORRECTNESS OF THE PLANS OR CALCULATIONS. FURTHERMORE, THE REVIEW DOES NOT IMPLY THAT QUANTITIES OF ITEMS ARE THE FINAL QUANTITIES REQUIRED. THE REVIEW SHALL NOT BE CONSTRUED IN ANY REASON AS ACCEPTANCE OF FINANCIAL RESPONSIBILITY OF THE TOWN OF MEAD FOR ADDITIONAL QUANTITIES OF ITEMS SHOWN THAT MAY BE REQUIRED DURING THE CONSTRUCTION PHASE. THIS APPROVAL IS FOR CONFORMANCE TO THESE STANDARDS AND SPECIFICATIONS AND OTHER TOWN REQUIREMENTS. THE DESIGN AND CONCEPT REMAINS THE RESPONSIBILITY OF THE PROFESSIONAL ENGINEER OR LANDSCAPE PROFESSIONAL.

4. The Town of Mead Approval Block shall be included on all plan sheets

TOWN OF MEAD APPROVAL	
THESE PLANS ARE HEREBY APPROVED FOR ONE YEAR FROM DATE OF THE TOWN ENGINEER'S APPROVAL.	
APPROVED BY:	
_____	_____
TOWN ENGINEER	DATE

B. Plan Details

1. Key Map
2. Legend of symbols
3. North arrow, pointed to the top of the page, or to the right side of the page
4. Property lines - Indicate lots with lot number and block number to be served by solid lines
5. Survey monuments
6. Ownership or subdivision information
7. Street names, ROW, and easements with width dimensions
8. The location of existing utility lines - water, gas, telephone, storm drain, irrigation ditches, sanitary sewers, and other pertinent details, such as houses, curbs, water courses, cable television, etc.
9. Vicinity map
10. All bench marks
11. If irrigation ditches are involved, an approval block for the ditch company shall be provided.

C. Profile Details

1. Vertical and horizontal grids with scales and stationing.

Town of Mead Design Standards and Construction Specifications

2. Ground surface existing (dashed) and proposed (solid)
 - a. Existing utility lines
 - b. Bench marks (Town of Mead 88 datum) and project bench mark noted
 - c. Existing manhole inverts and rim elevations
- D. Overall Utility Plan (Single Sheet)
- E. Water Construction Plan

Water construction plans shall follow the appropriate water district requirements. In addition to the above general plan and profile details, all water supply construction plans shall include the following items at a minimum:

 1. Proposed water mains (Include Profile):
 - a. Size
 - b. Length
 - c. Materials, types of joints, and proposed depth
 - d. Location dimensions. Other information including elevation at/of top of valve nut, rim elevation of valve box, meter box, etc. may be required.
 2. Fittings (size and type), for example:
 - a. Tees
 - b. Crosses
 - c. Reducers
 - d. Bends
 - e. Plugs
 - f. Blow-offs
 - g. Kickblocks
 3. Valves (size and type)
 4. Fire Hydrants
 5. Irrigation tap locations and meter sizes with spot elevations.
 6. Plan, profile, and complete details for offsite transmission mains, pump stations, valves, vaults, tanks, service locations, etc.
 7. Complete material list included in drawings
 8. Crossings (clearance, show sleeving, if needed) Details
 9. Detail Sheets with all pertinent Details
- F. Sanitary Sewer Construction Plans

In addition to the general plan and profile details, sanitary sewer construction plans shall include the following:

 1. Proposed sanitary sewers (Profile Sheets):
 - a. Diameters
 - b. Materials and types of joints
 - c. Gradients
 - d. Length between manholes

Town of Mead Design Standards and Construction Specifications

2. Proposed manholes and cleanouts:
 - a. Stationing and other number designation
 - b. Elevation of inverts in and out of manhole
 - c. Elevation of manhole rim
3. Location control dimension
4. Manhole stub-outs
5. Proposed future extensions
6. Proposed wye and riser connection for services
7. Proposed service connections or stub-ins
8. Proposed underdrain
9. Proposed concrete encasement
10. Proposed cutoff walls

G. Storm Drainage Construction Plan

In addition to the above general plan and profile details, storm drainage construction plans shall include the following:

1. Drainage area plan; an overall plan of the area under study showing:
 - a. North arrow
 - b. Contours on site and off site
 - c. Location and elevation of City or USGS bench marks
 - d. USGS datum
 - e. Property lines
 - f. Boundary lines (counties, districts, tributary area, etc.)
 - g. Streets and street names and approximate grades
 - h. Subdivision (name and location by section)
 - i. Existing irrigation ditches
 - j. Existing drainage ways including gutter flow directions
 - k. Drainage sub-area boundaries
 - l. Easements required
 - m. Proposed curbs and gutters and gutter flow directions
 - n. Proposed cross pans and flow directions
 - o. Proposed piping and open drainage ways
 - p. Flow volumes for the five (5) year and 100-year storm runoff conditions. (Identify at inlets and outfalls)
 - q. Path of 100-year storm runoff flows delineated
 - r. Critical minimum finished floor elevations for protection from 100-year runoff
 - s. Proposed inlet locations and inlet sizes
 - t. Floodplain information, indicating land in floodplain, and land not in floodplain
 - u. Path of the emergency overflow spillway

Town of Mead Design Standards and Construction Specifications

- v. High water line and overland flow path for all inlets in sags and for all culverts under inlet control conditions
 - w. Area grading plans for final stage
 - x. Plant material protection plan
 - y. Riprap size
2. Proposed pipes
 - a. Plan showing stationing
 - b. Profile (include 5 and 100-year HGLs)
 - c. Size, lengths between manholes, and type material
 - d. Grades, capacity
 - e. Inlet and outlet details
 - f. Manhole details (station number and invert elevations)
 - g. Typical bedding detail
 3. Proposed open channels and detention facilities
 - a. Plan showing stationing
 - b. Profile (include the 5 and 100-year HGLs)
 - c. Grades and capacities
 - d. Typical cross sections for both channels and basins
 - e. Lining details
 4. Proposed special structures (manholes, headwalls, trash racks, etc.)
 - a. Plan
 - b. Elevation
 - c. Details of design and appurtenances
 5. Retaining Walls
 - a. Retaining walls equal to or greater than four (4) feet are required to be designed and stamped by a registered professional engineer and must be approved and permitted through the Town.
 - b. Retaining walls must have sufficient resistance against overturning and sliding, and they must possess adequate structural strength against bending outward.
 - c. The retaining wall submittal package shall be in accordance with the following outline and contain the applicable information listed:
 - i. Plans.
 - ii. Spot elevations.
 - iii. All proposed retaining walls should show top and bottom of wall elevations every 10 feet or on both sides of a step.
 - iv. Sections.
 - v. Details to include geofabric, drainage, foundation, etc.
 - vi. Calculations.
 - vii. A Geotechnical Report – type of soils, specific weight, allowable bearing pressure, etc.
 - viii. Loading diagram - include surcharge loads and slopes.

Town of Mead Design Standards and Construction Specifications

- ix. Factor of Safety against overturning shall be a minimum of 1.5 for granular soils (i.e. sand) and 2 for cohesive soils (i.e. clay).
- x. Factor of Safety against sliding shall be a minimum of 2 which includes the passive resultant.
- xi. For multiple tiered walls loads from upper wall need to be applied to the lower wall. In addition, the walls need to be analyzed as a single unit for bearing failure and slope stability.

H. Storm Water Management Plan (SWMP)

1. All new development and redevelopment projects are required to develop and implement a SWMP to reduce and ensure that BMP's are in place to prevent or minimize pollutants in stormwater runoff from construction activities that disturb one or more acres; or less than one acre if part of a larger common plan of development or sale that discharge storm water into the Town's storm water system.
2. Stormwater Management analysis and design shall meet or exceed these Standards and Specifications which were developed to support and supplement the policies and standards set forth by the Colorado Department of Public Health and Environment (CDPHE) and Mile High Flood District (MHFD). Policies and technical criteria not specifically addressed in this document shall follow the provisions of the CDPHE Colorado Water Quality Control Division (CWQCD) and the Urban Storm Drainage Criteria Manual (USDCM). The Responsible Party is also referred to the Colorado Department of Transportation's Standard Plans ("M-Standards") for additional design details not covered in these Standards and Specifications or the USDCM.
3. Development or redevelopment projects which disturb one (1) or more acres will require both sediment and erosion control plans and a CDPS General Permit for stormwater discharges associated with construction activities at least 10 calendar days prior to the commencement of construction activities. In fill lots or sites less than one acre of disturbance will require a sediment and erosion control plan.
4. The SWMP shall follow all the applicable requirements defined in the CDPS General Permit for Stormwater Discharges Associated with Construction Activity (Permit No. COR-30000) section "C. Stormwater Management Plan (SWMP) – Contents".
 - a. Site Description
 - b. Site Map
 - c. Stormwater Management Controls
 - d. Final Stabilization and Long-term Stormwater Management
 - e. Inspection and Maintenance
5. The SWMP shall contain a bar scale schedule of the earth disturbing activities for the construction site (in monthly increments). Major earth-disturbing activities and stabilization measures should be included.
6. The SWMP shall delineate the limits of disturbance for the project site including all earth disturbing activities, staging areas, and construction exits.
7. The SWMP shall be shown in a minimum of two (2) phases. Phase I shall show the existing conditions of the site with the initial BMP's required for construction. Phase II shall show the proposed conditions of the site with the BMP's required for stabilization. For complex projects, additional phases may be added to properly manage the stormwater.
8. Permit Coverage

Town of Mead Design Standards and Construction Specifications

- a. The Owner/Contractor is responsible for obtaining a permit from the CDPHE at least 10 calendar days prior to the commencement of construction activities for any earth disturbance of one (1) acre or greater. The Owner/Contractor shall provide the Town with a copy of permit prior to receiving a grading/construction permit. The Owner/Contractor is responsible for all fees associated with the permit.
 - b. If the Owner/Contractor transfers responsibility for stormwater discharges to another entity, a notice of transfer and acceptance of terms form shall be submitted to the CDPHE and a copy to the Town.
9. If the Owner/Contractor no longer has control of a specific portion of a permitted site and wishes to transfer coverage of that portion of site to another, the Owner/Contractor shall submit a notice of reassignment of permit coverage form to the CDPHE and a copy to the Town.
 10. The Owner/Contractor is responsible for submitting an inactivation notice form to the CDPHE when the site has been finally stabilized in accordance with the SWMP. A copy of the inactivation notice shall also be submitted to the Town.
- I. Erosion Control Plans
1. The erosion control plans shall complement the phases described in the SWMP. At a minimum, the erosion control plan Phase I shall show the existing conditions of the site with the initial BMPs required before site disturbance begins. Phase II shall show the proposed conditions of the site with the BMP's required for final stabilization. For complex projects, additional phases may be added to properly manage stormwater runoff.
 2. All erosion control BMP details shall conform to the latest edition of the Town of Mead Standards and Specifications, USDCM Volume III or CDOT M-Standards.
 3. BMPs shall be installed before any earth disturbing activities commence.
 4. Stormwater discharges from construction activities shall not cause, have the reasonable potential to cause, or measurably contribute to an exceedance of any water quality standard.
 5. Construction shall be phased in a manner to limit earth disturbing activities (i.e. the entire project site should not be disturbed if construction will only be occurring in one particular section).
 6. Sediment caused by accelerated soil erosion shall be removed from runoff water before it leaves the construction site.
 7. Bulk storage structures for petroleum products and any other chemicals shall have secondary containment or equivalent protection to contain all spills and prevent any spilled material from entering State waters.
 8. A copy of the SWMP and site maps must be available at all times on the construction site unless otherwise approved by CDPHE or the Town.
 9. The SWMP and site maps shall be continuously updated to reflect new or revised BMPs due to changes in design, construction, operation, or maintenance of the construction site. Updates must be made within 72 hours following the change in BMPs.
 10. The Responsible Party shall inspect the construction site (including all BMPs, storage containers, and construction equipment) a minimum of every 14 calendar days and within 24 hours after a precipitation event or snow melt that cause's surface erosion. Inspections shall continue until an Inactivation Notice is filed with CDPHE and copied to the Town.

Town of Mead Design Standards and Construction Specifications

11. The Responsible Party shall keep a record of all inspections on site and available for review by CDPHE or Town staff. Inspection reports must identify any incidents of noncompliance with the terms and conditions of the Permit.
 12. BMPs requiring maintenance or adjustment shall be repaired immediately after observation of the failing BMP.
 13. For all instances of noncompliance based on environmental hazards and chemical spills and releases, all needed information must be provided orally to CDPHE spill reporting line (24-hour number for environmental hazards and chemical spills and releases: 1-877-518-5608) within 24 hours from the time the Owner/Contractor comes aware of the circumstances.
 14. Straw bales shall not be used for primary erosion or sediment control (i.e. straw bales may be used for reinforcement behind another BMP such as silt fence).
 15. BMPs intended for sheet flow sediment runoff shall be placed parallel to the slope.
 16. All BMPs shall be cleaned when sediment levels accumulate to half the design of the BMP unless otherwise specified.
 17. A vehicle tracking pad shall be placed at all exits from the site to prevent track-out onto Town streets. If track-out does occur, the Owner/Contractor shall immediately sweep the street of debris. Recycled crushed concrete or asphalt shall not be used for vehicle tracking pads.
 18. All sediment collected in BMPs shall be removed at the request of the Town Engineer and prior to Conditional Acceptance.
 19. Permanent erosion control measures for slopes, channels, ditches, or any disturbed land area shall be completed within 14 calendar days after final grading or the final earth disturbance has been completed. When it is not possible to permanently stabilize a disturbed area after an earth disturbance has been completed or where significant earth disturbance activity ceases, temporary soil erosion control measures shall be implemented within 14 calendar days. Temporary erosion control measures shall be maintained until permanent soil erosion measures are implemented.
 20. Final stabilization has been achieved when all earth disturbing activities at the site have been completed, and uniform vegetative cover has been established with an individual plant density of at least 70 % of pre-disturbance levels, or equivalent permanent, physical erosion reduction methods have been employed.
 21. All temporary BMPs shall be removed from the site upon final stabilization and submitting the Inactivation Notice.
 22. All site wastes (including trash and building materials) must be properly managed to prevent potential pollution of State waters.
- J. Street Construction Plans
- In addition to the above general plan and profile details, all street construction plans shall include the following:
1. Existing irrigation ditches to be relocated, removed or piped.
 2. Proposed curb, gutter, and sidewalk.
 3. Proposed cross pans including flow direction.
 4. Storm drainage facilities.

Town of Mead Design Standards and Construction Specifications

5. Location and elevation of bench marks.
 6. Horizontal curve data, with radii, tangents, PC, PI, and PT.
 7. Typical section of street construction showing structure and dimensions.
 8. Stations and elevations of radius points (back of curb).
 9. Proposed profile of center lines, top of curb, flow lines, or back of sidewalk.
 10. Stations, lengths, and elevations of vertical curve PC, PI, and PT.
 11. % slope of tangent lines.
 12. Limits of construction.
 13. Show sufficient existing or future construction to assure continuity of construction.
 14. Stations, details, and elevations of drainage facilities and other structures.
 15. Street, park and trail lights, and underground service cable locations.
 16. Complete material list.
 17. High point, low point, K factor, and design speed for curve.
 18. Medians.
 19. Street, park, and trail signage and pavement marking plan.
 20. Underpasses.
 21. Intersection detail drawings may be required by the Town Engineer.
 22. Traffic Signal Modification Plans at 1" = 20' or larger scale.
 23. Traffic Signal design plans, if required by the Town, at 1" = 20' or larger scale.
- K. Irrigation Plans (see also Chapter 800)
1. Existing irrigation, graphically distinguished from proposed irrigation.
 2. Improvements or site conditions that will materially affect the successful operation of the system, such as buildings, sidewalks, slopes, swales, plant groupings, ditches, etc.
 3. Point of connection and size of tap and meter.
 4. Irrigation material schedule including pipe type and size, head type, arc and nozzle, valve type and size, etc.
 5. Trench depth schedule from top of pipe.
 6. Label size of all pipe on plan.
 7. Indication at each zone valve of zone number, valve size, and gpm.
 8. All miscellaneous details required to construct the system.
 9. Irrigation schedule on plans demonstrating ability of system to comply with these Standards and Specifications.
 10. Plan and details for a physical delineation between privately maintained landscaping and Town maintained landscaping. The delineation may be a fence, wall, mow strip, or planter as approved by the Town Engineer.
 11. Existing and design water pressure.
 12. Confirmation that system provides head to head coverage.

Town of Mead Design Standards and Construction Specifications

13. Turf and planting beds irrigated with different zones.
14. Pressure loss calculation sheet.
- L. Park Construction, HWY 66 Scenic Entry Corridor, common open space, detention ponds and Town owned property Landscape Plan (see also Chapter 800)
 1. Scale 1"=30' minimum.
 2. Existing and proposed (design) contours maximum of two (2) foot intervals, including spot elevations.
 3. Existing plant material, including material to be removed and plant material protection zone, if applicable, noting methods of protection. Indicate size and species.
 4. Plant material schedule indicating graphic representation, alphabetized common name and botanical name including: genus, species, variety or cultivar, size, quantity, and plant material totals.
 5. Proposed plant material shown at mature size. Plants with one (1) irrigation zone shall have similar water demand requirements.
 6. All miscellaneous improvements and appurtenances including playgrounds, sidewalks, drives, curbs, manholes, parking lots, etc.
 7. All existing and proposed miscellaneous improvements and appurtenances including playgrounds, sidewalks, hardscape play areas, trails, pavilions, site furniture, lighting including trail and street lights, signage, drives, curbs, manholes, parking lots, berms, water features, etc.
 8. Graphic representation of all groundcover types (sod, seed, bedding plants, mulch, rock, etc.).
 9. All proposed retaining walls or slope retention methods.
 10. Seed blend, amendment required, and application rate for all seeded areas.
 11. Amount and type of soil amendment required for landscape areas not seeded.
 12. Existing and proposed utility easements.
 13. Sight triangles.
 14. Recreation athletic facilities (such as softball, baseball, soccer, football, tennis, basketball, playground equipment, etc.) shall be reviewed on a case by case basis and be approved by the Town prior to beginning any construction on the site. At a minimum, all such facilities plans shall meet the requirements of section 800 of these Standards and Specifications.
 15. Regional trail profiles and cross sections.
 16. Listing of total linear footage of sidewalks and trail, square footage of all planting beds, square footage of sod, and square footage of seeded areas.
 17. Natural features relevant to the site.
 18. All appropriate details.

201.3 Town of Mead Standard Notes

The following standard notes shall be included on all construction plan sets as appropriate.

- A. GENERAL NOTES:

Town of Mead Design Standards and Construction Specifications

1. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE LATEST TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS, COLORADO DEPARTMENT OF TRANSPORTATION, MOUNTAIN VIEW FIRE RESCUE DISTRICT REQUIREMENTS, <INSERT APPROPRIATE UTILITY DISTRICTS>, AND ALL APPLICABLE STATE AND LOCAL STANDARDS AND SPECIFICATIONS.
2. THE CONTRACTOR SHALL HAVE IN POSSESSION AT THE JOB SITE AT ALL TIMES ONE (1) SIGNED COPY OF APPROVED PLANS, STANDARDS AND SPECIFICATIONS, AND PERMITS. CONTRACTOR SHALL CONSTRUCT AND MAINTAIN EMERGENCY ACCESS ROUTES TO THE SITE AND STRUCTURE AT ALL TIMES PER THE APPLICABLE MOUNTAIN VIEW FIRE RESCUE DISTRICT REQUIREMENTS. THE CONTRACTOR SHALL OBTAIN WRITTEN APPROVAL FOR ANY VARIANCE TO THE ABOVE DOCUMENTS. THE CONTRACTOR SHALL NOTIFY THE TOWN ENGINEER OF ANY CONFLICTING STANDARDS OR SPECIFICATIONS. IN THE EVENT OF ANY CONFLICTING STANDARD OR SPECIFICATION, THE MORE STRINGENT OR HIGHER QUALITY STANDARD, DETAIL OR SPECIFICATION SHALL APPLY.
3. THE CONTRACTOR SHALL OBTAIN, AT HIS OWN EXPENSE, ALL APPLICABLE CODES, LICENSES, STANDARD SPECIFICATIONS, PERMITS, BONDS, ETC., WHICH ARE NECESSARY TO PERFORM THE PROPOSED WORK, INCLUDING, BUT NOT LIMITED TO A LOCAL AND STATE GROUNDWATER DISCHARGE AND COLORADO DEPARTMENT OF HEALTH AND ENVIRONMENT (CDPHE) STORMWATER DISCHARGE PERMIT ASSOCIATED WITH CONSTRUCTION ACTIVITY.
4. ALL WORK SHALL BE SUBJECT TO INSPECTION AND APPROVAL BY AUTHORIZED TOWN OF MEAD PERSONNEL.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR NOTIFYING THE TOWN ENGINEER, GEOTECHNICAL ENGINEER, AND ALL UTILITY OWNERS, AT LEAST 48 HOURS PRIOR TO START OF ANY CONSTRUCTION, PRIOR TO BACKFILLING, AND AS REQUIRED BY JURISDICTIONAL AUTHORITY AND/OR PROJECT SPECIFICATIONS. THE CONTRACTOR SHALL CONTINUE WITH NOTIFICATIONS THROUGHOUT THE PROJECT AS REQUIRED BY THE STANDARDS AND SPECIFICATIONS.
6. THE CONTRACTOR SHALL BE SOLELY AND COMPLETELY RESPONSIBLE FOR CONDITIONS AT AND ADJACENT TO THE JOB SITE; INCLUDING, SAFETY OF PERSONS AND PROPERTY DURING THE PERFORMANCE OF WORK. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE TOWN CONSTRUCTION REVIEW OF THE CONTRACTOR'S PERFORMANCE IS NOT INTENDED TO INCLUDE REVIEW OF THE ADEQUACY OF THE CONTRACTOR'S SAFETY MEASURES IN, ON, OR NEAR THE CONSTRUCTION SITE.
7. THE CONTRACTOR SHALL PREPARE A TRAFFIC CONTROL PLAN FOR TOWN APPROVAL BY THE TOWN OF MEAD PRIOR TO CONSTRUCTION AND PROVIDE ALL LIGHTS, SIGNS, BARRICADES, FENCING, FLAGMEN OR OTHER DEVICES NECESSARY TO PROVIDE FOR PUBLIC SAFETY. THE CONTRACTOR AGREES TO COMPLY WITH THE PROVISIONS OF THE TRAFFIC CONTROL PLAN AND THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)," PART VI, FOR CONSTRUCTION SIGNAGE AND TRAFFIC CONTROL. ALL TEMPORARY AND PERMANENT TRAFFIC SIGNS SHALL COMPLY TO THE MUTCD WITH REGARD TO SIGN SHAPE, COLOR, SIZE, LETTERING, ETC. UNLESS

Town of Mead Design Standards and Construction Specifications

OTHERWISE SPECIFIED. IF APPLICABLE, PART NUMBERS ON SIGNAGE DETAILS REFER TO MUTCD SIGN NUMBERS.

8. THE TYPE, SIZE, LOCATION, AND NUMBER OF ALL KNOWN UNDERGROUND UTILITIES ARE APPROXIMATE AS SHOWN ON THE DRAWINGS BASED ON INFORMATION BY OTHERS. NOT ALL UTILITIES ARE SHOWN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE EXISTENCE, SIZE, TYPE, AND LOCATION OF ALL UNDERGROUND UTILITIES WHETHER SHOWN OR NOT ALONG THE ROUTE OF THE WORK. LOCATION OF EXISTING UTILITIES SHALL BE VERIFIED BY CONTRACTOR PRIOR TO DATE OF CONSTRUCTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY SIZE AND HORIZONTAL AND VERTICAL LOCATIONS OF EXISTING FACILITIES PRIOR TO CONSTRUCTION AND NOTIFY THE TOWN OF ANY DISCREPANCIES. THE ENGINEER AND/OR OWNER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS SHOWN ON PLANS. THE CONTRACTOR SHALL BE FULLY AND SOLELY RESPONSIBLE FOR ANY AND ALL DAMAGES AND COSTS WHICH MIGHT OCCUR BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES. THE CONTRACTOR SHALL NOTIFY ALL PUBLIC AND PRIVATE UTILITY COMPANIES AND DETERMINE THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO PROCEEDING WITH GRADING AND CONSTRUCTION. ALL WORK PERFORMED IN THE AREA OF UTILITIES SHALL BE PERFORMED AND INSPECTED ACCORDING TO THE REQUIREMENTS OF THE UTILITY OWNER. LIKEWISE, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING AND MAPPING ANY EXISTING UTILITY (INCLUDING DEPTH) WHICH MAY CONFLICT WITH THE PROPOSED CONSTRUCTION, AND FOR RELOCATING ENCOUNTERED UTILITIES AS DIRECTED BY THE ENGINEER. CONTRACTOR SHALL CONTACT AND RECEIVE APPROVAL FROM TOWN ENGINEER AND THE UTILITY OWNER BEFORE RELOCATING ANY ENCOUNTERED UTILITIES. CONTRACTOR RESPONSIBLE FOR SERVICE CONNECTIONS, AND RELOCATING AND RECONNECTING AFFECTED UTILITIES AS COORDINATED WITH UTILITY OWNER AND/OR ENGINEER, INCLUDING NON-MUNICIPAL UTILITIES (TELEPHONE, GAS, CABLE, ETC., WHICH SHALL BE COORDINATED WITH THE UTILITY OWNER). THE CONTRACTOR SHALL IMMEDIATELY CONTACT THE TOWN ENGINEER UPON DISCOVERY OF A UTILITY DISCREPANCY OR CONFLICT. AT LEAST 48 HOURS PRIOR TO CONSTRUCTION, THE CONTRACTOR SHALL NOTIFY THE UTILITY NOTIFICATION CENTER OF COLORADO (1-800-922-1987, WWW.UNCC.ORG).
9. ALL TRENCHES SHALL BE ADEQUATELY SUPPORTED AND THE SAFETY OF WORKERS PROVIDED FOR AS REQUIRED BY THE MOST RECENT OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) "SAFETY AND HEALTH REGULATIONS FOR CONSTRUCTION." THESE REGULATIONS ARE DESCRIBED IN SUBPART P, PART 1926 OF THE CODE OF FEDERAL REGULATIONS. SHEETING AND SHORING SHALL BE UTILIZED WHERE NECESSARY TO PREVENT ANY EXCESSIVE WIDENING OR SLOUGHING OF THE TRENCH WHICH MAY BE DETRIMENTAL TO HUMAN SAFETY, TO THE PIPE BEING PLACED, TO TREES, OR TO ANY EXISTING STRUCTURE WHERE EXCAVATIONS ARE MADE UNDER SEVERE WATER CONDITIONS. THE CONTRACTOR MAY BE REQUIRED TO USE AN APPROVED PILING INSTEAD OF SHEETING AND SHORING.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REMOVING ANY GROUNDWATER ENCOUNTERED DURING THE CONSTRUCTION OF ANY PORTION OF THIS PROJECT. GROUNDWATER SHALL BE PUMPED, PIPED, REMOVED AND DISPOSED OF IN A MANNER WHICH DOES NOT CAUSE FLOODING OF EXISTING

Town of Mead Design Standards and Construction Specifications

STREETS NOR EROSION ON ABUTTING PROPERTIES IN ORDER TO CONSTRUCT THE IMPROVEMENTS SHOWN ON THESE PLANS. GROUNDWATER TO BE PUMPED SHALL BE TESTED, PERMITTED, AND PUMPED PER THE STATE OF COLORADO AND LOCAL GROUNDWATER DISCHARGING PERMIT REQUIREMENTS.

11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING NEARBY PUBLIC STREETS OF MUD OR DEBRIS DUE TO CONSTRUCTION ACTIVITY INITIATED BY SAID CONTRACTOR ON A DAILY BASIS OR AS OTHERWISE DIRECTED BY AUTHORIZED TOWN PERSONNEL.
12. ALL SURPLUS MATERIALS, TOOLS, AND TEMPORARY STRUCTURES, FURNISHED BY THE CONTRACTOR, SHALL BE REMOVED FROM THE PROJECT SITE BY THE CONTRACTOR. ALL DEBRIS AND RUBBISH CAUSED BY THE OPERATIONS OF THE CONTRACTOR SHALL BE REMOVED, AND THE AREA OCCUPIED DURING CONSTRUCTION ACTIVITIES SHALL BE RESTORED TO ITS ORIGINAL CONDITION OR BETTER, WITHIN 48 HOURS OF PROJECT COMPLETION.
13. PRIOR TO THE BEGINNING OF WORK, A PRECONSTRUCTION CONFERENCE SHALL BE HELD BETWEEN THE TOWN, THE RESPONSIBLE PARTY WHO IS SCHEDULED TO PERFORM THE WORK, THE DESIGNATED ON-SITE FIELD REPRESENTATIVE, THE CONSULTING ENGINEER OR LANDSCAPE PROFESSIONAL, AND ANY OTHER ENTITIES INVOLVED IN THE CONSTRUCTION.
14. THE CONTRACTOR IS REQUIRED TO PROVIDE AND MAINTAIN EROSION AND SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH THE TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS, THE STATE OF COLORADO, URBAN DRAINAGE AND FLOOD CONTROL DISTRICT "URBAN STORM DRAINAGE CRITERIA MANUAL VOLUME 3", THE M-STANDARD PLANS OF THE COLORADO DEPARTMENT OF TRANSPORTATION, AND THE APPROVED EROSION CONTROL PLAN. THE TOWN OF MEAD MAY REQUIRE THE CONTRACTOR TO PROVIDE ADDITIONAL EROSION CONTROL MEASURES AT THE CONTRACTOR'S EXPENSE DUE TO UNFORESEEN EROSION PROBLEMS OR IF THE PLANS DO NOT FUNCTION AS INTENDED. THE CONTRACTOR IS RESPONSIBLE FOR PROHIBITING SILT AND DEBRIS LADEN RUNOFF FROM LEAVING THE SITE, AND FOR KEEPING ALL PUBLIC AREAS FREE OF MUD AND DEBRIS. THE CONTRACTOR IS RESPONSIBLE FOR RE-ESTABLISHING FINAL GRADES AND FOR REMOVING ACCUMULATED SEDIMENTATION FROM ALL AREAS INCLUDING SWALES AND DETENTION/WATER QUALITY AREAS. CONTRACTOR SHALL REMOVE TEMPORARY EROSION CONTROL MEASURES AND REPAIR AREAS AS REQUIRED AFTER VEGETATION IS ESTABLISHED AND ACCEPTED BY THE TOWN OF MEAD.
15. DEVELOPMENT PHASING OF ANY PROJECT MUST BE SHOWN ON THE CONSTRUCTION PLANS, APPROVED BY THE TOWN ENGINEER AND MADE A PART OF THE APPLICATION PROCEDURE. NO PHASING SHALL BE PERMITTED UNLESS THIS REQUIREMENT HAS BEEN ADHERED TO.
16. NO WORK SHALL BEGIN UNTIL THE INSTALLING RESPONSIBLE PARTY IS IN POSSESSION OF AN APPROVED SET OF PLANS AND THE TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS, AND ALL NECESSARY PERMITS FOR THE IMPROVEMENTS HAS BEEN ISSUED BY THE TOWN. TOWN ENGINEERING'S APPROVAL SHALL BE FOR GENERAL CONFORMITY TO THE UTILITY SPECIFICATIONS AND SHALL NOT CONSTITUTE BLANKET APPROVAL OF ALL DIMENSIONS, QUANTITIES AND DETAILS OF THE MATERIAL OR EQUIPMENT SHOWN. NOR SHALL SUCH APPROVAL RELIEVE THE RESPONSIBLE PARTY,

Town of Mead Design Standards and Construction Specifications

CONSULTING ENGINEER, OR LANDSCAPE ARCHITECT OF THEIR RESPONSIBILITY FOR ERRORS CONTAINED IN THE DRAWINGS.

17. THE RESPONSIBLE PARTY SHALL FURNISH REASONABLE AID AND ASSISTANCE REQUIRED BY THE TOWN ENGINEER FOR THE PROPER EXAMINATION OF THE MATERIALS AND WORK. WORK SHALL BE PERFORMED IN ACCORDANCE WITH ACCEPTED WORKMANSHIP PRACTICES AND THE TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS. ANY WORK NOT ACCEPTED BY THE TOWN ENGINEER SHALL BE REDONE UNTIL COMPLIANCE WITH THESE STANDARDS IS ACHIEVED. INSTRUCTIONS GIVEN BY THE TOWN ENGINEER RELATING TO QUALITY OF MATERIALS AND WORKMANSHIP MUST BE OBEYED AT ONCE BY THE RESPONSIBLE PARTY. THE TOWN SHALL NOT SUPERVISE SET OUT WORK, OR GIVE LINE AND GRADE STAKES.
18. THE MATERIALS USED IN PROJECTS SHALL BE NEW AND SUBJECT TO THE INSPECTION AND APPROVAL OF THE INSPECTOR AT ALL TIMES. THE INSPECTOR HAS THE RIGHT TO PERFORM ANY TESTING DEEMED NECESSARY TO ENSURE COMPLIANCE OF THE MATERIAL WITH THESE STANDARDS. NO MATERIAL SHALL BE USED BEFORE BEING INSPECTED AND APPROVED BY THE INSPECTOR. FAILURE OR NEGLIGENCE ON THE PART OF THE INSPECTOR TO CONDEMN OR REJECT INFERIOR MATERIALS OR WORK SHALL NOT BE CONSTRUED TO IMPLY THEIR ACCEPTANCE SHOULD THEIR INFERIORITY BECOME EVIDENT AT ANY TIME PRIOR TO FINAL ACCEPTANCE OF THE WORK. INSPECTORS HAVE THE AUTHORITY TO REJECT DEFECTIVE OR INFERIOR MATERIALS AND/OR DEFECTIVE WORKMANSHIP AND TO SUSPEND WORK UNTIL SUCH TIME AS THE RESPONSIBLE PARTY SHALL CORRECT THE DISCREPANCIES IN QUESTION.
19. WHENEVER DEFECTIVE MATERIALS AND WORK ARE REJECTED, THE RESPONSIBLE PARTY SHALL PROMPTLY REMOVE SUCH DEFECTIVE MATERIALS AND CONSTRUCTION FROM THE JOB SITE AND REPLACE ALL DEFECTIVE PORTIONS TO THE SATISFACTION OF THE TOWN ENGINEER. IN THE EVENT THE RESPONSIBLE PARTY FAILS TO REMOVE REJECTED ITEMS FROM THE JOB SITE WITHIN A REASONABLE LENGTH OF TIME, THE TOWN ENGINEER MAY ARRANGE FOR SUCH REMOVAL AT THE EXPENSE OF THE RESPONSIBLE PARTY.
20. INSPECTION SHALL NOT RELIEVE THE RESPONSIBLE PARTY FROM ANY OBLIGATION TO PERFORM THE WORK STRICTLY IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS OR ANY MODIFICATIONS THEREOF. WORK NOT SO CONSTRUCTED SHALL BE REMOVED AND CORRECTED BY THE RESPONSIBLE PARTY AT HIS SOLE EXPENSE, WHENEVER SO ORDERED BY THE TOWN ENGINEER, WITHOUT REFERENCE TO ANY PREVIOUS ERROR OR OVERSIGHT IN INSPECTION.
21. PURSUANT TO TOWN CODE SECTION 7-2-260, AS MAY BE AMENDED FROM TIME TO TIME, EXCEPT IN CASES OF EMERGENCY, NO CONSTRUCTION ACTIVITIES SHALL BE ALLOWED BETWEEN THE HOURS OF 7:00 P.M. AND 7:00 A.M.; NOR ON SATURDAY, SUNDAY OR TOWN HOLIDAYS UNLESS APPROVED BY THE TOWN ENGINEER IN EACH CASE. WHEN ANY INSPECTOR IS REQUIRED TO WORK OUTSIDE THE HOURS OF 7:00 A.M. TO 4:00 P.M. ON REGULAR TOWN BUSINESS DAYS, OVERTIME SHALL BE CHARGED TO THE RESPONSIBLE PARTY. REQUESTS FOR OVERTIME SHALL BE MADE TO THE TOWN ENGINEER AT LEAST 48 HOURS IN ADVANCE. PAYMENT FOR SUCH OVERTIME WORK SHALL BE MADE TO THE TOWN PRIOR TO FINAL ACCEPTANCE.

Town of Mead Design Standards and Construction Specifications

22. IN THE EVENT ONE OR MORE INSPECTORS REPRESENTING PRIVATE CONSULTING ENGINEERING FIRMS ARE ALSO INSPECTING A PROJECT ALONG WITH THE TOWN ENGINEER, THE INSTRUCTIONS GIVEN BY THE TOWN ENGINEER SHALL PREVAIL IN THE EVENT OF CONFLICTING INSTRUCTIONS.
23. ADA COMPLIANCE: THE CROSS-SLOPE OF ALL WALKS MUST NOT BE STEEPER THAN 1:48 (2.0%) PERPENDICULAR TO DIRECTION OF TRAVEL. RUNNING SLOPE OF ACCESSIBLE WALKS MUST BE NOT STEEPER THAN 1:20 (5.0%) IN DIRECTION OF TRAVEL. MAXIMUM GRADE OF ACCESSIBLE CURB RAMPS AND RAMPS IS 1:12 (8.3%). CURB RAMPS SHALL PROVIDE A LANDING AT THE TOP AND RAMP RUNS PROVIDE LANDINGS AT THE BOTTOM AND TOP OF EACH RAMP RUN AT A SLOPE NOT TO EXCEED 1:48. RAMPS RISE EXCEEDING SIX INCHES SHALL INCLUDE HANDRAILS. RAMP RUNS WITH A RISE GREATER THAN 6 INCHES (150 MM) SHALL HAVE HANDRAILS COMPLYING WITH SECTION 505. ACCESSIBLE PARKING SPACES AND ACCESS AISLES SHALL NOT EXCEED 1:48 IN ALL DIRECTIONS. CONTRACTOR SHALL NOTIFY ENGINEER PRIOR TO PLACEMENT OF FLATWORK OF SITE CONDITIONS OR DISCREPANCIES WHICH PREVENT TYPICAL REQUIRED GRADES FROM BEING ACHIEVED. ALL RAMPS, STAIRS, EDGE PROTECTION, AND RAILINGS SHALL BE CONSTRUCTED IN ACCORDANCE WITH CURRENT ADA STANDARDS. ACCESSIBLE CURB RAMPS SHALL CONFORM TO THE CDOT M-STANDARDS (SEE DETAIL M-608-1, ETC).
24. PROTECT ALL TREES AND VEGETATION. PLACE CONSTRUCTION FENCING AT DRIP LINE OF TREES AND PLANTS NEAR THE WORK ZONE. DEEP WATER TREES WEEKLY. HAND EXCAVATION REQUIRED AT ROOT ZONES WHERE PROPOSED PAVING OR UTILITY WORK IS WITHIN DRIPLINE OF TREES. REPAIR OF ANY DAMAGE TO EXISTING IMPROVEMENTS OR LANDSCAPING IS THE RESPONSIBILITY OF THE CONTRACTOR.
25. THE WORK SHALL BE SURVEYED AND STAKED UNDER THE SUPERVISION OF A LICENSED LAND SURVEYOR IN ACCORDANCE WITH THE APPROVED PLANS.
26. RIM AND GRATE ELEVATIONS SHOWN ON PLANS ARE APPROXIMATE ONLY AND ARE NOT TO BE TAKEN AS FINAL ELEVATIONS. THE CONTRACTOR SHALL ADJUST RIMS AND OTHER IMPROVEMENTS TO MATCH FINAL PAVEMENT AND FINISHED GRADE ELEVATIONS.
27. THE CONTRACTOR SHALL FURNISH THE ENGINEER OF RECORD A COMPLETE SET OF CONSTRUCTION RECORD DRAWINGS ("AS-BUILTS"), FOR THE CONSTRUCTED IMPROVEMENTS. THE PLANS SHALL SHOW SUFFICIENT DIMENSION TIES TO PERMANENT SURFACE FEATURES FOR ALL BURIED FACILITIES TO ALLOW FOR FUTURE LOCATING. THE PLANS SHALL SHOW FINAL PAVEMENT, FLOW LINE ELEVATIONS, CONTOURS AT POND/DRAINAGE FEATURES (AS SURVEYED AND CERTIFIED BY A COLORADO P.L.S.), MANHOLE, PIPE, AND INLET LOCATIONS, INVERTS, GRATE ELEVATIONS, SIZES OF ALL UTILITIES, AND ANY VARIATIONS FROM THE APPROVED PLAN. FINAL AS-BUILT PLANS PREPARED BY THE ENGINEER OF RECORD SHALL BE PROVIDED TO THE TOWN OF MEAD.
28. IF A FOUNDATION UNDERDRAIN SYSTEM IS INSTALLED IN THE PUBLIC RIGHT-OF-WAY, THE FOLLOWING STATEMENT SHALL BE INCLUDED IN THE DRAWINGS:
 - a. "THE FOUNDATION UNDERDRAIN SYSTEM IS THE RESPONSIBILITY OF THE OWNER/DEVELOPER OR ITS ASSIGNS. THE TOWN IS NOT RESPONSIBLE FOR THE MAINTENANCE OR REPAIR OF SAID SYSTEM."

Town of Mead Design Standards and Construction Specifications

B. GRADING NOTES:

1. CONSTRUCTION SHALL ADHERE TO THE FOLLOWING SEQUENCE UNLESS OTHERWISE SPECIFIED BY THE TOWN ENGINEER: SANITARY SEWER INSTALLATION, WATER MAIN INSTALLATION, CURB AND GUTTER INSTALLATION, WATER SERVICE INSTALLATION.
2. COMPACTION OF ALL TRENCHES MUST BE ATTAINED AND COMPACTION TEST RESULTS SUBMITTED TO THE ENGINEER AND THE TOWN OF MEAD PRIOR TO FINAL ACCEPTANCE.
3. ALL WORK, INCLUDING CORRECTION WORK, SHALL BE INSPECTED BY A TOWN REPRESENTATIVE WHO SHALL HAVE THE AUTHORITY TO HALT CONSTRUCTION WHEN STANDARD CONSTRUCTION PRACTICES ARE NOT BEING ADHERED TO.
4. DEVELOPER AND BUILDER SHALL REGULARLY PATROL THE PUBLIC LANDS ADJACENT TO THE DEVELOPMENT TO REMOVE CONSTRUCTION DEBRIS AND KEEP THE SITE CLEAN AND SAFE.
5. ALL SITE GRADING (EXCAVATION, EMBANKMENT, AND COMPACTION) SHALL CONFORM TO THE RECOMMENDATIONS OF THE LATEST SOILS INVESTIGATION FOR THIS PROPERTY AND SHALL FURTHER BE IN CONFORMANCE WITH THE TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS", LATEST EDITION. A CDPS GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH CONSTRUCTION ACTIVITIES SHALL BE OBTAINED PRIOR TO ANY GRADING BEING PERFORMED ON SITES ONE (1) ACRE OR LARGER IN SIZE. THESE PERMITS CAN BE OBTAINED FROM THE STATE WATER QUALITY CONTROL DIVISION.
6. NATURAL VEGETATION SHALL BE RETAINED AND PROTECTED WHEREVER POSSIBLE. EXPOSURE OF SOIL TO EROSION BY REMOVAL OR DISTURBANCE OF VEGETATION SHALL BE LIMITED TO THE AREA REQUIRED FOR IMMEDIATE CONSTRUCTION OPERATION AND FOR THE SHORTEST PRACTICAL PERIOD OF TIME.
7. TOPSOIL SHALL BE STOCKPILED TO THE EXTENT PRACTICABLE ON THE SITE FOR USE ON AREAS TO BE REVEGETATED. ANY AND ALL STOCKPILES SHALL BE LOCATED AND PROPER MEASURES TAKEN TO CONTROL EROSION AND SEDIMENT MOVEMENT.
8. AT ALL TIMES, THE PROPERTY SHALL BE MAINTAINED AND/OR WATERED TO PREVENT WIND-CAUSED EROSION. EARTHWORK OPERATIONS SHALL BE DISCONTINUED WHEN DUST SIGNIFICANTLY IMPACTS ADJACENT PROPERTY. IF EARTHWORK IS COMPLETE OR DISCONTINUED AND DUST FROM THE SITE CONTINUES TO CREATE PROBLEMS, THE OWNER/DEVELOPER SHALL IMMEDIATELY INSTITUTE MITIGATIVE MEASURES AND SHALL CORRECT DAMAGE TO ADJACENT PROPERTY.
9. PERMANENT SLOPES SHALL NOT EXCEED 4:1 (H:V) IN AREAS TO BE SEEDED OR SODDED. RETAINING WALLS SHALL BE REVIEWED AND APPROVED BY SEPARATE APPLICATION TO THE TOWN OF MEAD.
10. THIS EROSION AND SEDIMENT CONTROL PLAN HAS BEEN SUBMITTED TO THE TOWN OF MEAD AND IS IN GENERAL CONFORMANCE WITH THE TOWN'S EROSION CONTROL STANDARDS. ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURE MAY BE REQUIRED OF THE OWNER AND HIS OR HER AGENTS DUE TO

Town of Mead Design Standards and Construction Specifications

UNFORESEEN EROSION PROBLEM OR IF THE PROPOSED EROSION CONTROL MEASURES DO NOT FUNCTION AS INTENDED. THE REQUIREMENTS OF THIS EROSION CONTROL PLAN AND THE OBLIGATION OF THE LANDOWNER SHALL RUN WITH THE LAND UNTIL SUCH TIME AS THE EROSION CONTROL PLAN IS PROPERLY COMPLETED, OFFICIALLY MODIFIED, OR VOIDED.

C. WATER NOTES:

1. WATER NOTES FROM THE APPROPRIATE SERVICE PROVIDER SHALL BE INCLUDED ON ALL CONSTRUCTION PLANS.

D. SANITARY NOTES: (applicable to project within Town of Mead Sanitary Service Boundary)

1. DISTRICT SHALL REFER TO THE TOWN OF MEAD IN THESE NOTES.
2. DISTRICT'S ACCEPTANCE OF THESE PLANS IS VALID FOR ONE YEAR.
3. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE DISTRICT STANDARDS.
4. CONTRACTOR TO VERIFY LOCATIONS AND ELEVATIONS OF EXISTING UTILITIES PRIOR TO COMMENCING ANY CONSTRUCTION.
5. THE CONTRACTOR SHALL NOTIFY THE DISTRICT A MINIMUM OF 48 HOURS AND A MAXIMUM OF 96 HOURS PRIOR TO STARTING CONSTRUCTION OR PRIOR TO RESUMING CONSTRUCTION AFTER A BREAK.
6. SANITARY SEWER SHALL BE POLYVINYL CHLORIDE (PVC) PIPE, ASTM D3034, SDR-35, OR AS INDICATED ON THE PLANS.
7. ALL CONCRETE SHALL BE MINIMUM 4000 PSI AT 28 DAY STRENGTH.
8. MAINTAIN A MINIMUM OF 10 FEET HORIZONTAL SEPARATION OUTSIDE DIAMETER TO OUTSIDE DIAMETER BETWEEN WATER LINES AND ALL SEWER LINES AND MANHOLES.
9. ALL SEWER MAINS CROSSING WATER MAINS WITH LESS THAN 18 INCHES OF SEPARATION SHALL BE ENCASED IN CONCRETE.
10. RIM ELEVATIONS SHOWN ARE APPROXIMATE AND SHOULD NOT BE TAKEN AS FINAL. ALL MANHOLES SHALL BE FINAL ADJUSTED AFTER PAVING SUCH THAT THE RIM IS $\frac{1}{4}$ TO $\frac{1}{2}$ INCH BELOW FINISHED ASPHALT. MANHOLES IN UNPAVED AREAS SHALL BE SET SO THAT THE RIM IS 0.5' ABOVE FINISHED GRADE. BURIED MANHOLES ALLOWED IN CULTIVATED FIELDS AS APPROVED BY TOWN ENGINEER. AS-BUILTS SHALL ALLOW FINAL NORTHING/EASTING AND RIM ELEVATION OF ALL BURIED MANHOLES.
11. INVERT (AS-BUILT) DATA SHALL BE COLLECTED BY A LICENSED SURVEYOR ON EACH PIPE INVERT IN A MANHOLE. CENTER OF MANHOLE SURVEYING IS NOT ACCEPTABLE FOR SLOPE CALCULATIONS. RECORD DRAWINGS (AS-BUILTS) MUST DEMONSTRATE CONFORMANCE TO DISTRICT STANDARDS.
12. THE CONTRACTOR SHALL HAVE A SET OF APPROVED PLANS ON SITE AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECORDING ACTUAL RECORD DRAWING DIMENSIONS AND DISTANCES AS WELL AS SERVICE LOCATIONS ON THESE PLANS AND SUBMITTING THEM TO THE ENGINEER FOR PREPARATION OF RECORD DRAWINGS. THESE DRAWINGS SHALL BE KEPT CURRENT AT ALL TIMES.

Town of Mead Design Standards and Construction Specifications

13. BEFORE ANY CONSTRUCTION COMMENCES, A PLUG SHALL BE INSTALLED TO PREVENT DRAINAGE THROUGH THE NEW SEWER LINE FROM ENTERING THE EXISTING SEWER LINE. THIS PLUG WILL BE INSTALLED IN THE MANHOLE, WHICH CONNECTS NEW WORK WITH THE EXISTING AND MAY NOT BE REMOVED UNTIL CONDITIONAL ACCEPTANCE.
 14. UNDERDRAINS, IF INSTALLED, ARE THE RESPONSIBILITY OF THE DEVELOPER. DISTRICT ASSUMES NO LIABILITY FOR ANY PORTION OF OR ANY DAMAGE CAUSED BY UNDERDRAINS. ABSOLUTELY NO PART OF AN UNDERDRAIN SYSTEM, INCLUDING CLEAN OUTS, WILL BE ALLOWED INSIDE OF SANITARY SEWER MANHOLES. ALL UNDERDRAINS SHALL BE INSTALLED BELOW THE SANITARY SEWER AND OFFSET TO THE SIDE. PIPE MATERIAL SHALL BE DIFFERENT COLOR THAN SANITARY SEWER.
 15. NO SERVICE LATERALS SMALLER THAN 8-INCH IN DIAMETER SHALL ENTER MANHOLES.
 16. SERVICE CROSSINGS OF CURB SHALL BE MARKED WITH A CUT "S" IN CURB FACE. PAINT IS NOT ACCEPTABLE. SERVICE SHALL BE EXTENDED INTO THE LOT A MINIMUM OF 10 FEET.
 17. CONTRACTOR SHALL MARK THE END OF ALL SEWER SERVICES AND MAIN STUBS WITH A CARSONITE COMPOSITE UTILITY MARKER WITH MINIMUM OF FOUR FEET ABOVE GRADE, PAINTED GREEN.
 18. ALL PIPES SHALL HAVE SQUEEGEE (CDOT #8 BEDDING) UNLESS OTHERWISE SHOWN OR THE DISTRICT MAY APPROVE AN ALTERNATE BEDDING IN SPECIAL CASES.
 19. PRIOR TO APPROVAL, ALL SANITARY SEWER PIPES SHALL BE PRESSURE-TESTED PER ASTM C924. ALL MANHOLES SHALL BE VACUUM-TESTED PER UNI-B-98.
 20. PRIOR TO REMOVAL OF PLUGS AT MANHOLES, PIPE SHALL BE JET-CLEANED AND VACUUMED TO REMOVE DEBRIS AND VIDEOED. NOTICE SHALL BE GIVEN TO THE DISTRICT INSPECTOR ONE (1) WEEK PRIOR TO CLEANING. INSPECTOR MUST BE PRESENT DURING THE OPERATION. ONCE APPROVAL HAS BEEN GIVEN BY INSPECTOR, PLUGS MAY ONLY BE REMOVED AFTER CONDITIONAL ACCEPTANCE BY THE DISTRICT.
 21. THE FINAL RECORDED PLAT AND RECORDED ADDRESS PLAT SHALL BE PROVIDED TO THE DISTRICT FOR CONDITIONAL ACCEPTANCE.
 22. TWENTY (20) MONTHS AFTER CONSTRUCTION AND PRIOR TO THE EXPIRATION OF WARRANTY, THE DEVELOPER SHALL CAMERA/VIDEO THE SANITARY SEWER LINES AND PROVIDE A DVD TO THE DISTRICT FOR REVIEW.
- E. STREET NOTES:
1. AFTER ANY OVERLAY OF AN EXISTING ROADWAY, WHERE TOWN UTILITIES ARE PRESENT, THE DEVELOPER SHALL OPEN ALL MANHOLES AND VALVE BOXES FOLLOWING THE PAVING OPERATION TO ENSURE THAT MANHOLE AND VALVES WERE NOT PAVED OVER NOR FILLED WITH ASPHALT.
 2. WHEN AN EXISTING ASPHALT STREET IS CUT, THE STREET MUST BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN ITS ORIGINAL CONDITION. THE EXISTING STREET CONDITION SHALL BE DOCUMENTED BY THE TOWN OF MEAD'S INSPECTOR BEFORE ANY CUTS ARE MADE. PATCHING SHALL BE DONE IN

Town of Mead Design Standards and Construction Specifications

CONFORMANCE WITH THE TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS. THE FINISHED PATCH SHALL BLEND SMOOTHLY INTO THE EXISTING SURFACE. ALL LARGE PATCHES SHALL BE PAVED WITH AN ASPHALT LAY-DOWN MACHINE. IN STREETS WHERE MORE THAN ONE CUT IS MADE, AN OVERLAY OF THE ENTIRE STREET WIDTH, INCLUDING THE PATCHED AREAS, MAY BE REQUIRED. THE DETERMINATION OF NEED FOR A COMPLETE OVERLAY SHALL BE MADE BY THE TOWN ENGINEER.

3. FINAL LIMITS OF REQUIRED ASPHALT SAWCUTTING AND PATCHING MAY VARY FROM LIMITS SHOWN ON PLANS. CONTRACTOR TO PROVIDE SAWCUT AND PATCH WORK TO ACHIEVE POSITIVE DRAINAGE AND A SMOOTH TRANSITION TO EXISTING ASPHALT WITHIN SLOPES ACCEPTABLE TO THE ENGINEER AND WITHIN MUNICIPAL STANDARDS. CONTRACTOR SHALL PROVIDE ADDITIONAL SAWCUTTING AND PATCHING AT UTILITY WORK, CONNECTION POINTS TO EXISTING PAVEMENT AND FEATURES, ETC. THAT MAY NOT BE DELINEATED ON PLANS.
4. PAVING SHALL NOT START UNTIL A GEOTECHNICAL REPORT AND PAVEMENT DESIGN HAVE BEEN APPROVED BY THE TOWN OF MEAD'S THE TOWN ENGINEER DIVISION AND SUBGRADE COMPACTION TEST AND PROOF ROLL HAVE BEEN PERFORMED AND THE RESULTS HAVE MET WITH THE APPROVAL OF THE TOWN OF MEAD. THE PAVEMENT DESIGN REPORT MUST BE SUBMITTED THREE (3) WEEKS PRIOR TO THE ANTICIPATED DATE OF PAVING.
5. ALL DAMAGED EXISTING CURB, GUTTER, AND SIDEWALK SHALL BE REPAIRED PRIOR TO ACCEPTANCE OF COMPLETED IMPROVEMENTS.
6. ALL CURB RETURNS WITHIN PUBLIC RIGHT-OF-WAY SHALL BE CONSTRUCTED WITH SIDEWALK RAMPS IN ACCORDANCE WITH THE TOWN OF MEAD DESIGN STANDARDS AND CONSTRUCTION SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF PUBLIC AND PRIVATE IMPROVEMENTS. ALL SIDEWALK RAMPS SHALL INCLUDE A CAST IRON TRUNCATED DOME DETECTABLE WARNING PATTERN AS SHOWN ON THE DETAIL SHEETS.

201.4 Stormwater Report Requirements

- A. The purpose of the Stormwater Report is to provide a detailed study and analysis of the proposed development. It shall include calculations for all runoff and for all drainage structures of facilities within the development. Also, any change to the Preliminary concept shall be presented in the Final Report.
- B. The Preliminary Drainage Report shall be submitted with the Preliminary Plat for the site. A Preliminary Report shall also be submitted as part of the initial Site Plan submittal A Final Drainage Report will be required for final Site Plan approval.
- C. The Final Stormwater Report shall be submitted with the civil construction drawings for the site. The Final Report (which updates the Preliminary Drainage Report) shall be reviewed with the submittal of the construction plans and approved by the Town Engineer prior to issuance of construction permit.
- D. Reports shall be typed on 8-½ " x 11" paper and bound. The drawings, figures, charts, plates and/or tables shall be bound with the report or included in a folder/pocket attached at the back of the report.

Town of Mead Design Standards and Construction Specifications

E. The report shall include a cover letter presenting the final design for review and shall be prepared by or under the direction of an engineer licensed in Colorado. The report also shall contain a Responsible Party certification sheet as follows:

1. "(Name of Responsible Party) hereby certifies that the drainage facilities for (Name of Development) will be constructed according to the design presented in this report. I understand that the Town of Mead does not and shall not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that the Town of Mead reviews drainage plans but cannot, on behalf of (Name of Development), guarantee that final drainage design review will absolve (Name of Responsible Party) and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Plat and/or Development Permit does not imply approval of my engineer's drainage design."

Attest:

(Name of Responsible Party)

Authorized Signature

2. "I hereby certify that this report (plan) for the final drainage design of (Name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Mead Standards and Specifications for the Design and Construction of Public and Private Improvements for the Responsible Parties thereof. I understand that the Town of Mead does not and shall not assume liability for drainage facilities designed by others."

Registered Professional Engineer

State of Colorado No. _____

(Affix Seal)

F. Preliminary Drainage Report

1. **Report:** The report shall provide an overview and impacts analysis of the proposed project or development, existing and developed runoff conditions, stormwater runoff flow rates and volumes, water quality and erosion control measures, stormwater attenuations or detention ponding measures, proposed stormwater utility improvements, basic design requirements, referenced study resources, methods, and findings. The preliminary drainage report shall be prepared by the Engineer of Record and include at a minimum the following sections. Approval of a preliminary drainage report and figures shall not be construed as approval of specific design details or the final drainage report and figures.
 - a. Background: Provide written statement and discussion describing the proposed project or development including at a minimum the following information:
 - i. Site location, including legal description (county, township, range, and section) and discussion of the area characteristics identifying land development patterns and features, transportation networks, major drainageways, facilities, and

Town of Mead Design Standards and Construction Specifications

- easements within and adjacent to the site and stormwater and systems including creeks, channels, irrigation ditches, and storm sewers.
- ii. Site description, including total land area, total offsite land area to be disturbed and/or effected, general topography, existing ground cover and vegetation, wetlands, groundwater conditions.
- iii. Name surrounding developments.
- b. Development Proposal: Provide a general description of the proposed project or development, including land use, density, site development plans and coverage, and stormwater planning concepts.
- c. Existing Stormwater Basins and Drainage Patterns: Include a description of the existing stormwater basins and drainage pattern that are impacted by the site development, including:
 - i. The tributary stormwater basin containing the project site and tributary major drainageway.
 - ii. The stormwater major basin(s) that are onsite, upstream and downstream of the site,
 - iii. Offsite drainage patterns and their effect on site development,
 - iv. Onsite drainage patterns, existing runoff systems, and inflow and outflow points,
 - v. Previous drainage studies for the site, drainage basin, or local area that may influence drainage design, and
 - vi. Existing drainage problems, floodplain impacts, and groundwater conditions contributing to site runoff.
- d. Conformance with Stormwater Master Plan(s): Describe how the proposed stormwater system improvements conform with adopted Stormwater Collections, Major Drainageways, and Stormwater Master Plans.
- e. Design Criteria: Discussion of the proposed calculation methods and criteria used.
 - i. Hydrology Criteria: Design Rainfall, runoff calculation method, detention discharge and storage calculation method, design storm recurrence interval, justification of other criteria or calculation methods used that or not presented or referenced in these Standards.
 - ii. Hydraulic Criteria: State calculation methodology and programs that will be used for the hydraulic design and analysis and be completed with final design and included in the Final Drainage Report.
 - iii. Variance from Criteria: Identify provisions by section number for which a variance is requested. Provide justification.
- f. Wetlands Impacts: Identify any delineated wetland or wetland buffer areas identified by the US Fish & Wildlife Services. If there is an area on the project site further investigation by a certified wetland delineator to determine the extents of the wetland on site. Include any discussion of any necessary analyses, avoidance and mitigation measures, and improvements needed to address wetlands permitting requirements.
- g. Developed Stormwater Conditions: Describe and define proposed stormwater runoff conditions following development, estimated by using the proposed land use and developed patterns for the project site based on the minor and major storm events included a discussion and summary table of the following:
 - i. Acceptance and conveyance of offsite runoff through the proposed site development

Town of Mead Design Standards and Construction Specifications

- ii. Proposed major basin(s) and sub-basin(s) onsite, upstream and downstream of the site,
 - iii. Proposed drainage rates, flow patterns, drainage facilities, detention ponds, water quality measures, and outflow points,
 - iv. Downstream properties and systems, such as streets, utilities, existing structures, and developments, impacted by the proposed development from the site to the receiving major drainageway, and
 - v. Proposed stormwater systems and facility design, including discussion of the following:
 - (a) General concepts and alternative for site drainage improvements, such as the provision, layout, alignment of storm sewer, open swales and channels, inlets, detention ponds and outlets.
 - (b) Solutions and alternatives for conveying onsite and contributing offsite runoff, mitigating drainage impacts, enhancing water quality, erosion and sediment control, and maintenance.
 - h. Water Quality: Describe mitigation measures and improvements that will be utilized to address Town Standards and how these improvements will be accommodated within the site development plan.
 - i. Stormwater Detention: Include a technical analysis of stormwater detention proposed for the development in conformance with these Standards. Identify the approximate size and location of any required detention facilities include the location of the emergency spillway and downstream pathway.
 - i. Include review and analysis of the downstream pathway to ensure there are no negative effects to the downstream properties for the proposed discharge rates (facility outlet flow rate(s) and emergency spillway flow rate)
 - j. Conclusions and Recommendations: Include conclusions and recommendations for proposed drainage facilities to be provided in conjunction with site development, and conformance with these Standards.
2. References
3. Technical Appendices
- a. Provide all technical support material in an appendix, including without limitation, engineering equations, assumptions, calculations used in preparing the report, and hydrologic and hydraulic sources, references, and methods. The hydrologic analysis shall include areas, storm frequencies, runoff coefficients, times of concentration, and all runoff computation. Any relevant pages from previous drainage reports referenced in the report shall be included in the appendices.
 - b. Hydrologic models (CUHP, EPA SWMM, etc) if required per these Standards and Specifications need to be supplied.
4. Drawings and Figures
- a. Vicinity Map: Providing a general location map identifying major drainageways and surrounding development and public infrastructure system. The map shall include and identify the site area, the area contributing off-site flow, location of the final discharge system (stream, lake, reservoir, etc.) and the pathway for flow from the site to the final discharge system. Typically, the map should be on 8 1/2 by 11 inches at a scale ranging from 1-inch equals 400 feet to 1-inch equals 2,000 feet.

Town of Mead Design Standards and Construction Specifications

- b. Floodplain Map: Identifying the 100-year floodplain, conveyances and high hazard zones for the site impacted by floodplains. Identify the site on the map.
 - c. Wetland Map: Identifying Wetlands. Identify the site on the map.
 - d. Existing Drainage Figure:
 - i. General Property Boundaries
 - ii. Topography
 - iii. Stormwater Basins and Design Points
 - iv. Stormwater Drainage Facilities
 - v. Streets
 - vi. Irrigation Ditches
 - vii. Floodplains and Wetlands
 - viii. Site Runoff
 - ix. Existing Building Floor Elevations
 - x. Stormwater Routing
 - e. Developed Drainage Figure:
 - i. General Property Boundaries
 - ii. Topography
 - iii. Stormwater Basins and Design Points
 - iv. Stormwater Drainage Facilities
 - v. Streets
 - vi. Site Runoff
 - vii. Irrigation Ditches
 - viii. Floodplains and Wetlands
 - ix. Proposed Building Floor Elevations
 - x. Stormwater Routing Systems
 - f. Construction Plan Sheets:
 - i. Stormwater Management Plan
 - ii. Erosion Control Plan
 - iii. Storm Plan and Profile Plan
 - iv. Storm Details
- G. Final Drainage Report
- 1. **Technical Report:** The technical report shall provide an overview and impacts analysis of the proposed project or development, historic and developed runoff conditions, stormwater runoff flow rates and columns, water quality and erosion control measures, stormwater attenuation or detention ponding measures, proposed stormwater utility improvements, basic design requirements, and referenced study data sources, methods and findings, and include the following information:
 - a. Engineer's Statement
 - i. See Section 200 for required Engineer's Statement.

Town of Mead Design Standards and Construction Specifications

- b. Provide written statement and discussion describing the proposed project or development including at a minimum the following information:
 - i. Site location, including legal description (county, township, range, and section) and discussion of the area characteristics identifying land development patterns and features, transportation networks and stormwater systems (creeks, channels, irrigation ditches, and storm sewers) in the surrounding area.
 - ii. Site description, including total land area, total offsite land area to be disturbed or effected, general topography, and existing round cover, wetlands, groundwater conditions, and stormwater and irrigation ditch systems.
- c. Development Proposal: Provide a general description of the proposed project or development, including land use, density, site development plans and coverage, and stormwater planning concepts.
- d. Existing Stormwater Basins and Drainage Patterns: Include a description of the stormwater basins and drainage pattern that are impacted by the site development, including:
 - i. The tributary stormwater basin containing the project site and tributary major drainageway.
 - ii. The major basin and minor sub-basin stormwater basins that are onsite, upstream and downstream of the site,
 - iii. Offsite drainage patterns and their effect on site development,
 - iv. Onsite drainage patterns, existing runoff systems, and inflow and outflow points,
 - v. Previous drainage studies for the site, drainage basin, or local area that may influence drainage design, and
 - vi. Existing drainage problems, floodplain impacts, and groundwater conditions contributing to site runoff.
- e. Conformance with Stormwater Master Plans: Describe how the proposed stormwater system improvements conform with adopted Stormwater Collections, Major Drainageways, and Stormwater Master Plans.
- f. Design Criteria: Discussion of the proposed calculation methods and criteria used.
 - i. Hydrology Criteria: Design Rainfall, runoff calculation method, detention discharge and storage calculation method, design storm recurrence interval, justification of other criteria or calculation methods used that or not presented or referenced in these Standards.
 - ii. Hydraulic Criteria: Inlet, pipe, swale and other conveyance system sizing calculation methods, detention pond sizing calculation methods, and justification of other criteria or calculation methods used that or not presented or referenced in these Standards.
 - iii. Regulations and Variance from Criteria: Identify provisions by section number for which a variance is requested. Provide justification.
- g. Wetlands Impacts: Identify any delineated wetland or wetland buffer areas identified by the US Fish & Wildlife Services. If there is an area on the project site further investigation by a certified wetland delineator to determine the extents of the wetland on site. Include any discussion of any necessary analyses, avoidance and mitigation measures, and improvements needed to address wetlands permitting requirements.
- h. Developed Stormwater Conditions: Describe and define proposed stormwater runoff conditions following development, estimated by using the proposed land use and

Town of Mead Design Standards and Construction Specifications

developed patterns for the project site based on the minor and major storm events included a discussion and summary table of the following:

- i. Acceptance and conveyance of offsite runoff through the proposed site development
 - ii. Proposed major basin(s) and sub-basin(s) onsite, upstream and downstream of the site,
 - iii. Proposed drainage rates, flow patterns, drainage facilities, detention ponds, water quality measures, and outflow points,
 - iv. Downstream properties and systems, such as streets, utilities, existing structures, and developments, impacted by the proposed development from the site to the receiving major drainageway, and
 - v. Proposed stormwater systems and facility design, including discussion of the following:
 - (a) General concepts and alternative for site drainage improvements, such as the provision, layout, alignment and size of storm sewer, open swales and channels, inlets, detention ponds and outlets.
 - (b) Solutions and alternatives for conveying onsite and contributing offsite runoff, mitigating drainage impacts, enhancing water quality, erosion and sediment control, and maintenance.
 - i. Water Quality: Describe mitigation measures and improvements that will be utilized to address Town Standards and how and these improvements will be accommodated within the site development plan. Include a stormwater quality analysis stating the required and provided water quality capture volume treated onsite.
 - j. Stormwater Detention: Include a technical analysis of stormwater detention proposed for the development in conformance with these Standards. Identify the size and location of any required detention facilities include the location of the emergency spillway and downstream pathway.
 - i. Include review and analysis of the downstream pathway to ensure there are no negative effects to the downstream properties for the proposed discharge rates (facility outlet flow rate(s) and emergency spillway flow rate)
 - k. Stormwater Management Plan and Erosion Control Plan: Include analysis and describe necessary mitigation measures and improvements that will be incorporated into the erosion control plan as part of the site development. Provide a discussion of how proposed erosion and sedimentation control measures will ensure that downstream properties and drainageways will not be adversely impacted by site development and construction activities.
 - l. Conclusions and Recommendations: Include conclusions and recommendations for proposed drainage facilities to be provided in conjunction with site development, and conformance with these Standards.
2. References
 - a. Reference criteria and technical information used.
 3. Technical Appendices
 - a. Provide all technical support material in an appendix, including without limitation, engineering equations, assumptions, calculations used in preparing the report, and hydrologic and hydraulic sources, references, and methods. The hydrologic analysis shall include areas, storm frequencies, runoff coefficients, times of concentration, and

Town of Mead Design Standards and Construction Specifications

- all runoff computation. Any relevant pages from previous drainage reports referenced in the report shall be included in the appendices.
- b. Hydrologic and Hydraulic models (CUHP, EPA SWMM, etc) if created need to be supplied.
 - c. Final Stormwater Design Features: Construction plans for any site development shall include final stormwater design features in the report and attached drawings. The final design information in the report shall provide the technical basis and support for the proposed construction design and all detailed engineering calculations for stormwater systems. The stormwater system(s) shall be labeled as such that the storm system features can be identified between the report, calculations, and drawings/figures. Design features include without limitation:
 - i. Inlet sizing and design,
 - ii. Storm sewer sizing, design, type, EGL and HGL's,
 - iii. Open channel (swale and drainageway) design and sizing,
 - iv. Stormwater routing for stormwater conveyance (storm sewer and swales) and detention pond facilities,
 - v. Curb and gutter conveyance capacities,
 - vi. Detention pond outfall structures (orifices, inlets, and weirs).
 - vii. Water quality measures, and
 - viii. Any unique stormwater improvements design details.
4. Drawings and Figures
- a. Vicinity Map: Providing a general location map identifying major drainageways and surrounding development and public infrastructure system. The map shall include the site area, the area contributing off-site flow, location of the final discharge system (stream, lake, reservoir, etc.) and the pathway for flow from the site to the final discharge system. Typically, the map should be on 8 1/2 by 11 inches at a scale ranging from 1 inch equals 400 feet to 1 inch equals 2,000 feet.
 - b. Floodplain Map: Identifying the 100-year floodplain, conveyances and high hazard zones for the site impacted by floodplains. Identify the site on the map.
 - c. Wetland Map: Identifying Wetlands. Identify the site on the map.
 - d. Existing Drainage Figure:
 - i. General Property Boundaries
 - ii. Topography
 - iii. Stormwater Basins and Design Points
 - iv. Stormwater Drainage Facilities
 - v. Streets
 - vi. Site Runoff
 - vii. Irrigation Ditches
 - viii. Floodplains and Wetlands
 - ix. Building Floor Elevations
 - x. Stormwater Routing
 - e. Developed Drainage Figure:
 - i. General Property Boundaries

Town of Mead Design Standards and Construction Specifications

- ii. Topography
- iii. Stormwater Basins and Design Points
- iv. Storm System Features
- v. Stormwater Drainage Facilities
- vi. Riprap and Embankment Protection
- vii. Streets
- viii. Site Runoff
- ix. Irrigation Ditches
- x. Floodplains and Wetlands
- xi. Building Floor Elevations
- xii. Stormwater Routing System
- f. Construction Plan Sheets:
 - i. Stormwater Management Plan
 - ii. Erosion Control Plan
 - iii. Storm Plan and Profile Plan with Storm HGL's
 - iv. Storm Details

201.5 Final Utility Report Requirements

- A. The purpose of the Final Utility Report is to provide a detailed study and analysis of the proposed development. It shall include calculations for all sanitary sewage flows and all water systems demands and for all appurtenances within the development. Also, any change to the Preliminary concept shall be presented.
- B. The Final Utility Report shall be submitted with the civil construction drawings for the site. The Final Report (which updates the Preliminary Utility Study) shall be reviewed with the submittal of the construction plans and approved by the Town Engineer prior to issuance of construction permit.
- C. Reports shall be typed on 8-½ " x 11" paper and bound. The drawings, figures, charts, plates, and/or tables shall be bound with the report or included in a folder/pocket attached at the back of the report.
- D. The report shall include a cover letter presenting the final design for review and shall be prepared by or under the direction of an engineer licensed in Colorado. The report also shall contain a Responsible Party certification sheet as follows:

"(Name of Responsible Party) hereby certifies that the sewer and water system for (Name of Development) will be constructed according to the design presented in this report. I understand that the Town of Mead does not and shall not assume liability for the sewer and water system designed and/or certified by my engineer. I understand that the Town of Mead reviews utility plans but cannot, on behalf of (Name of Development), guarantee that final utility design review will absolve (Name of Responsible Party) and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the Plat and/or Development Permit does not imply approval of my engineer's utility design."

Attest: _____

Name of Responsible Party

Town of Mead Design Standards and Construction Specifications

Notary Public

Authorized Signature

"I hereby certify that this report (plan) for the Final Utility Design of (Name of Development) was prepared by me (or under my direct supervision) in accordance with the provisions of the Town of Mead Design Standards and Construction Specifications for the Design and Construction of Public and Private Improvements for the Responsible Parties thereof. I understand that the Town of Mead does not and shall not assume liability for utilities designed by others."

Registered Professional Engineer

State of Colorado No. _____

(Affix Seal)

- E. The Final Utility Report shall be prepared in accordance with the following outline. The report drawings shall include the following:

Report Contents

The Report shall be in accordance with the following outline and contains the applicable information listed:

1. General Location and Description
 - a. Location
 - i. Township, range, section, one-quarter ($\frac{1}{4}$) section.
 - ii. Streets within and adjacent to the subdivision with ROW width shown.
 - iii. Major facilities and easements within and adjacent to the site.
 - iv. Names of surrounding developments.
 - b. Description of Property
 - i. Area in acres.
 - ii. Vegetation (trees, shrubs, ground cover, general soil conditions, topography, and slope).
 - iii. Major drainage ways.
 - iv. General project description.
 - v. Proposed land use.
2. Basins and Pressure Zones
 - a. Major Basin Description
 - i. Reference to sewer master plan studies, reports for adjacent subdivisions, and the Town Utility Masterplan.
 - ii. Major basin characteristics, and existing and planned land uses.
3. Design Criteria
 - a. Regulations: Discussion of the optional provisions selected or the deviation from the criteria, if any, and its justification.
 - b. Development Criteria Reference and Constraints

Town of Mead Design Standards and Construction Specifications

- i. Discussion of previous utility studies (i.e., utility reports, project master plans, etc.) for the site in question that influence or are influenced by the design.
 - ii. Discussion of the effects of adjacent utility studies.
 - iii. Discussion of the impact of site constraints such as streets, other utilities, existing structures, and development or site plan.
 - c. System Design Criteria
 - i. Refer to Chapters 400 and 500 for sanitary sewer and water design criteria.
 - ii. Provide all supporting calculations and information.
 - iii. Discussion and justification of other criteria or calculation methods used that are not presented in or referenced by the criteria.
4. Conclusions
 - a. Compliance with Standards
5. Reference
 - a. Reference criteria and technical information used.

Two (2) copies of the Final Utility Report including the Final Utility Plan shall be submitted to the Town Engineering for review.

201.6 Traffic Impact and Access Study

A. Introduction

This section contains guidelines for conducting Traffic Impact Studies (TIS) for submittal to the Town of Mead. These guidelines have been established to ensure consistent and proper traffic planning and engineering practices when land use actions are being considered within the Town. These guidelines provide for a standard process, set of assumptions, set of analytic techniques, and presentation format to be used in the preparation of all Traffic Impact Studies submitted to the Town of Mead.

B. Responsibility for Traffic Impact Studies

A Traffic Impact Study (TIS) may be required by the Town to adequately assess the impact of a development proposal on the existing and/or planned street system. The TIS shall be the responsibility of the developer, with the Town serving in a review capacity. The TIS shall be prepared by a registered Professional Engineer, licensed in Colorado, with adequate experience in transportation planning. All studies shall include the seal and signature of the Professional Engineer registered in the State of Colorado who is responsible for the report contents. In addition, all reports shall include the following statement:

"We acknowledge that the Town of Mead's review of this study is only for general conformance with submittal requirements, current design criteria, and standard engineering principles and practices. We are also aware of the provisions of the Town of Mead Land Use Code."

Upon submission of a TIS, the Town will review the study data sources, methods, and findings. Comments will be provided in a written form. The developer and the developer's engineer shall then have an opportunity to incorporate the necessary revisions prior to submitting a final report. All studies must be approved by the Town before acceptance.

Traffic Impact Studies are required when any of the following threshold conditions could be met:

1. The daily trip generation of the development would exceed 250 trips per day;
2. The peak hour trip generation of the development (either A.M. or P.M.) would exceed 50 trips per hour;

Town of Mead Design Standards and Construction Specifications

3. Any residential development greater than 25 new dwellings units;
4. The development is requesting access to an arterial street or State Highway;
5. The adjacent street or closest intersection(s) already operates at or near LOS F in either the AM or PM peak hour of the day;
6. Any special conditions as determined by the Town Engineer.

If it is determined that none of the above conditions would apply, a waiver of the TIS requirement may be requested by submitting a brief letter report or technical memorandum demonstrating that each of the above conditions would not be met.

C. Updated Traffic Impact Study Required

The Town may require an update (amendment) to a previous TIS, or a new study, if any of the following thresholds are met:

1. Changes to the development proposal increases the expected trip generation for daily or peak hour trips by more than 15 percent from the original study;
2. The previous TIS is more than 2 years old, unless the Town Engineer has determined that the conditions have not significantly changed; or
3. The location, types, or number of access points for the development have changed.

D. Traffic Impact Study Format

Traffic consultants are required to contact the Town and conduct a pre-study conference to define and agree on the TIS parameters that should be incorporated into the TIS. The attached Traffic Impact Study Scoping Checklist (see Section L below) should be completed during the pre-study conference and initialed by the Town and the developer's traffic consultant as a record of the agreed upon scope. The conference should define the study area boundary, design years, traffic count locations, the directional distribution of traffic, intersections requiring operational analyses, and the method for projecting future background traffic volumes, etc. and the components of the study that should be documented. This should provide a firm basis of understanding and communication between the Town, the owner or developer, and their consultant in preparing a TIS that comprehensively addresses the potential traffic impacts of the project. Specific requirements may vary depending on the size and type of project and the site location. However, all Traffic Impact Studies shall contain, at a minimum, the following information:

1. Introduction
 - a. A brief description of the size of the land parcel, general terrain features, the location within the jurisdiction and the region should be included in this section. In addition, the primary roadways within the study area should be identified.
 - b. The limits of the study area should be based on engineering judgment and an understanding of existing traffic conditions at the site. In all instances, however, the study area limits shall be mutually agreed upon by the developer, the developer's engineer, and Town staff. A vicinity map that depicts the site in relation to the surrounding transportation system should be included.
2. Existing and Proposed Site Uses
 - a. The existing and proposed uses of the site should be identified relative to the various zoning categories of the Town. Include the proposed site plan as a figure in the TIS.
3. Existing and Proposed Uses in Vicinity of Site
 - a. A description of the existing land uses in the vicinity of the site, as well as their current zoning, should be included. The applicant should also identify, if known, any proposed

Town of Mead Design Standards and Construction Specifications

uses for vacant lands adjacent to the site to anticipate any potential transitions in land use. This latter item is especially important where large tracts of undeveloped land are within the prescribed study area and could potentially impact the adjacent transportation system.

4. Existing and Proposed Roadways and Intersections
 - a. A description of the existing roadways and intersections (laneage, intersection geometrics, and traffic control) as well as any improvements contemplated by government agencies should be included.

E. EXISTING CONDITIONS

The TIS report should discuss and graphically depict the following existing conditions:

1. Existing Average Daily Traffic (ADT) for streets within the established study area, based on recent traffic counts. All raw traffic count data, including 24-hour ADT counts and peak hour turning movement counts shall be provided in the appendix. Daily traffic counts should be actual machine counts rather than factored peak hour counts. Available machine counts from Colorado Department of Transportation, the Town, and other agencies may be acceptable if not more than two years old.
2. Existing A.M. and P.M. peak hour movements for intersections within the study area, based on recent traffic counts. Peak hour counts should include pedestrian movements. In some cases, bicycle movements may also be required. All intersection turning movement counts should be less than two years old.
3. A figure depicting the existing study area traffic volumes should be included in the TIS.
4. Existing A.M. and P.M. peak hour levels of service (LOS) for all study area intersections. Include a figure summarizing the LOS results and a tabulation that details the seconds of delay and resulting LOS for each approach vehicle movement and the overall intersection LOS.

Level of Service (LOS) is a qualitative measure of traffic operational conditions based on roadway capacity and vehicle delay. As defined by the Highway Capacity Manual, LOS ranges from A to F, with LOS A representing generally free-flow traffic and minimal delays, and with LOS F representing congested conditions and long delays.

The TIS shall include LOS analyses for the study area intersections and proposed site access driveways based on current Highway Capacity Manual (HCM) methods. Pedestrian and bicycle movements should also be considered in the evaluation, where applicable. LOS worksheets shall be included in the TIS appendix. Computer techniques, and the associated printouts, may also be used as part of the report graphics, but must be clearly labeled and referenced as a table or figure in the report and located in the report such that they are easily referenced. LOS calculations shall be performed for existing conditions, background conditions, and total traffic scenarios.

LOS C will be the design objective for peak hour intersection operations, with LOS D being the minimum acceptable operational condition for site plus background traffic. For signalized intersections, LOS E may be acceptable for individual movements provided an average intersection of LOS D is maintained. Minor movements at unsignalized intersections may be allowed to fall below LOS D, subject to specific conditions and Town approval.

F. Proposed Site Generated Traffic

Trip generation must be calculated for the maximum uses allowed under the existing and proposed zoning based on the latest data contained within the latest edition of TRIP GENERATION, Institute of Transportation Engineers (ITE). In the event that published data is not available for a proposed

Town of Mead Design Standards and Construction Specifications

land use, the Town must approve the estimated rates or trip generation method prior to acceptance. Traffic volume counts for similar existing uses or additional sources from other jurisdictions may be acceptable to the Town. The TIS should address the following, as applicable:

1. Trip Generation

- a. Summary table listing the type of each land use proposed, the size involved, the trip generation rates used (total daily traffic, AM and PM peak hours), and the resultant total site trip generation must be provided. Where ITE trip generation rate equations are available they should be utilized (rather than the average trip rates) if it appears that the equations provide a better match with the empirical trip data available for the size of the proposed development (based on a review of the trip rate graph in ITE's TRIP GENERATION for the land use and time of day in question).

2. Pass-By Trips

- a. Reductions to the site trip generation to account for pass-by traffic may be considered for commercial developments upon approval of the Town. Data contained in the latest edition of ITE's TRIP GENERATION HANDBOOK may be used to estimate the pass-by attraction of a proposed development. Pass-by trips would reduce the development's impact on the adjacent roadways, but the site driveway volumes are not reduced. A separate traffic assignment may be needed to demonstrate the pass-by volumes.

3. Internal Capture

- a. Internal trip reductions may be considered for mixed-use developments. The methodology presented in the latest edition of ITE's TRIP GENERATION HANDBOOK shall be used to calculate the internal capture potential. Justification for internal trip reductions shall be provided.

4. Transit Oriented Development

- a. Trip reductions may also be considered for developments located along transit corridors or in close proximity to light rail stations. The methodology presented in the latest edition of ITE's TRIP GENERATION HANDBOOK shall be used to calculate the potential vehicle trip reductions associated with the availability of transit. Justification for transit reductions shall be provided.

5. Trip Distribution

- a. The estimated distribution of trips oriented to and from the proposed development must be clearly stated in the report using the north, south, east, west compass points by percent of assignment and the methodology for arriving at the trip distribution estimates should be stated. Market studies and information concerning origin of trip attractions to the proposed development may be used to support these assumptions where available. A figure showing the percentage of site traffic on each street must be provided as part of the TIS graphic material.

6. Project Generated Traffic Assignment

- a. This section shall describe the utilization of the study area roadways by site generated traffic. A figure depicting the assignment shall be included in the TIS. Address each phase of development, if applicable, and include associated figures.

- G. Future Conditions

Future conditions shall include the short term, long term, and any intermediate phases of development. The future traffic volumes consist of background traffic plus site generated traffic.

Town of Mead Design Standards and Construction Specifications

Short term background volumes are the existing traffic unless a later scenario is specified by the Town.

1. Long Term Background Traffic Volumes
 - a. 20-year background traffic volume projections shall consider regional growth in traffic and the buildout of major vacant properties around the proposed development as defined by the Town. Sources on background traffic projections may include the Town's Transportation Master Plan, regional travel model projections, TIS's for adjacent or nearby development projects, CDOT traffic growth factors, etc.
 - b. It is recommended that the developer's traffic engineer propose the methodology for projecting background traffic and review it with the Town prior to completing the TIS.
 - c. A figure depicting the long-term background volumes (daily, A.M. and P.M. peak hours) shall be included in the TIS. Intermediate future scenarios corresponding to each phase of development should also be included, as applicable.
2. Long Term Background LOS
 - a. The 20-year background traffic operations shall be analyzed using HCM methods and figures and tables summarizing the LOS results shall be provided in the TIS.
 - b. LOS results for any intermediate future scenarios should also be provided. The LOS tabulation should be formatted to enable a side-by-side comparison of LOS for each intersection that includes existing, background, and background plus site development delay and LOS conditions.
3. Total Traffic Volumes
 - a. The total traffic volumes are the sum of the background plus site generated traffic volumes (daily, A.M. and P.M. peak hours). Figures depicting the short term (existing plus site) and long term (20-year background plus site) shall be included in the TIS.
 - b. Intermediate future horizons reflecting phases of development should also be provided, if applicable.
4. Total Traffic LOS
 - a. The total traffic operations shall be analyzed using HCM methods and figures and tables summarizing the results shall be included in the TIS. Intermediate phases of development shall also be analyzed, and appropriate figures included.

H. PROPOSED IMPROVEMENTS

This section shall describe the location, nature, and extent of proposed improvements to assure sufficient roadway capacity and multimodal accommodations. The recommendations shall include any planned projects by the Town or CDOT for which funds have been appropriated and obligated and any additional improvements necessitated by the development.

1. Roadway Laneage
 - a. Potential roadway widening to include additional through lanes shall be identified.
2. Intersection Geometry
 - a. Geometric improvements at intersections, such as additional auxiliary through lanes, turn lanes or storage modifications to maintain acceptable LOS shall be identified.
 - b. The criteria for adding auxiliary turn lanes shall be based on appropriate National Cooperative Highway Research Program (NCHRP) and/or CDOT State Highway Access Code guidelines. The length and tapers of any proposed acceleration,

Town of Mead Design Standards and Construction Specifications

deceleration, or turn lanes should also be noted, based on appropriate NCHRP and/or CDOT Access Code guidelines.

3. Traffic Control

- a. Traffic control improvements at site accesses and study area intersections will be identified. Where the need for traffic signals is identified, additional analyses are needed, as described in the following sections.

4. Signal Warrant Analysis and Signal Progression

- a. The need for new traffic signals shall be identified based on warrants specified in the Manual on Uniform Traffic Control Devices (MUTCD). The TIS should include appropriate signal warrant information from the MUTCD. Traffic progression along arterials is of primary importance; therefore, a spacing of one-half mile for all signalized intersections should be maintained. This spacing typically provides for good speed and optimum signal progression. If the one-half mile signal spacing cannot be achieved, a progression analysis shall be included in the TIS to demonstrate that progression will be maintained.
- b. To provide flexibility for existing conditions and ensure optimum two-way signal progression, analysis shall be made to properly locate all proposed site access approaches that could require signalization. An optimized two-way progression pattern, or time-space diagram, shall be established between two public intersections that bracket the proposed approach as determined by the Town. These bracketing intersections should be about one mile apart and be existing or planned future signal locations.
- c. The progression analysis shall use a cycle length of between 80 and 120 seconds and a travel speed of 40 mph unless the posted speed limit is less. A desirable bandwidth of 50% must be used where existing conditions allow. Where intersections have no signals presently, but are expected to have signals, a 60% mainline and 40% cross street cycle split should be assumed. The green time allowed to the cross street shall be considered no less than the time that is required for a pedestrian to cross the mainline at 3.5 feet per second. Intersections that would reduce the optimum bandwidth if a traffic signal were installed, shall remain unsignalized and have turning movements limited by driveway design or median islands.

5. Accident Analysis and Safety Improvements

- a. Traffic accident data for affected street corridors may be required for the study. The study period shall normally be five years. Where this is necessary, estimates of increased or decreased accident potential shall be evaluated for the development.
- b. If the proposed development might impact existing traffic safety problems in the study area, then safety improvement recommendations will be necessary.

6. Auxiliary Lanes

- a. The need for acceleration or deceleration lanes at site accesses shall be evaluated and identified in the TIS based on volume criteria per Colorado Department of Transportation (CDOT) criteria, as contained in the State Highway Access Code. Deceleration, storage, and taper requirements shall also be based on CDOT criteria.
- b. For arterial roadways, the criteria for Access Category NR-B, Non-Rural Arterial, shall apply.
- c. For collector roadways, the criteria for Access Category NR-C, Non-Rural Arterial, shall apply.

7. Vehicle Queues

Town of Mead Design Standards and Construction Specifications

- a. The analyses shall include an evaluation of the 95th percentile maximum probable vehicle queue lengths to ensure any identified auxiliary lane improvements will accommodate the projected queues. On-site queueing shall also be evaluated to ensure the proposed layout will accommodate queues such that circulation is maintained.
 - b. The TIS should include a tabulation of the left turn, through, and right turn vehicle queue lengths for each intersection approach, and the available storage length for each left and right turn lane should be noted.
8. Sight Distance
- a. Improvements to ensure adequate sight distance at all site accesses and intersections shall be included in the TIS.
9. Bicycle and Pedestrian Facilities
- a. Improvements to the non-motorized transportation network shall be identified. Such improvements may include bike lanes, sidewalks, trails, and multi-use paths.
 - b. These improvements shall provide multimodal connectivity to and through the development project and maintain continuity and conformance with the Town's street sections and any local or regional facilities identified in the Town's Transportation Plan.
10. Shared Parking
- a. Traffic studies for mixed-use developments where shared parking reductions are contemplated shall be required to include parking accumulation studies for existing facilities similar to the proposed uses and for the surrounding uses with which parking is being reciprocated. The TIS may utilize available shared parking data from the Urban Land Institute (ULI), ITE, or other recognized source, as approved by the Town.

I. Recommendations

If the analyses indicate unsatisfactory levels of service on study area roadways, recommendations for improvements to mitigate deficiencies shall be identified. In general, the recommendation section should include:

1. Recommended Improvements
 - a. This section shall describe the location, nature, and extent of proposed improvements to assure sufficient roadway capacity and operations. A conceptual layout should be provided showing the dimensions of the pertinent geometric features of the proposed improvements. Recommended traffic control, signing and striping improvements should be incorporated in the concept sketches, if applicable.
2. Recommendations on Phasing of Improvements
 - a. Where long term improvements are not needed in the short term, a logical phasing plan shall be developed.
3. Traffic Volume Proportions and Percent Contribution Calculations
 - a. The percent share of total traffic volumes may be required by the Town to determine the proportion of traffic using various public improvements (both existing and proposed) from several developments within the study area. This will assist the Town in determining the appropriate allocation of improvement costs among the area developments.
 - b. To facilitate this determination, the TIS should include a table identifying the amount of development traffic and the total traffic that will utilize the recommended improvements and calculate the development percent contribution to the need for said improvements.

Town of Mead Design Standards and Construction Specifications

The Town may take this same approach to calculating this developments percent contribution to any adjacent improvements that have already been implemented as a result of other developments in the area in case any cost contribution to existing improvements is warranted.

J. Conclusions

1. The last chapter of the report must be a clear, concise summary of the proposed project, the study findings, and recommendations. It is anticipated that the concluding chapter will serve as an executive summary.

K. Revisions to Traffic Impact Study

1. Revisions to the TIS may be required by the Town. The need for revisions will be based on the completeness of the TIS (based on a review of the Scoping Checklist), adherence to Town requirements, and the compatibility of the TIS with the proposed access and development plan.

L. Traffic Impact Study Scoping Checklist

1. The following scoping checklist shall be completed jointly by the Town and the engineer conducting the TIS during the pre-study conference referenced above. The completed checklist shall be included in the appendix of the report.

Town of Mead Design Standards and Construction Specifications

Traffic Impact Study Scoping Checklist

TIS Elements		Yes	No	Comments
REPORT COVER				
1	Original and Revision Dates			
2	Dated, Checked, Sealed, and Signature of P.E.			
INTRODUCTION				
1	Study Area Boundary Map (figure)			
2	Existing and proposed site uses and phasing. Include Site Plan with access points shown (figure)			
3	Existing and proposed uses in vicinity of site			
4	Existing and proposed roadways and intersections (figure)			
EXISTING CONDITIONS				
1	24-hour roadway counts < 2 years old			
2	Intersection peak hour counts < 2 years old			
3	Existing A.M., P.M., and Daily Traffic volumes (figure)			
4	Existing A.M. and P.M. peak hour LOS (figure and tabulation)			
PROPOSED SITE GENERATED TRAFFIC				
1	Trip Generation Summary (table)			
2	Pass-by Trips (provide justification and figure if needed)			
3	Internal Trips (provide justification)			
4	Transit Trip Reductions (provide justification)			
5	Trip Distribution (figure and provide justification)			
6	Trip Assignment (figure) – each phase			
FUTURE CONDITIONS				
1	Background Traffic Volumes (20-year and each phase) - Daily, A.M., and P.M. peak hours (figures)			
2	Background LOS (20-year and each phase) – A.M. and P.M. peak hours (figures and tabulation)			

Town of Mead Design Standards and Construction Specifications

<i>TIS Elements</i>		Yes	No	Comments
3	<i>Total Traffic Volumes (short term, long term, and each phase) – Daily, A.M. and P.M. peak hours (figures)</i>			
4	<i>Total Traffic LOS (short term, long term, and each phase) - A.M. and P.M. peak hours (figures and tabulation)</i>			
5	<i>Vehicle queuing (tabulation)</i>			
PROPOSED IMPROVEMENTS				
1	<i>Roadway Laneage</i>			
2	<i>Intersection Geometry</i>			
3	<i>Traffic Control</i>			
4	<i>Signal Warrant Analysis and Signal Progression</i>			
5	<i>Accident Analysis and Safety Improvements</i>			
6	<i>Auxiliary Lanes</i>			
7	<i>Shared Parking</i>			
8	<i>Pedestrian, Bicycle and Transit accommodations</i>			
9	<i>Site access sight distance evaluation</i>			
RECOMMENDATIONS				
1	<i>Recommended improvements (provide sketches)</i>			
2	<i>Recommendations on phasing improvements</i>			
3	<i>Percent Share of Development Traffic Volumes</i>			
CONCLUSIONS				
1	<i>Summary of Findings</i>			

Scoping Checklist completed on: _____

Representing the Town of Mead: _____

Representing the Developer's Traffic Engineer: _____

Town of Mead Design Standards and Construction Specifications

I have reviewed the attached report with this check list and all the required items have been included except as noted above.

Traffic Engineer

Town of Mead Design Standards and Construction Specifications

202 PERMITS AND INSPECTIONS

202.1 Permits Required

All Contractors, public utility agencies, and property owners installing public or private improvements, or storing materials or equipment, within any public right-of-way or easement must obtain the required permit prior to the commencement of the work. The following are permits required prior to doing certain described activities in the public right-of-way:

A. Grading Permit

1. A grading permit shall be obtained from the Town of Mead for all construction activity disturbing more than 0.5 acres or moving more than 500 cubic yards of earthwork in accordance with Chapter 11, Article II of the Town Code.

B. Right of Way Permit (Utility Excavation, Street Cut, and Obstruction Permit)

1. A Right of Way Permit shall be obtained from the Town of Mead for all proposed construction activities located in public Rights of Way and easements in accordance with Chapter 11, Article II of the Town Code.

C. Street, Driveway, and Culvert Permit (ROW Access Permit)

1. A Street, Driveway, and Culvert Permit to be obtained from the Town of Mead for all proposed driveway or access connections to any Town of Mead Right of Way in accordance with Chapter 11, Article II of the Town Code.

D. Flood Hazard Development Permit (FHDP)

1. A Flood Hazard Development Permit (FHDP) shall be obtained from the Town of Mead for all proposed development or construction activities located in any Special Flood Hazard Area in accordance with Chapter 16, Article XII of the Town Code.

E. State and Federal Permits

1. Land development activity and the construction of public infrastructure often require additional permits from state and federal agencies. Examples include an Emission Permit for fugitive dust (issued by the Colorado Department of Public Health and Environment), a Discharge Permit for storm water associated with construction activity (issued by the Colorado Department of Health), and a Section 404 Permit for impacts to wetlands or waterways (issued by the US Army Corps of Engineers). It is the responsibility of the developer to obtain all applicable State and Federal Permits.

202.2 Application

- A. Applications for the various permits are available at the public counter of Town of Mead. The application form must be completed and submitted to the Town Engineer along with the required items stated on the permit application or as required by the Town Engineer.

202.3 Review and Approval of Submittals

- A. The application will be reviewed by the Town of Mead. If additional information is required, the Applicant will be contacted. The Town of Mead will check to make certain that the Applicant has provided the required bond and when applicable the license and insurance certificates. Once the permit application and all required submittals have been reviewed and found to be complete, the Permit may be issued by the Town of Mead.

202.4 Issuance of Permit

- A. The Permit is issued to the Applicant after all fees have been collected.

Town of Mead Design Standards and Construction Specifications

- B. Any modifications to the approved permit including any scope or schedule changes must be submitted in writing to the Town Engineer for review and approval.
- C. The Town of Mead may authorize a private entity to issue permits for all work described in this chapter.

202.5 Plans

- A. Any plans required for permit process shall clearly indicate the proposed work and its location. Refer to Chapter 200 for all plan requirements.

202.6 Permit Standard and Conditions

A. General Requirements

The Applicant shall be responsible for all of the following requirements:

1. Approval of Permit: Permits are issued subject to the approval of the Town of Mead, State, or other governmental agencies having either joint supervision over the section of road, or authority to regulate land use by means of zoning and/or building regulations.
2. Other Agency Approval: Permit Applicants are responsible for obtaining separate permits or permission as may be required. Examples may be when work is proposed within the state highway, railroad or irrigation company rights-of-way or private property.
3. Easements: It shall be the Applicant's responsibility to determine the necessity of any Easements and to obtain those Easements and approvals that may be required.
4. Submittals and Fees: Applicant shall pay all required fees, provide insurance, surety (if required), and provide appropriate plans, if necessary.
5. Coordination of Utility Work: The Applicant shall be responsible for coordinating any utility work including relocation of the utilities (e.g., power poles, transformers, signals, etc.).
6. Affected Area: The Applicant is responsible for returning the areas affected by construction to equal or better condition. The Applicant is responsible for repairing any damage to private or public property or other adjacent right-of-way that occurs during construction.
7. Not Transferable: The permit may not be transferable or assignable except as designated in any applicable agreement(s). The Applicant may subcontract the work to be performed under a permit, provided that the Applicant remains responsible for the performance of the work identified in the permit, the insurance and Surety, and the Warranty period. If permit is transferred, a new construction coordination meeting may be required.
8. Supplemental Permit: No work outside the scope of the approved permit may occur without the approval of the Town Engineer. It is the Applicant's responsibility to notify the Town of Mead of the issues and apply for a supplemental permit for the additional work.
9. Public Display: All required permits and approved construction plans must be available on the job site at all times during construction and placement of traffic control devices.
10. Erosion Control Inspector: The Town erosion control inspector must be notified at least 24 hours prior to any planned construction.
11. No Reimbursement of Fees: In general, once the permit is approved and fees are collected, no permit fee will be reimbursed, even if the permit has expired before construction takes place.

B. Requirements to Preserve Quality of Streets and Traffic Flow

1. Traffic Control Plans: A Traffic Control Plan (TCP) shall be submitted prior to or submitted with the permit application for all proposed work for approval by the Town Engineer. All

Town of Mead Design Standards and Construction Specifications

signs, barricades and other necessary traffic control devices shall be placed in accordance with the MUTCD, Part VI.

All work described above shall be performed by a Traffic Control Supervisor and a certificate for the Traffic Control Supervisor shall be submitted with the TCP. The TCP shall detail all devices, hours of work, days, dimensions of tapers and barricades, work area, etc. The TCP shall provide a device summary on the sheet.

The Town may require the developer to notify the local newspaper and/or the impacted residents, depending on the size and type of project, a minimum of 48 hours prior to the commencement of work.

2. Traffic Flow During Peak Hours. Construction traffic shall be restricted as follows unless authorized in writing by the Town Engineer:
 - a. Major school routes as identified by the Town, shall be restricted during the hours of 7:00 a.m. to 8:30 a.m. and from 2:00 p.m. to 4:00 p.m.
 - b. All arterials shall be restricted during the hours of 7:00 a.m. to 8:30 a.m. and 4:30 pm. to 5:30 p.m.
3. Barricades, Warning Lights, and Signal Lights: Any person performing work in the public right-of-way shall place barricades, warning lights, and any other safety devices at the location, sufficient to warn the public of the hazard and which are in compliance with the MUTCD. The Contractor shall be responsible for the maintenance of all barricades at all times.

On all there shall be an individual responsible for the Traffic Control and able to be contacted 24 hours a day. This individual shall be certified as a Traffic Control Supervisor (TCS), by the American Traffic Safety Services Association (ATSSA) and/or Colorado Contractors Association (CCA).

4. Protection of Existing Improvements: Ensure protection as follows:
 - a. Existing Installations: The Contractor shall at all times take proper precautions and be responsible for the protection of existing street and alley surfaces, driveway culverts, street intersection culverts or aprons, irrigation systems, mailboxes, driveway approaches, curb, gutter, and sidewalks, and all other identifiable installations that may be encountered during construction.
 - b. Utilities: The Contractor shall at all times take proper precautions for the protection of existing utilities, the presence of which are known or can be determined by field locations of the utility companies. The Contractor shall contact the UNCC (One Call) at 1-800-922-1987 for utility locates a minimum of 2 working days prior to his proposed start of work.
 - c. Existing Improvements: Existing improvements to adjacent property such as landscaping, fencing, utility services, signs, driveway surfaces, etc., that are not authorized for removal, shall be protected from injury or damage resulting from the Contractor's operations.
 - d. Survey Markers. The Contractor shall at all times take proper precautions for the protection of property pins/corners and survey control monuments encountered during construction. Any damaged or disturbed survey markers shall be replaced by a registered land surveyor at the Contractor's expense.
 - e. Responsibility for Repair: The repair of any damaged improvements as described above shall be the responsibility of the permit holder.

Town of Mead Design Standards and Construction Specifications

- f. Minimizing Inconvenience. The Contractor shall abide by the requirements set forth by the permit to minimize inconvenience to traffic and any inconvenience to adjacent property owners.
5. Permanent Pavement Patches: All permanent pavement patches and repairs shall be made with “in-kind” materials. For example, concrete patches in concrete surfaces, full depth asphalt patches with full depth asphalt, concrete pavement with asphalt overlay patches will be expected in permanent “overlaid” concrete streets, etc. In no case is there to be an asphalt patch in concrete streets or concrete patch in asphalt streets. Any repair not meeting these requirements will be removed and replaced by the Contractor at their expense.
6. Pavement Less than 5 Years Old: In streets that are less than five (5) years old the Town of Mead reserves the right to deny any street excavation or require repairs that are over and above these specifications.
7. Work to be Done in Expedient Manner: All work shall be done in an expedient manner. Repairs shall be made as rapidly as is consistent with high quality workmanship and materials. Use of fast setting concrete and similar techniques may be required and are encouraged whenever possible without sacrificing the quality of repair.

Completion of the work including replacement of pavement and cleanup shall be accomplished immediately after the repair work or activity involving the cut is done. Extension of time for completion shall be with the written approval of the Engineer. If the repairs are not completed in the allotted time, the Town of Mead has the right to repair the street and bill the full cost of work and administrative expenses to the Contractor. The Town of Mead requires a reasonable continuous, diligent effort from the Contractor to complete work and daily cleanup.
8. Inspection Requests: It shall be the responsibility of the person performing the work authorized by the permit to notify the Town Engineer or authorized representatives that such work is ready for inspection. The Town Engineer requires that every request for inspection be received at least 24 hours before such inspection is desired. Such requests may be in writing or by telephoning the Town Engineer.
9. Removal and Replacement of Unsatisfactory Work: Removal and replacement of unsatisfactory work shall be completed within fifteen days of written notification of the deficiency unless deemed an emergency requiring immediate action. If deemed an emergency for health/safety reasons, the Contractor must complete the work immediately. In the event the replacement work has not been completed, the Town of Mead will take action against the Contractor’s bond to cover all related costs.
10. Road Closures: Road closures will only be allowed with the written approval of the Town Engineer. Proper posting and public notification will be required 7 days in advance of any closure. Forms of notification may include door hangers, variable message signs and press releases.

202.7 Stop Work Orders

202.8 The Town may issue stop work orders or take any other applicable enforcement action(s) in accordance with the Town Code. Conditional Acceptance

- A. Conditional acceptance of public improvements: When all improvements within the development or when a phase of the development is completed, the developer shall request, in writing, inspection and Conditional Acceptance of the public improvements. The Town and representatives of the applicable public entity or entities will conduct the inspections for conformance with the approved construction plans.

Town of Mead Design Standards and Construction Specifications

1. Conditional Acceptance. If the public improvements completed by the developer are satisfactory, the Town shall grant Conditional Acceptance by a resolution of the Board of Trustees ("Conditional Acceptance Resolution"). The date of Conditional Acceptance of the public improvements shall be set forth in the Conditional Acceptance Resolution. Conditional Acceptance marks the beginning of the two (2) year warranty guaranty period.
 - a. For all projects where, Conditional Acceptance is granted between the dates of November 1st and April 30th, the two (2) year warranty guarantee period shall not begin until May 1st.
 2. Correction of deficiencies. If improvements constructed by the developer are unsatisfactory, the Town shall provide written notice (punch list) to the developer of the repairs, replacements, construction or other work required to receive Conditional Acceptance. The developer shall complete all required work within thirty (30) days of said notice, weather permitting. After the developer completes the required work, the developer shall request the Town to reinspect the work to decide if the Town can grant Conditional Acceptance as provided in Paragraph (1) above. Failure to correct the deficiencies may result in the suspension of development activities, including but not limited to the issuance of building permits and certificates of occupancy.
 3. Minimum public improvements required for building permits. The Town shall issue no building permit for the construction of any structure until all the water lines, fire hydrants, sanitary sewer lines, storm sewer facilities (i.e., storm sewers, catch basins and stormwater detention ponds) and streets with at least the asphalt base course, serving particular phase development have been completed and granted Conditional Acceptance, subject to and in accordance with any applicable agreement(s).
 4. Developer shall provide a certified statement of construction costs no later than forty-five (45) days after improvements are completed and shall furnish evidence that all contractors, subcontractors, and material suppliers performing work or providing materials related to construction or installation of the improvements have been paid in full.
 5. Certified record plan drawings. The developer shall provide the Town Engineer certified Record Plan drawings (As-Built Plans) and other required drawings upon completion of the construction of public improvements. Any drawings or other documents required by the Town shall be provided not later than ninety (90) days after improvements are completed. As-built plans and other required drawings for public improvements shall be submitted as paper documents and as AutoCAD TM drawing files. Failure to provide the required as-built drawings may result in the suspension of development activities, including but not limited to the issuance of building permits and certificates of occupancy.
- B. Developer maintenance of public improvements following Conditional Acceptance: For a two-year warranty period (guaranty period) from the date of Conditional Acceptance of any improvements related to the development, the developer shall, at his or her own expense, take all actions necessary to maintain the public improvements and make needed repairs or replacements that, in the reasonable opinion of the Town, shall become necessary. If within thirty (30) days after the developer's receipt of written notice from the Town requesting replacement or repairs to the public improvements, the developer has not completed such repairs, the Town may exercise its rights to secure performance in accordance with applicable agreement(s).
- C. The requirements for Conditional Acceptance shall be set forth and included in applicable agreements, including any applicable subdivision improvement agreement or site plan agreement.

Town of Mead Design Standards and Construction Specifications

202.9 Final Acceptance

- A. Final Acceptance of Public Improvements: Developer shall request inspection no sooner than sixty (60) days before and at least thirty (30) days before the end of two-year warranty guarantee period from Town inspectors and during the growing season. It is the developer's responsibility to schedule inspections when plants are not in dormancy. The Town and representatives of any other public entity expected to accept dedication of improvements will conduct the inspections for conformance with the approved construction plans and prepare a project Punch List of items to be resolved.
1. If the public improvements completed by the developer are satisfactory, the Town shall grant final acceptance by a resolution of the Board of Trustees ("Final Acceptance Resolution"). Following the effective date of the Final Acceptance Resolution and developer's compliance with any condition(s) set forth therein, the Town shall issue the developer a certificate of final acceptance. Upon issuance of said certificate, all improvements specified in the certificate shall be owned and maintained by the Town, the developer, or other entity or entities as may be specifically identified in the approved construction plans, final plat, or separate written agreement, as applicable.
 2. If the improvements are unsatisfactory, the Town shall provide written notice to the developer of the repairs, replacements, construction or other work required to receive "final acceptance." The developer shall complete all work within thirty (30) days of said notice, weather permitting. After the developer completes the required work, the developer shall request the Town to reinspect the work to decide if Town can grant "final acceptance" as provided in paragraph (1) above.
- B. No later than thirty (30) days following final acceptance of the public improvements, the Developer shall provide the Town updated certified record plan drawings (As-Built Plans) of any changes made to the improvements between Conditional Acceptance and Final Acceptance. Failure to provide the required certified As-Built Plans may result in the suspension of development activities, including, but not limited to, the withholding of building permits and certificates of occupancy.
- C. Collateral held by the Town (irrevocable letter of credit, cash deposit, or other security acceptable to the Town shall be released at Final Acceptance per the Town Code and any applicable written agreement between the Town and developer.
- D. At the Town's discretion, an extended warranty may be accepted for portions of a project that do not fully meet Town Standards and Specifications at the time of inspection, in order to facilitate Final Acceptance. Collateral for extended warranty periods in the form of an irrevocable letter of credit or cash deposit shall be required.
- E. The requirements for Final Acceptance shall be set forth and included in applicable agreements, including any applicable subdivision improvement agreement or site plan agreement.

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CHAPTER 300 STREET AND ROADWAY DESIGN

301 GENERAL PROVISIONS

301.1 Purpose

This Chapter contains minimum criteria to be met on newly designed and constructed public and private (open to general public) streets and parking lots in the Town. Roadway design shall meet or exceed these Standards and Specifications. Policies and technical criteria not specifically addressed in this document shall follow the provisions of the American Association of State Highway and Transportation Officials (AASHTO), CDOT Standard Specifications for Road and Bridge Construction (CDOT S&S), Highway Capacity Manual, Manual on Uniform Traffic Control Devices (MUTCD), and the Colorado Department of Transportation's Standard Plans ("M-Standards"). Improvements shall also be in conformance with the Land Use Code.

302 STREET ROADWAY DESIGN CRITERIA

302.1 Street Classifications

- A. All streets are classified as Arterial, Collector, Local streets, or Alleys. These classifications relate to the function of the streets. Lower order streets function primarily as access to individual lots, and higher order streets function primarily for the purpose of mobility (expeditious movement of people and goods).
- B. Street cross sectional elements shall conform to the detail drawing as determined by the Town Engineer. Collector and arterial streets shall be constructed whenever the alignment of the proposed street is generally the same as the collector and arterial streets shown on the Comprehensive Plan, Transportation Plan, or whenever a traffic engineering analysis of the future traffic volumes indicates the need of a cross section greater than that of a local residential street. The development Transportation Impact Study shall determine the required street classification based on anticipated traffic volumes. These cross sections can be found in Details D3.01 through D3.06.
- C. Additional ROW may be required to satisfy other criteria contained in these Standards and Specifications. Areas outside the ROW shall be contour graded, compacted, and sloped, as required for proper drainage, soil stability, and maintenance accessibility.
- D. Portions of High Plains Boulevard (aka WCR 9.5) is subject to the CDOT regional planning for the I-25 Parallel Arterial (IPA) corridor study. The roadway and drainage design criteria for High Plains Boulevard shall follow the regional study standards, access control, and design criteria.

302.2 Horizontal Alignment

- A. All streets shall have a logical relationship to the existing topography and to the location of existing or platted streets within adjacent properties. Certain streets within the Project may need to be extended to the Project boundary to provide for the future logical extension of the street through adjacent properties.
- B. To ensure connectivity, enhance general circulation and to provide secondary points for access, the street layout for all subdivisions should include at least one connecting street to neighboring vacant land with spacing approximately every 1/8 to 1/4 mile or as directed by the Town Engineer.
- C. Streets shall intersect or connect to other streets at right angles, and intersections shall be constructed so that lanes are not offset through the intersection. If a street approaching another street is at an oblique angle, then the design shall have the intersecting streets at

Town of Mead Design Standards and Construction Specifications

right angles for 100 linear feet from the intersecting flowlines. Horizontal and vertical alignment and ROW limits shall be coordinated so as not to obstruct sight distance at intersections, in accordance with Town Code.

- D. Layout of new Local streets and Collector streets not covered by the Transportation Master Plan shall meet the needs of the specific development and satisfy all other specific requirements of this chapter. The Town of Mead retains the authority to designate collector streets and retains authority for approval of the overall street layout.
- E. A major component in street layout is neighborhood traffic safety. Traffic calming is the implementation of physical and perceptual techniques intended to slow or divert traffic on existing or planned roadways. It is often a reactive approach to minimize high speeds and volumes of vehicular traffic. Significant efforts in traffic calming have been put forward on existing Roadways and in the development of new Roadways to limit traffic speeds and traffic volumes in neighborhoods and to provide for safer travel for all modes of transportation including pedestrian, bicycle, and vehicular. In addition, new streets shall be laid out to minimize opportunities for cut-through traffic.
- F. New Minor Collectors and Local streets are limited in continuity. The maximum permitted length between 90 degree turns and controlled intersections is 660 feet on local streets. The maximum continuous length for a Minor Collector is 1320 feet.
- G. On Arterial and Major Collector roadways, curve radii and tangents shall be as large as possible using the minimums only where necessary. However, minimum radius curves shall be used on Local Residential, Minor Collector, and Connector Local streets unless otherwise required. Angle point direction changes are not allowed. All changes in direction shall be made using standard curves.
 - 1. Horizontal Curve Radii Table: The minimum allowable centerline radii for horizontal curves shall be as designated in 300-1. Reverse and compound curves should be used only when a single radius curve will not work. For driver safety, compound curves shall have a ratio no greater than 1.5 where the value of the larger radius is divided by the smaller radius.
 - 2. Minimum Tangent Length
 - a. Intersection: Whenever a street intersects a street of higher or equal classification, a tangent length (as measured in a straight line from the nearest gutter flowline of the intersected street to the point on the centerline of the intersecting street) shall be provided for safe sight distance and safe traffic operation. The minimum required tangent lengths indicated in Table 300-1 apply to the leg(s) for which the crown is not carried through the intersection. The angle of departure shall not exceed 10 degrees for the length of tangent.
 - b. Reverse Curves. The tangent between reverse curves shall be no less than the length shown in Table 300-1.
 - c. Broken Back Curves. Two curves in the same direction (broken back curves) shall be separated by a tangent with a length of at least 2 times the minimum length shown in Table 300-1.
 - 3. Consistent Radii: All curves along a street shall be designed with radii that are approximately equal. The purpose of this limitation is to provide consistency and minimize unexpected difficult or quick maneuvers for the driver.
 - 4. Horizontal Curves on Vertical Curves: For driver safety, horizontal curves shall not begin near the top of a crest vertical curve nor near the bottom of a sag vertical curve.

Town of Mead Design Standards and Construction Specifications

302.3 Vertical Alignment

- A. Maximum and Minimum Grades for Streets: The maximum and minimum grades for specific street classifications are shown in to Table 300-1. The centerline grade in the bulb of a cul-de-sac shall not exceed 3 percent. Where sidewalks and/ or ramps cross the flowline ADA requirements shall be met for the flowline grades.
- B. Minimum Flowline Grades: Minimum flowline grades for gutters shall be 0.50 percent, except the bulb of cul-de-sacs where the minimum shall be 1.0 percent.
- C. Grade Breaks. No single point grade break shall exceed 0.50 percent, except for the flow line in sag curves where the maximum grade break is 1.0%. In curb returns, a grade break may be as great as 3.0% for extreme circumstances., Grade Breaks, except for those located within curb returns, shall be spaced at least 25 feet apart.
- D. Requirements for Using Vertical Curves: Vertical curves are required for grade changes that exceed 1.0 percent. Both centerlines and the curb and gutter flowlines shall be designed with vertical curves to meet the requirements of AASHTO "A Policy on Geometric Design of Highways and Streets" most current edition. Minimum K-values for design shall conform to Table 300-1, and design shall meet or exceed these minimums. No grade changes are allowed at the beginning or end of a vertical curve. The curve information shall be based on the grade going into or out of the vertical curve. In sag curves on flow line, the minimum grade requirement shall override the slope within the vertical curve.
- E. Sump Sag Curves: For sag curves, the street centerline shall be designed with a vertical curve with minimum requirements noted above. The minimum flowline grade on a sag curve shall be 0.5 percent. Curb and gutter shall be constructed with no vertical curve in these areas. The grade into an inlet located in a sump shall have a 0.5 percent grade into and out of the inlet. The inlet(s) themselves in these situations do not need to meet the minimum flowline grades.
- F. Joining Existing Improvements: Connection with existing streets shall be made to match the existing grade of the existing improvements, in accordance with vertical alignment criteria.
- G. Vertical Clearance: Vertical clearance above a roadway is a minimum of 16.0 feet.

302.4 Sight Distance

- A. Sight distance is the distance necessary for a vehicle operator to perform expected functions and be able to do so without causing a hazard for the driver or other vehicle operators for the specific design speed of the street. Vehicles shall perform moves without causing other vehicles to slow from the average running speed. In no case shall the distance be less than the stopping sight distance. This includes visibility at intersections and driveways as well as around curves and roadside encroachments.
- B. All Stopping, Passing, and Corner Sight Distance dimensions shall meet the requirements of AASHTO "A Policy on Geometric Design of Highways and Streets" most current edition. In no case shall the stopping sight distance be less than as specified in Table 300-1.
- C. In addition to the required sight distances noted above, a minimum thirty feet (30') by thirty feet (30') sight triangle measured from the flowline of the street is required at all intersections.
- D. Sight Distance Triangles and Easements: All sight-distance easements must be shown on the street plan/profile plans. All sight distances must be within the public right-of-way or a sight distance easement. If the line-of-sight crosses onto private property, a "Sight Distance Easement" shall be dedicated to provide the required sight distance. The easement or right-of-way shall be dedicated to the Town; however, maintenance shall be noted on the final plat as the responsibility of a private entity such as the property owner or the homeowner's association.

Town of Mead Design Standards and Construction Specifications

E. Sight Obstructions:

1. Any object within the sight distance easement more than 30 inches above the flowline elevation of the adjacent street shall constitute a sight obstruction and shall be removed or lowered. Such objects include but are not limited to berms, buildings, parked vehicles on private property, cut slopes, hedges, trees, bushes, utility cabinets or tall crops.
2. Mailbox clusters must be installed a minimum of 2 feet from back of walk and not cause any sight obstruction. Mailboxes must not pose a fixed object hazard for vehicles and pedestrians. The sight distance shall be measured to the centerline of the closest through-lane in both directions. In no case shall any permanent object encroach into the line-of-sight of any part of the sight-distance triangle. Street trees required by the Town are excepted from this requirement. Trees are permitted if pruned up to 8 feet.

302.5 Cross Slope

- A. Cross slope on a pavement is provided to drain water from the street surface. The design of cross slope shall consider driver comfort and safety.
- B. Minimum Cross Slope: A minimum cross slope on all streets shall be 2.0 percent. Minimum cross slope on reconstruction or overlays is 1.5 percent.
- C. Maximum Allowable Cross Slope: Maximum allowable cross slope on all new construction shall be 3 percent. Maximum allowable Cross Slope on any reconstruction or overlays of existing roadways shall be 4 percent.

302.6 Superelevation on Horizontal Curves

- A. The purpose of superelevating a roadway is to maintain the riding comfort on smaller than standard curves. Superelevation may only be used when other means of design will not work. The following criteria shall be followed:
 1. Where superelevation is permitted: Superelevation may be allowed for curves on Arterial and Major Collector streets in order to reduce the minimum centerline radius. In no case shall superelevation exceed 4.0 percent cross slope. Superelevation shall not be used to reduce minimum radii on Local or Minor Collector Streets.
 2. Run Out: When superelevation is used, a minimum 100-foot run-out shall be used entering and exiting the superelevated portion.
 3. Drainage: Where the superelevation is used, the gutter shall always be an inflow type on the downhill side. The water must enter a storm sewer system or other acceptable outlet from the street rather than crossing the street in sheet flow or in crosspans.

Town of Mead Design Standards and Construction Specifications

302.7 Street Design Criteria

- A. Street design criteria for various street types are listed on Table 300-1. The requirements of the Town of Mead Land Use Code, the Town Transportation Plan, and the Town's Comprehensive Plan shall be adhered to.

Table 300- 1: Street Design Criteria

Design Element		Arterial		Collector		Local		Alley	
		Major	Minor	Major	Minor	Comm/ Industrial	Residential		
Overall Design Parameters									
Design Speed / Posted Speed		50/40	45/40	40/25 – 30	40/25 – 30	25	25	15	
Stopping Sight Distance		400'	400'	275'	275'	200'	200'	100'	
Daily Traffic Volume Capacity Design Standards / Max (vpd)		26 K / 32 K	10,000 K / 12,000 K	8 K / 10 K	8 K / 10 K	1 K	1 K	NA	
Horizontal Alignment									
Min Centerline Radius (No Super – Elevation)		1200'	1200'	610'	610'	275'	250'	50'	
Max Super – Elevation (ft/ft)		0.04	0.04	0.04	NA	NA	NA	NA	
Min Tangent Between Curves or Intersections		200'	200'	150'	150'	100'	100'	20'	
Vertical Alignment									
Max Centerline Grade		5%	5%	6%	8%	8%	8%	8%	
Min Centerline Grade		0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	
Min Gutter Flowline Grade		0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	
Min K – Values for Vertical Curves	Crest	110	110	60	60	30	30	10	
	Sag	95	95	60	60	40	40	20	
Intersection Design									
Min Sight Distance at Driveways and Intersections		1030'	1030'	660'	660'	310'	260'	210'	
Access Management									
		Without Raised Median	With Raised Median	Without Raised Median	With Raised Median				
Distance Between Intersections	Signalized	½ Mile		½ Mile		NA	NA	NA	NA
	Un-Signalized	¼ Mile		¼ Mile		300' Min	250' Min	200' Min	200' Min
Min Distance Between High Volume Driveways and Intersections		1320'	660'	660'	330' Min	200'	175'	175'	150'
Min Distance Between Driveway Edges		660'	660'	660'	330' Min	75'	30'	30'	12'
Min Corner Clearance Between Driveways / Alleys and Street Intersections		660'		660'		175'	100'	175'	50'
Driveway Approach Street Configuration ¹		Radial Curb Return (If approved by Town Engineer)		Radial Curb Return (If approved by Town Engineer)		Curb Cut	Curb Cut	Curb Cut	Curb Cut
NOTES:									
¹ Driveways are not allowed on arterials unless approved by Town Engineer.									

Town of Mead Design Standards and Construction Specifications

302.8 Curb Radii

Curb radii criteria for various intersections are listed on Table 300-2:

Table 300- 2: Curb Radii Criteria

Classification	Major Arterial	Minor Arterial	Collector	Local
Major Arterial	45 feet	45 feet	40 feet	N/A
Minor Arterial	45 feet	40 feet	35 feet	N/A
Collector	40 feet	35 feet	30 feet	25 feet
Local	N/A	N/A	25 feet	20 feet

302.9 Cul-de-Sacs

- A. Cul-de-sac's are only permitted on Local Streets.
- B. Cul-de-sacs shall follow the design layout as shown in Detail 3.26a and Detail 3.26b.
- C. The minimum flowline radius for a cul-de-sac shall be 50 feet.
- D. Hammerhead cul-de-sacs are not allowed.
- E. Lengths of cul-de-sacs are required to be no greater than 500 feet. Cul-de-sac's with a length greater than 500 feet shall be provided with a secondary emergency access road.
- F. Surface drainage shall be directed toward the intersecting street, or if this is not reasonably practical, a drainage structure and 20-foot wide easement shall be provided at the end of the cul-de-sac for the storm outfall system.

302.10 Dead-End Streets

- A. New permanent dead-end streets are prohibited.
- B. Temporary Dead-End Streets: Temporary dead-end streets will be permitted only on streets that have no direct access from adjoining property. Additionally, a temporary dead-end street shall be planned to extend into neighboring property during a later development phase or project. The road including curb and gutter must be fully constructed to the property line.
- C. Temporary Turnarounds: At locations where the temporary dead-end street is longer than 150 feet, a temporary turnaround shall be constructed with an approved all-weather surface. The turnaround shall have a minimum radius of 50 feet to the edge of the completed dead-end street. No curb and gutter is required on temporary turnarounds. A temporary access easement shall be obtained from the adjacent property owner as required and dedicated to the Town.
- D. CDOT Type 3 road barricades shall be installed at all temporary dead-end streets. Barricades shall be accompanied by a "future street extension" sign for the entire cross section of the roadways if it is planned for the street to be continued in the future.

302.11 Medians

- A. Painted or raised medians are required on all arterial streets as directed by the Town Engineer.
- B. Medians requested by developers may be approved as long as additional rights-of-way are dedicated and all maintenance shall be done by viable private parties.
- C. The minimum width of any raised median shall be four feet (4') wide.
- D. The design of medians shall include the evaluation for needed turn lanes and accesses. The project Transportation Impact Study shall identify the minimum requirements of turn lanes.

Town of Mead Design Standards and Construction Specifications

- E. Drainage: Landscaped medians shall be provided with drainage facilities to handle sprinkler runoff and nuisance flows. Sprinklers shall be designed to prevent spray onto the pavement surface. A properly designed drain system shall be required.
- F. Nose: Use vehicle tracking templates to determine the position of the median nose so that vehicles do not track onto the median.
- G. Paving: All non-landscaped areas of medians shall be paved with stamped concrete, concrete, or exposed aggregate concrete in accordance with streetscape standards.
- H. Transitions: The ends of medians shall transition into turn lanes with a minimum radius of 100 feet. A change of directions must be accomplished with the use of radii. Angle points shall not be allowed.
- I. Objects: No permanent structures, including light poles, fire hydrants, trees, etc., shall be placed within 5 feet of the travel lane or in any location that would obstruct sight distance except for structures as approved in these Standards. If a median streetlight is placed within 5 feet of the travel lane, the light must be a breakaway model.

302.12 Sidewalks, Curb, and Gutter

- A. Sidewalks shall be constructed in accordance with Construction Detail 3.11.
- B. Curb and Gutter shall be constructed in accordance with Construction Detail 3.07, Detail 3.08, and Detail 3.11.
- C. Mountable curb and gutter is allowed on local streets or as directed by the Town Engineer.
- D. Attached sidewalks are only allowed in retrofit areas and/or as approved by the Town Engineer.
- E. All detectable warning surfaces shall be cast iron truncated domes.

302.13 Crosspans

- A. Crosspans for passing storm drainage flow across roadways shall be constructed in accordance with the Construction Detail 3.15. The pans shall be a minimum of 6 feet wide with 3/4-inch typical catch. Greater widths may be required by the Town Engineer or as needed to meet Drainage criteria. Mid-block crosspans shall be allowed.
- B. The use of double cross pans along local streets is not allowed unless approved by the Town Engineer.
- C. No crosspans are allowed to cross collector or arterial streets.
- D. The minimum grade on crosspans at flowline of pan shall be 0.5 percent.
- E. Crosspan transitions:
 - 1. Design Speeds: Pavement transition from standard crown to crosspan shall be designed using the appropriate design speeds as given in Table 300-1.
 - 2. Intersections: Transitions from standard crown to crosspan at intersections shall be designed in accordance with Detail 3.20. Details shall be prepared to show the elevations in the locations shown on Detail 3.20.
 - 3. Pavement Material: The asphalt thickness on approaches to both sides of the crosspans shall be increased to a minimum depth of 16 inches with a transition back to the normal depth equal to the width of the crosspan, per Detail 3.15.

Town of Mead Design Standards and Construction Specifications

302.14 Sidewalk Chases

- A. Storm water from concentrated points of discharge shall not be allowed to flow over sidewalks, but shall drain to the roadway by use of a sidewalk chase or other methods approved by the Town Engineer.
- B. A sidewalk chase shall not be located within a curb ramp, curb cut, or driveway.
- C. Sidewalk chase shall only be allowed in special situations, on a case-by-case basis, as determined by the Town Engineer. Sidewalk chase sections shall be constructed in accordance with Construction Detail 3.22

302.15 Requirements of Improvements Adjacent to Existing Roadways (Street widening)

- A. Where proposed street construction will widen existing roadways, or add a turn lane, then the following requirements shall apply:
 - 1. Existing cross slope of adjacent lanes shall be maintained. Where this is not possible, the change in cross slope for the new lane shall not exceed 2.0%.
 - 2. The removal limits shall be sawcut in a clean straight line and shall not be in the traveled wheel path.
 - 3. The entire adjacent lane along the new improvements shall be roto-milled two (2) inches and overlaid with the final lift of the new improvements. Geosynthetic fabric may be required at the joint to prevent the pavements from reflective cracking.
 - 4. A geotechnical investigation shall be conducted on all roadways adjacent to the development to evaluate the condition of the asphalt. The investigation shall consist of borings or other suitable method of sampling, at spacing of no more than 250 feet unless otherwise accepted by the Town Engineer. The results of this investigation shall be submitted to the Town for determination of what, if any, existing asphalt may be utilized to meet the requirements of applicable agreement(s).

302.16 Off-site Design

- A. The design grade, and existing ground at that design grade, of all roadways that dead end due to project phasing, subdivision boundaries, etc., shall be continued in the same plan and profile as the proposed design for at least five hundred feet (500') or to its intersection with an arterial roadway.
- B. If the off-site roadway adjacent to the proposed development is not fully improved, the Responsible Party is responsible for the design and construction of a transition for the safe conveyance of traffic from the improved section to the existing roadway. The following formula shall be applied to the taper of lane change necessary for this transition:
 - 1. For roadways with speeds less than 45 mph: $L = WS^2/60$

For roadways greater than or equal to 45 mph: $L=WS$

Where:

L = Length of Transition in Feet

W = Width of Offset in Feet

S = Posted Speed Limit

302.17 Right-Of-Way Grading

- A. Slopes: The maximum slopes for all areas within the Right of Way or outside of the right of way that can affect the public improvements, shall be 4:1 unless designed with retaining walls. Any slopes proposed to exceed 4:1 must be proven to be stable and must be approved by the

Town of Mead Design Standards and Construction Specifications

Town Engineer. In general, retaining walls are discouraged and not allowed within the right-of-way. The minimum slopes in non-roadway areas shall be 2 percent unless otherwise allowed by the Town Engineer. All areas shall be seeded or stabilized in accordance with these Standards.

- B. Off-site Fill Material: Any material from an off site location to be used in rights-of-way or areas within the influence area of the right-of-way must be tested and discussed within the Soils Investigation Studies.

302.18 Rural Roadside Ditches

- A. Any rural or interim roadway sections developed without curbs (and with roadside drainage ditches) must complete the ditch construction with the installation of sod or other approved erosion control blanket within the ditch area. The profile grade of the ditch shall be maintained at a minimum slope of one (1) percent and a maximum slope of five (5) percent. The side slopes of the ditches outside of the Right of Way shall be a maximum of 4:1 and meet any specific drainage criteria. Flatter slopes may be considered when a paved invert is designed for the ditch bottom.
 - 1. Slope: The slope and capacity of any roadside ditches shall be maintained in any areas that driveways cross the ditch. Each site is required to provide ditch capacity and culverts meeting the Storm Drainage Criteria.
 - 2. Maintenance: All driveway improvements within the right-of-way including piping, ditches, curb and gutter, and sidewalk are the responsibility of the adjoining property owner. The Town will not provide maintenance of these items.

302.19 Emergency Access Requirements

- A. Any emergency access not on public streets shall be provided in accordance with the requirements of the Fire Marshall.
- B. Slope: The slope of the fire lanes shall be a minimum of 0.5 percent and a maximum of 8 percent.
- C. Cross Slope: The Cross Slope of the fire lanes shall be minimum of 1.0 percent and a maximum of 4.0 percent.
- D. Lane Width: The lane width shall be in accordance with the requirements of the Fire Marshall. The lane width shall be measured from the edge of the roadway to edge of the roadway and shall be located in an access Easement dedicated to the Town. The access Easement shall have a minimum width of the fire lane. The lane widths may be required to be increased through horizontal curves to accommodate fire truck passage.
- E. Vertical Clearance: The vertical clearance shall be in accordance with the requirements of the Fire Marshall.
- F. Barricade: The fire lane may have an approved barricade, but it must be approved by the Fire Marshall.
- G. Surface: The surface of the roadway must be a paved surface complying with Local Street pavement thickness requirements, unless approved otherwise by the Town Engineer or Fire Marshall.
- H. Maintenance: All access roadways shall be maintained and kept clear for emergency use at all times, and shall be the responsibility of the land owner or HOA.

Town of Mead Design Standards and Construction Specifications

303 PAVEMENT DESIGN ANALYSIS

303.1 General

- A. This subsection provides the basic criteria and design procedure for roadway pavements. Recommended design methodologies for asphalt and Portland cement concrete are addressed and essentially follow the CDOT and AASHTO methodology. Some standardization of criteria has been made in design procedures.

303.2 Minimum Pavement Section

- A. The following Table 300-3 provides the minimum acceptable pavement sections for each roadway classification. Final pavement designs shall be based on subgrade support test results.
- B. For all street cuts into existing pavement, the asphalt patch shall meet the minimum sections as identified in Table 300-3 or match the existing asphalt section plus one inch (+1”), whichever is greater.

Table 300- 3: Minimum Acceptable Pavement Sections

Classification	Composite Asphalt Layer HMA (Inches)	Aggregate Base Course Layer ABC (Inches) – (Class 5 or Class 6 accepted)	Full Depth Asphalt HMA (Inches) & Patching	Portland Cement Concrete (Inches)
Local, Private streets and parking lots	4.0	6.0	6.0	6.0
Minor Collector	5.0	6.0	7.0	6.0
Major Collector	5.0	6.0	7.0	7.0
Minor Arterial	6.0	6.0	8.0	8.0
Major Arterial	6.0	6.0	8.0	8.0
Emergency Access Only	4.0	6.0	6.0	6.0

303.3 Pavement Design Reports

- A. Prior to any roadway construction, the Responsible Party shall provide a pavement design report that recommends typical pavement structural sections based on the known site soil conditions.
- B. The report shall be prepared by or under the supervision of and signed by a PE registered in the State of Colorado and shall include the following information:
1. Vicinity map to locate the investigated area.
 2. Scaled drawings showing the location of borings.
 3. Scaled drawings showing the estimated extent of subgrade soil types and EDLA/ESAL for each street.
 4. Pavement design alternatives for each street on a scaled drawing.
 5. Tabular listing of sample designation, sample depth, Group Number, Liquid Limit, Plasticity Index, % passing the No. 200 sieve, Group Index, Unified and AASHTO Classification, and soil description.
 6. Proctor Compaction Curves.

Town of Mead Design Standards and Construction Specifications

7. Subgrade support testing of each soil type used in the design. (see 303.6.(c))
8. Pavement design computer printouts or nomographs properly drawn to show soil support, EDLA/ESAL, and structural number.
9. Design calculations. Include for all phases of project.
10. Design coefficient used for asphalt, base course, etc.
11. A discussion regarding potential subgrade soil problems including, but not limited to:
 - a. Heave or settlement prone soils,
 - b. Frost susceptible soils,
 - c. Ground water,
 - d. Drainage considerations (surface and subsurface),
 - e. Cold weather construction (if appropriate), and
 - f. Other factors, properties, or fill areas which could affect the design or performance of the pavement system.
12. Recommendations to alleviate or mitigate the impact of problems discussed in item 11 above.

303.4 Pavement Thickness Design Criteria

- A. Pavement design procedures in this section provide for a 20-year service life of pavement when normal maintenance is provided to keep the roadway surface in an acceptable condition.

Table 300- 4: Flexible Pavement Design Criteria

Town of Mead Design Standards and Construction Specifications

ROAD CLASSIFICATION	20-Year Design Traffic Information		Serviceability Index (psi)			Reliability	Default Asphalt for Composite Section	Default Aggregate Base Course Section	Default Full Depth Asphalt Pavement Thickness inches ²	Min. Struct. No. ⁴
	EDLA ³	ESAL	S _i	S _t	D	(%)	Layer, inches			
			Init.	Final	psi		HMA	ABC	Min.	
<u>LOCAL</u>										
Resid. Two-lane	5	36,500	4.5	2.0	2.5	75	4.0	6.0	6.0	2.45
Resid. Cul-de-sac and single lane ⁵	10	73,000	4.5	2.0	2.5	80	5.5	6.0	6.5	2.82
Indust./commercial	50	365,000	4.5	2.3	2.2	75	5.5	11.0	8.5	3.60
<u>COLLECTOR</u>										
Minor	25	182,500	4.5	2.3	2.2	75	5.5	7.0	7.5	3.20
Major	50	365,000	4.5	2.3	2.2	85	6.5	9.0	8.5	3.82
Indust./commercial	100	730,000	4.5	2.3	2.2	85	7.0	11.0	10.0	4.30
<u>ARTERIAL</u>										
Minor (two-lane)	100	730,000	4.5	2.5	2.0	90	7.5	11.5	NA	4.51
Major (four-lane)	200	1,460,000	4.5	2.5	2.0	90	8.0	15.0	NA	4.90

NOTES:

¹ Wearing surface course shall be Grading S or SX for residential roadway classification and Grading S for collectors, arterials, and all industrial/commercial roadways.

² Full depth pavements may be used only on Local / Residential Class roads with written approval of the Town Engineer.

³ EDLA shall be calculated based on projected traffic uses. Minimum EDLA values are as given for the design lane. The Engineer may require greater EDLA values if warranted. EDLA for arterial/collector intersections shall be two-way traffic.

⁴ Minimum structural numbers are based on subgrade R-value = 5 and CDOT calculations; MR = 3,025 and Std. Deviation = 0.44
CDOT Design methods shall be used for resilient modulus calculations for all roads

⁵ Single lane refers to a paved surface less than 20 feet wide, including residential alleys.

⁶ Min/Max Lift Thickness – Grade SX – 1 ½”/2 ½”, Grade S – 2”/3.5”, Grade SG – 3”/5” (2” minimum surface wearing course).

⁷ The minimum pavement sections shall be per Table 300-3.

303.5 Design Factors

A. Equivalent Daily Load Applications(EDLA) / Equivalent Single Axle Load (ESAL)

1. Equivalent Daily Load Applications (EDLA) and Equivalent Single Axle Loads (ESAL) units are based on 18 kip (80 kN) axle loading on each design lane. All data and design procedures in this section use EDLA or ESAL units for pavement loading repetitions. Minimum EDLA and ESAL criteria for each roadway classification are given in Table 300-4.
2. Alternatively, higher EDLA/ESAL values may be considered with justification provided by the Traffic Impact Study, proposed land uses, and traffic analysis that defines proportion of truck vehicles.

B. Design Serviceability and Reliability

1. The Serviceability Index to be used for all Town Roadways dedicated for public use is given in Table 300-4.

C. Default Pavement Section

Town of Mead Design Standards and Construction Specifications

1. Table 300-4 provides the default acceptable pavement sections for each roadway classification based on assumed subgrade support and traffic values. These pavement thicknesses may be used for preliminary planning purposes and cost estimates. All pavement thickness designs must be based on actual subgrade support test results and traffic projections. In specifying layer thickness, the designer shall consider how the pavement section will be physically constructed (e.g. Specify how to construct 2' of treated subgrade or the number of lifts and the grade for asphalt in a 6-inch asphalt section.)

D. Flexible Pavement Strength Coefficients

1. Table 300-4 contains the standard design coefficient for various pavement materials. Nonstandard design coefficients may be used only if approved in advance by the Town Engineer. In addition, design values must be verified by pre-design mix test data and supported by daily construction tests.

E. Portland Cement Concrete Working Stress (f')

1. The working stress (f') to be used in the design shall be 75 percent of that provided by third-point beam loading, which shall have a minimum laboratory 28-day strength of 600 psi based on actual tests of materials to be used.

303.6 Subgrade Investigation Requirements

A. Field Investigation

The geotechnical investigation shall consist of borings or other suitable method of sampling subgrade soils to a depth of at least five (5) feet below proposed subgrade elevation, with a 10-foot boring every third hole, at spacings of no more than 250 feet unless otherwise accepted by the Town Engineer. Samples shall be taken after grading is completed and the subgrade is rough cut.

B. Classification Testing

Each subgrade sample shall be tested to determine liquid limit, plastic limit, plasticity index and the percent passing the U.S. Standard No. 200 sieve. Samples of sands and gravels may require gradation analysis for classification determination. This data shall be determined using the following methods:

Liquid Limit - AASHTO T 89

Plastic Limit - AASHTO T 90

% Passing No.200 - AASHTO T 11

Gradation - AASHTO T 27

The results of these tests shall be used to calculate the AASHTO Classification and Group Index using AASHTO M 145.

C. Subgrade Support Testing

1. Individual subgrade samples shall be tested to determine the subgrade support value using Hveem Stabilimeter (R-value), or California Bearing Ratio (CBR) and Unconfined Compressive Strength (Q_u) testing, or direct measurement of resilient modulus of soil AASHTO T-307. These values shall be used in the design of pavement sections in accordance with the procedures outlined below. Tests shall be conducted in accordance with this procedure.
2. R-Value Tests - Hveem Stabilimeter tests shall be conducted in accordance with AASHTO T 190. The design R-value shall be at 300 psi exudation pressure. The reported data shall consist of:

Town of Mead Design Standards and Construction Specifications

- a. Dry density and moisture content for each sample.
- b. Expansion pressure for each sample.
- c. Exudation Pressure - corrected R-value curve showing the 300-psi design R-value.
3. CBR Tests: California Bearing Ratio Tests shall be conducted in accordance with AASHTO T193 with the following modifications:
 - a. Note 4 of AASHTO T193 shall not apply. A 3-point CBR evaluation is required.
 - b. The compaction method used for the CBR test shall be determined by the soil classification.
 - c. Surcharge shall be calculated using a unit weight of 140 pcf for HMA and 135 pcf for ABC.
 - d. The design CBR value shall be determined from the CBR dry density curve and shall be the CBR value at 95 % compaction.
 - e. In addition to the values requested in AASHTO T193 Stress Penetration curves for each sample, a CBR dry density curve and Proctor compaction test results shall be reported.

303.7 Pavement Design Procedures

A. Flexible Pavements

1. The following procedure should be used in determining the Structural Number (SN) of the pavement being designed:
 - a. Determine roadway classification and corresponding EDLA/ESAL (Table 300-4)
 - b. Determine the Serviceability Index (SI) of the roadway classification (Table 300-4)
 - c. Determine the reliability (R) of the roadway classification (Table 300-4)
 - d. Approved proper nomographs
2. Determine the required structural number using AASHTO pavement design software or nomographs from AASHTO or CDOT along with soil support test results and EDLA/ESAL values previously determined. If used, copies of the nomograph determinations must be included with the design submittal.
3. Once the Structural Number (SN) has been determined, the design thicknesses of the pavement structure can be determined by the general equation:

$$SN = a(1)D(1) + a(2)D(2) + a(3)D(3) + \dots$$

where

A(1), Aa(2), Aa(3), Aa(n) = strength coefficients

D(1),D(2),D(3),D(n) = thickness of pavement component sections

The strength coefficients for various components of the pavement structure are given in Table 300-6.

- a. The component thickness selected must meet two (2) conditions:

Total thickness selected cannot be less than the minimum specified in Table 300-3 for the roadway classification.

The base course thickness selected cannot exceed two and one-half (2.5) times the asphalt thickness selected in Table 300-3.

- b. Pavement section calculations shall be rounded up to the next thickness one-half ($\frac{1}{2}$) -inch increment.

Town of Mead Design Standards and Construction Specifications

- c. The standard deviation for design of asphalt pavements shall be 0.44
- d. The design must reference any mitigation measures required when the subgrade contains swelling soils. Design reports recommending alternative methods or materials to address swelling soils (i.e. base course, lime, cement, etc) must present the measures to be used to ensure adequate drainage of such layers and to maintain separation of the layers from the swelling soils. Swell tests shall be conducted for samples with probable expansion (volume change estimate) greater than two (2)% based on actual tests. Surcharge pressure shall be 150 psf, or as specified by The Town Engineer.
- e. Alternative methods and materials shall be approved specifically in writing by the Town Engineer prior to any construction of the roadway. With this approval, Table 300-5 shall be utilized for appropriate strength coefficients. Also, if approved in writing, minimum design requirements for composite sections can be found in Table 300-3.

B. Rigid Pavement

1. Rigid pavements are those that possess a high bending resistance and distribute loads over a large area of foundation soil. Examples include Portland cement concrete pavement. Rigid pavement shall only be utilized as specifically authorized by the Town Engineer.
2. The design of rigid pavements is a function of support characteristics of the subgrade soil (R-value, CBR, or resilient modulus), traffic (EDLA/ESAL), and the strength of the concrete (working stress). In comparison to the strength of the concrete slab, the structural contributions of underlying layers to the capacity of the pavement are relatively insignificant. Therefore, the use of thick bases or subgrades under concrete pavement to achieve greater structural capacity is considered to be uneconomical and is not recommended.
3. Use the following procedure to obtain required thickness:
 - a. Determine roadway classification and corresponding EDLA/ESAL (Table 300-4).
 - b. Determine design Serviceability Index (SI) of the roadway (Table 300-4).
 - c. The working stress of the concrete (F') used in the design shall be 75% of that provided by third- point beam loading, which shall have a minimum laboratory 28-day strength of 600 psi based on actual tests of materials to be used.
 - d. The reliability factor for design of all concrete pavements shall be 90%.
 - e. The standard deviation for design of concrete pavements shall be between 0.30 and 0.40.
 - f. Determine the structural numbers using AASHTO pavement design software. Nomographs of the AASHTO or CDOT parameters may be used instead. If used, copies of the nomograph determinations must be included with the design submittal.
 - g. Using EDLA/ESAL and working stress data, locate point on the pivot line; connect this point to the R-value or CBR value on the soil support scale to determine slab thickness.
 - h. Use slab thickness from step f. (rounded upward to the nearest one-half (1/2) inch) or the minimum thickness from Table 300-3.
 - i. For swelling soils (swell potential greater than two (2)%, under 200 psf surcharge pressure) concrete paving shall not be permitted without subgrade treatment.
 - j. Pavement joint detail plans. With rigid pavement designs, the construction plans shall include a joint pattern layout for each street, alley or intersection. All joints and joint filling in rigid pavements shall be designed and detailed in accordance with the current CDOT M&S Standards.

Town of Mead Design Standards and Construction Specifications

Table 300- 5: Pavement Strength Coefficients

Pavement Component	Strength Coefficients	(Limiting Test Criteria)
Conventional Materials		
Hot Mix Asphalt	0.44	(Rt 90+)
Aggregate Base Course	0.14	(CBR 80+ or R 78+)
Granular Subgrade Course	0.07	(CBR 15+ or R 50+)
Recycled Asphalt/Concrete Pavement Subgrade Course	0.07	(CBR 15+ or R 50+)
Treated Materials		
Cement Treated Aggregate Base	0.23	(7 day 650-1000 psi) *
Lime Treated Subgrade	0.14	(7 day, 160 psi, PI <6) *

* 100 degree moist oven

304 TRAFFIC CONTROL DEVICES

304.1 General

- A. This chapter describes general signal, signing, and striping design requirements for use in the Town of Mead. All design and construction of signals, signing, and striping shall be in conformance with this chapter and the latest revision of the MUTCD.

304.2 Design Requirements

- A. Traffic Signal Design Requirements
 1. The design of traffic signals shall be performed by a qualified Traffic Engineer approved by the Town of Mead. The Town of Mead may charge the cost of design and construction to the developer when the work is completed by the Town of Mead.
 2. The design will follow the current version of Colorado Department of Transportation Standards for a standard mast arm type traffic signal installation

304.3 Traffic Signing

- A. General
 1. Type and Location of Signs: The Town Engineer shall make the final determination regarding the type and location of signage controls within the right-of-way. These controls shall include traffic control signs (regulatory and warning), street name signs, delineators, object markers, and permanent barricades.
 2. Design, Installation and Maintenance: Because the Town of Mead will maintain the permanent traffic control devices on public rights-of-way, all traffic control devices shall be fabricated and installed in accordance with Appendix A, Construction Specifications. All design shall be in accordance with this chapter and the latest revision of the MUTCD.
 3. New Roadway: Permanent signage, unless otherwise approved by the Town Engineer, shall be completely in place before any new Roadway is opened to the public.
 4. Other Standards: These Standards are to be used in conjunction with other applicable Local Entity Regulations.

Town of Mead Design Standards and Construction Specifications

5. Sign Posts, Supports and Mountings: Sign posts and their foundations and sign mountings shall be constructed to hold signs in a proper and permanent position (as defined by the MUTCD), to resist swaying in the wind or displacement by vandalism.
 - a. Sign Post. The post shall be constructed in two sections:
 - i. Anchor (Stub). A 2-1/4-inch 12-gauge galvanized steel square stub section with holes, three (3) feet long, is driven into the ground 30 to 33 inches with 3 to 6 inches remaining above the final grade. The sign post system's material specification is Telspar 22F12A 03PG, 2-1/4-inch x 3 feet anchor post with holes, or perforated.
 - ii. Sign Post. A 2-inch square galvanized steel post section with holes is inserted into the stub and bolted. The material specification is Telspar 20F12P-10PG, 2-inch square 12-gauge 10-foot post with holes. Posts shall be installed 6 to 8 inches into the anchor (stub), which has 3 to 6 inches sticking out above the final grade.
 - b. Post Bolts. Two 2-1/2-inch long, 3/8-inch hex head bolts are used to attach sign posts to sign anchor (stubs). These bolts shall be installed in adjacent holes at the top of the anchor (stub), at 90 degrees to one another.
 - c. Sign Bolts. Signs shall be mounted to the post with a minimum of one drive rivet (TL3806 EG) and nylon washer (against sign face) at the top of sign. The bottom of the sign shall be attached with one 5/16-inch hex bolt, one metal washer and one nylon washer against sign face. The bolt or rivet system is used to fasten signs to the Telspar post.
 - d. Other Sign Mounts. Streetlights and approved utility poles, when located appropriately, may be used for signs such as warning, parking, and speed limit signs. Streetlight locations should be checked for potential sign installation during the design process and shown on the sign plan sheets.
 - e. Breakaway Post System. Posts must be of appropriate length to comply with MUTCD specifications for the location, must conform to the Town of Mead's Specifications, and must meet the Federal breakaway standards.
 6. Sign Reflectivity: All traffic control signs must be fabricated with reflective materials. All reflective materials to be a minimum of diamond grade, except parking and street name signs shall be a minimum of high intensity material or greater, per Section 304.3C. All signs or traffic control devices must have a 7-year materials warranty. No silk-screened signs will be permitted.
 7. Backing Plates: Aluminum blanks of .080 gauge are standard, except for signs larger than 30 x 30 inches, which shall be .100 or .125-gauge aluminum. Sign blanks shall be 6061 or 5052-H38 aluminum alloy.
- B. Intersections
1. Street Name Sign
 - a. General. All street name signs must conform to these standards, See Construction Detail D3.25. If the intersection has a traffic signal, street name signs will be designated as part of the signal.
 - b. Minor Intersection. Nine-inch (9-inch) plates (height) shall be used at all minor intersections; lengths will vary to fit street names. Also see street name sign drawing D3.25.

Town of Mead Design Standards and Construction Specifications

- c. Major Intersection. 12-inch plates (height) shall be used at all major intersections, which include the intersections with Collector and Arterial Roadways. Lengths will vary to fit street names.
- d. Sign Assembly. There shall be two plates for each road, with a minimum of four plates per street sign assembly. Street name signs shall be mounted directly to the sign post with two drive rivets per sign and nylon washers against sign face. Typical installation shall include four street name signs, two for each direction. For signs with lengths of 18" – 30" use .080 gage blank thickness; for signs 36 to 48 inches use .100 gage blank thickness.
- e. Sign Face.
 - i. Letter Size. Refer to the following table and Construction Detail 3.25 for letter size specifications.

Type of Mounting	Letter Size	Height of Sign Blank
Local/Local to Collector	6"	9", Lengths may vary
Arterials and Above	8"	12", Lengths may vary
Metro Overhead	14"	18", Lengths may vary

- ii. Color. Letters and numbers are to be white on a green background face. Private streets shall use green letters on a white background face. The colors shall not fade when exposed to an accelerated test of ultraviolet light equivalent to 5 years of outdoor exposure. No silk-screened signs are permitted. Minimum of high intensity materials shall be used for local signs and diamond grade for metro overhead signs.
 - iii. Border. There shall be no borders on street name signs
 - f. Street Name. Street names and 100-block (where applicable) designations should be obtained from the approved plat. Internally illuminated signs are not permitted
 - g. Change of Name or Numbers. At the point where a street changes names/numbers from one section to the next, the change shall be designated with a street name assembly by using standard names, numbers, and directional arrows to indicate change. This will be accomplished using an 18-inch double height street name plate. This change and shall look like a standard street name sign, separated horizontally with a vertical white line in the middle of the sign.
- 2. Stop Signs
 - a. Location of all stop signs shall be determined and discussed in the TIS.
 - b. Stop signs will be placed in accordance with the TIS, approved construction plans, and the MUTCD. In general, stop signs should be placed at point of curvature (PC) and behind attached sidewalk (if present).
- 3. Warning Signs
 - a. Intersection warning signs may be required on Arterial Roadways in advance of major intersections. An advisory plaque identifying the name of the intersecting side street shall be placed beneath the advance intersection warning sign. Placement of these signs shall be per MUTCD standards.

C. Traffic Control Signs

1. Design and Size:

- a. Sign specifications and diagrams are detailed in the latest revision of the Federal "Standard Highways Sign". This publication is available from the U.S. Department of

Town of Mead Design Standards and Construction Specifications

Transportation, Federal Highway Administration. Acceptable sign sizes are listed in the standard column of the table printed with each diagram. Expressway and construction warning signs shall be a minimum of 36 x 36 inches. The MUTCD also includes sign size guidance in the Regulatory Sign and Plaque Sizes table and the Warning Sign and Plaque Sizes table.

2. Mounting:

- a. Signs should be mounted on existing streetlight and power poles if/when these existing poles are located such that the sign placement will adequately convey the intended message, with new posts being used only if necessary. Streetlight locations should be checked for potential sign installation during the design process and shown on the signing and striping plan sheets. 3/4-inch stainless steel banding shall be used to mount signs to fiberglass and steel poles. Installation of signs on wood poles can be achieved by using 3/8-inch x 2-1/2-inch lag bolts.

3. Regulatory

- a. Reflectivity. All regulatory signs, except parking, shall be Diamond grade reflectivity or greater. This includes the red series and black on white signs.
- b. Sheeting Material. All signs shall be fabricated with sheeting material, including letters. No silk-screened signs will be permitted.
- c. Stop Sign. Stop sign sizing shall conform to the MUTCD. However, stop signs shall also not be less than 30 x 30-inch in size for local residential streets and 36 x 36-inch minimum for all other street classifications above local and consist of diamond grade sheeting or greater.
- d. Yield Sign. For roundabouts or minor intersections only, a 36 x 36 x 36-inch yield sign may be used in lieu of a stop sign, at the discretion of the Town of Mead according to MUTCD.
- e. Speed Limit Sign. All Collectors and Arterials should have speed limit signs at a minimum 1/2-mile intervals. All subdivisions shall have a speed limit sign at each entrance. Speed limit signs should also be placed approximately 125 to 150 feet beyond any arterial or collector intersection to convey the appropriate speed limit to vehicles entering from that intersection. Speed limit signs should also be posted anytime that there is a reduction in speed limit (such as when transitioning from a rural to suburban setting), and the reduction in speed limit should not exceed 10 mph increments.
- f. Parking/No Parking Sign. Designated parking and “no parking” zones shall be signed in accordance with MUTCD. No silk-screened signs are permitted.

4. Warning

- a. Reflectivity Requirements. All yellow warning signs shall be made with diamond grade yellow sheeting. All school-related signs and plaques shall be made with diamond grade fluorescent yellow/green sheeting.
- b. “No Outlet” Sign. On dead end streets, cul-de-sacs, and temporary dead-end streets, a “No Outlet” sign will be required and mounted with standard mounting system under the street name sign. The sign shall be an MUTCD #W14-2ap (36 x 8-inch minimum black on yellow warning sign). A separate 30 x 30-inch W14-2 “No Outlet” sign may also be required in specific locations.
- c. “Road Closed” Sign and Barricades.

Town of Mead Design Standards and Construction Specifications

striping on new roadways, overlays, and chip seals, etc. will require two full applications of paint

B. Pavement Markings (Symbols, Arrows, "ONLY"s)

1. General

- a. The Town of Mead must use preformed thermoplastic on all pavement markings such as arrows, "onlys," crosswalks, railroad crossings, school crossings, stop bars, and bike symbols.

2. Preformed Thermoplastic Pavement Marking Specifications

- a. The prefabricated markings described shall be 125 mils (90 mils for bike symbols) in thickness and consist of white or yellow pigmented plastic film with imbedded reflective glass spheres, uniformly distributed throughout their entire cross-sectional area. It shall be possible to affix the markings to bituminous or Portland cement concrete pavements by a two part epoxy adhesive and shall have a black contrasting border. Prefabricated legends and symbols shall conform to the applicable shapes and sizes as outlined in the MUTCD. All concrete curing compound shall be removed before installing thermoplastic in specific marking locations as approved by the Town Engineer.

3. Crosswalks

- a. General. Crosswalks shall be used at all signalized intersections, approved crossings, school routes, adjacent to schools, and as otherwise directed. Mid-block pedestrian crossings may also be installed where appropriate as determined by the Town Engineer.
- b. Standard Crosswalk. White 9-foot long, x 18-inch wide "Continental" or "Denver" style bars shall be used for all crosswalks.

4. Stop Bars

- a. All stop bars shall be white and a minimum of 18 inches wide. Stop bars are required at signalized locations where the speed limit is 35 mph or higher and other locations specified by the Town Engineer.

5. Symbols

- a. Preformed thermoplastic pavement marking standard material is available from Flint Trading Co. (or approved equivalent) and shall be a minimum of 125 mils thick or approved equal. This material shall be used for all arrows, "onlys," bike symbols (90 mils), railroad crossing symbols, etc.
- b. The purpose of the placement of bicycle markings on the roadway is to reinforce the specified use of this designated area (Bike Lane/Bike Routes/roadways with Shared Lane Markings) and to supplement any regulatory signs. Bicycle markings are to be used on Collector and Arterial Roadways with designated Bike Lanes. The application of bicycle symbols and markings shall be consistent with the MUTCD and the current version of the AASHTO Guide for Development of Bicycle Facilities. Bicycle markings are to be re-installed in the same location on Roadways that have been under construction for routine street maintenance or rehabilitation.

6. Roundabouts

- a. Roundabout markings shall be in accordance with the MUTCD.
- b. Yield Line. The roundabout shall require an 18" material yield line (18" material 36" long with 36" gaps) at the point of entry into the circulatory roadway unless otherwise approved by the Town Engineer.

Town of Mead Design Standards and Construction Specifications

- c. All linear lines (yield, center, edge, crosswalks, & lane lines) in concrete shall be epoxy per CDOT 713.17.
- C. Striping
 - 1. General
 - a. Typical. Typical striping widths for lane lines are 4 inches, unless otherwise noted. Double yellow centerline must have a 4-inch gap between stripes according to MUTCD.
 - b. Pavement. Epoxy pavement markings shall be used for asphalt and concrete pavement striping per CDOT 713.17.
 - c. Layout. All striping on sealcoats shall require a layout line. Prior to striping, tabs are required for sealcoats (prior to the sealcoat process). All other conditions require spot taping at an interval of 25 ft or closer.
 - d. Retro-reflectivity. The epoxy shall be applied with beads for each coat. The application rate for beads shall be 6.5 pounds per gallon. The beads shall be type 2, non-floating, water resistant.
 - 2. Broken Line
 - a. All broken lines shall be 4-inch wide or 8-inch wide using a 6-foot cycle (2-foot paint or therm, 4-foot gap).
 - 3. Turn Bay Line
 - a. All turn bay lines shall be created with a minimum 8-inch wide line. However, if a turn bay occurs on a horizontal curve, the bay taper from the start of the double wide 8" shall be marked with short 8-inch wide dotted lines (2-foot long with 4-foot gap).
 - 4. Centerline
 - a. Centerline striping shall be yellow and in conformance with MUTCD
 - 5. Parking Stalls and Angle Parking
 - a. All striping for parking shall be white and 4 inches wide. All edge lines of parking areas shall also be white and a minimum of 4 inches wide.
 - 6. Bikeway
 - a. A 4-inch minimum wide white stripe shall be used for Bike Lanes.
- D. Temporary Striping: All temporary striping shall conform to "Standard Specifications for Road and Bridge Construction," published by CDOT, the latest revision except as herein amended. When approved, temporary striping shall be required prior to the opening of a Roadway for travel where pavement and/or permanent striping cannot be completed due to weather and/or time constraints.
 - 1. Specifications
 - a. Temporary striping shall be the same color and width as for permanent striping. Temporary striping shall consist of tabs or 4 x 4-inch (min.) tape, depending on the pavement surface, spaced at 25-foot intervals.
 - 2. Time Duration Limit
 - a. Temporary striping is permitted for no more than 7 days.
 - 3. Extensions
 - a. Extensions must be requested in writing if weather does not allow installation of permanent striping.

Town of Mead Design Standards and Construction Specifications

305 CONSTRUCTION SPECIFICATIONS

305.1 General

- A. All Street Construction shall be completed in accordance with the Construction Specifications included in Appendix A.

306 STREET DETAILS

- A. The following is a list of standard details for Streets that are part of the Town of Mead Standards and Specifications:

D3.01A	4-Lane Major Arterial Street
D3.01B	2-Lane Major Arterial Street
D3.02A	2-Lane Minor Arterial Street
D3.02B	2-Lane Minor Arterial Street Half Section
D3.03	Major Residential Collector and Business Collector Street
D3.04	Minor Collector Street
D3.05	Residential Local Street
D3.06	Rural Road
D3.07	Vertical Curb and Gutter Detail
D3.08	Mountable Curb and Gutter Detail
D3.09	Vertical Curb Catch to Spill Transition Detail
D3.10	Vertical to Mountable Curb Transition Detail
D3.11	Sidewalk Detail
D3.12	Directional Curb Ramp Detail
D3.13	Diagonal Curb Ramp Detail
D3.14	Mid-Block Curb Ramp
D3.15	Concrete Pan Layout Detail
D3.16	Concrete Pan Detail
D3.17	Concrete Driveway with Detached Sidewalk Detail
D3.18A	Concrete Driveway with Attached Walk Detail
D3.18B	Concrete Driveway with Attached Walk Detail
D3.19	Driveway Detail (Rural Road Only)
D3.20	Street Intersection Detail
D3.21	Street Intersection Striping Detail
D3.22	Concrete Chase Detail
D3.23a	Asphalt Patch Detail (1 of 4)
D3.23b	Asphalt Patch Detail (2 of 4)
D3.23c	Asphalt Patch Detail (3 of 4)
D3.23d	Asphalt Patch Detail (4 of 4)
D3.24	Sign Post Detail
D3.25	Street Name Sign Detail
D3.26a	Local Cul-De-Sac Detail
D3.26b	Local Offset Cul-De-Sac Detail
D3.27	Widening Detail for Street Knuckle (Local Streets Only)
D3.28	Guardrail Detail

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Town of Mead Design Standards and Construction Specifications

CHAPTER 400 SANITARY SEWER UTILITY

401 GENERAL PROVISIONS

401.1 General

- A. Sanitary Sewer improvements shall conform with this Chapter 400 in addition to Chapter 13, Article 1 of the Town Code.

401.2 Purpose

- A. This Chapter pertains to all components of the sanitary sewer system. Designs are intended to provide safe, reliable sewer service to customers and serve the sewage treatment needs of customers in an efficient, cost effective and environmentally responsible manner. Determination of the best materials and construction methods are based upon lowest life cycle costs, not necessarily upon lowest initial costs.
- B. All utility installation within the Town Right-of-Way shall require a Right-of-Way Use Permit prior to any installation activity. See Chapter 200 regarding permits and permitting processes in the Town and Chapter 300 regarding road cut standards.
- C. All utility installation outside of the Town Right-of-Way (private property) shall require a Grading Permit prior to any installation activity. See Chapter 200 for Grading Permit regulations.
- D. All utilities must be clearly labeled on the plans and include the type, size, depth, etc. Whenever possible, utilities shall be designed according to the typical utility layout plan (See detail drawing D4.02, "Example Site Plan.")

401.3 General Specifications and Jurisdictions

- A. There are two sanitary sewer districts providing wastewater service within the Town:
 1. The Town of Mead (Town)
 2. St. Vrain Sanitation District (SVSD)
- B. The Responsible Party is responsible for determining which sanitary service provider will serve a proposed development and shall design and construct all the proposed sewer facilities to the service provider's criteria and standards.
- C. General Process/Submittal Requirements:
 1. The purpose of these Standards and Specifications are to provide general criteria for the design of sanitary sewer mains and appurtenances within the Town of Mead sanitary sewerage service area. Any deviation from these standards must be approved by the Town and additional documentation may be required. The Town reserves the right for a submittal and review process as outlined in Chapter 200 for plan approval.
 2. If construction of sanitary sewer improvements has not commenced within 1 year from Town approval, the utility plans must be resubmitted for review and comment.
 3. The Town will establish and may amend procedures to be followed by the Responsible Party performing work on sanitary sewer lines. These procedures will include all requirements for documentation, submittals, fees, engineering design, construction, and acceptance.

401.4 Granting of Service

- A. Sanitary sewer shall be extended at the Responsible Party's expense, when it has been determined that the Town has the capability and capacity to serve the area, provided that the

Town of Mead Design Standards and Construction Specifications

area to be served is located within the Town of Mead sanitary sewer service area and provided that the owner can show evidence of fee ownership of the property to be serviced. The request for service must be in compliance with stipulations contained in all utilities agreements entered into by the Town as well as in compliance with all applicable Town ordinances, codes and charter principles.

402 GENERAL DESIGN CRITERIA – ALL SERVICE PROVIDERS

402.1 General Criteria

- A. Sanitary sewerage design and construction shall adhere to service provider's criteria and standards. Additional criteria may be required by the service provider's Engineer for the overall hydraulics of the affected wastewater system. The Town may also have additional criteria, in either sanitary sewer jurisdiction, based on the potential impact of proposed sewer facilities through affected public right-of-way or other adjacent public infrastructure.
- B. In general, sewer easements, proximity of sewer to other utilities, proximity of sewer within Town of Mead Right-of-Way, and the location of sewer service lines shall comply with service provider's and Town of Mead Standards and Specifications. In the event of conflict or discrepancy between standards, the more stringent standards shall apply.
- C. Sewer mains shall be designed and sized through manholes at the end of cul-de-sacs or out lots to serve future upstream development.
- D. Sanitary sewer mains and appurtenances shall be constructed in conformance with these Standards and Specifications and shall be designed by or under the direct supervision of a registered P.E. licensed to practice in the State of Colorado.
- E. Refer to Chapter 200 for construction plan requirements related to sanitary sewer.

402.2 Details of Design

- A. Sewer Location in Easements
 1. A Non-Exclusive sewer easement dedicated to the Town must be provided when the sewer is located outside of public right-of-way or outside of an easement within a subdivision that is dedicated to the public for utility purposes on the recorded plat of that subdivision. The easement width shall depend on location but shall be a minimum of twenty (20) feet. Sewer mains installed in easements shall ordinarily be located in the center of the easement unless stated otherwise in the easement documents or indicated in the Town approved construction plans.
 2. A combined sewer and water easement shall have a minimum width of 30-feet, plus 10-feet for each added utility in the easement or shall meet minimum requirements for the St. Vrain Sanitation District and applicable water districts.
- B. Sewer Proximity to Other Utilities
 1. Sewer lines that parallel water lines shall be located a minimum distance of ten (10) feet horizontally from the water line, as measured from outside diameter of pipe (OD) to OD. Where sewer lines cross water mains, the sewer pipe must be a minimum vertical distance of eighteen (18) inches from the water main as measured OD to OD. If this distance is not feasible, the crossing must be designed and constructed to protect the utilities. The design must be approved by the Town Engineer.
 2. If the minimum vertical separation cannot be achieved at a utility crossing, minimum protection shall consist of the installation of an impervious structural material. Sewer pipe shall be encased in reinforced concrete. The encasement on sewer line shall be at least six (6) inches thick around the entire pipe and shall extend ten (10) feet in either direction

Town of Mead Design Standards and Construction Specifications

from the central point of utility crossing. In all cases, suitable backfill or other structural protection shall be provided to preclude settling and/or failure of the adjacent or perpendicular crossings.

3. Clearance from other utilities must be enough to facilitate future repairs to either utility line; minimum separation distances are eighteen (18) inches of vertical and five (5) feet of horizontal.

402.3 Service Line Location and Alignment

- A. Sanitary sewer service lines shall be designed on the shortest and straightest possible route.
- B. Sanitary sewer service lines shall not enter manholes and must connect to the mains with a wye fitting at least five (5) feet from the outer diameter of sanitary sewer manholes.
 1. A manhole connection must be approved by the Town Engineer but is not recommended. Service pipe shall transition from a 4" to an 8" pipe matching crowns and be 5 feet from the manhole. Connection of service shall be a standard connection at bottom of manhole either by less than or equal to the maximum slope.
- C. Each structure and each subdivided lot shall be served by a separate line. Compound taps are not allowed.
- D. Service lines shall be at least five (5) feet from the side property line, and no service line may be designed through or in front of any adjoining property. If possible, the service line should be located toward the low side of the lot.
- E. Service lines shall not extend beneath driveways or intersection streets.
- F. The minimum separation of sewer service from water service lines is ten horizontal (10) feet. If minimum horizontal separation cannot be achieved, the sewer line shall be concrete encased or otherwise protected with an impervious structural material approved by the service provider.
- G. Service Laterals to the Property Line: service laterals shall be extended at least ten (10) feet into the property or at least five (5) feet past the easement and shall be plugged or capped.
- H. All sanitary services shall be marked with an "S" chiseled into the concrete curb or other paved surface it crosses under.
- I. Clean outs
 1. Building sewer cleanouts shall be installed at intervals not to exceed 100 feet and/or for each aggregate change in direction exceeding 135 degrees. Each cleanout must be inspected and approved by the Town. Cleanouts must be the same size as the service size. Manholes must be installed in accordance with Chapter 400 – Sanitary Sewer Utility on any building sewer greater than 6 inches in diameter (i.e. no cleanouts allowed).
 2. Two-way cleanouts are required within 2 feet to 5 feet outside of a building (or at other location as approved by the Town)
- J. Ejector Systems/force main service lines
 1. When sewer service cannot be obtained under traditional gravity conditions the owner may request Town approval the use of an ejector system and force main. Force mains less than 4 inches in diameter must connect to the public sanitary sewer through a standard tee or wye. The force main must connect to the tee or wye in a manner to prevent leakage and to prevent sewage from entering the force main when the main line sewer is flowing full. After the connection is inspected the connection must be concrete encased to prevent separation due to thrust. The connection must be specifically detailed, and the Town must

Town of Mead Design Standards and Construction Specifications

approve the detail. Force mains need to be installed at a minimum depth of 5 feet to prevent freezing. At any time, the force main is less than 5 feet deep it must be protected against freezing.

K. Size

1. Minimum diameter allowable from main to the building is 4-inch. Follow international plumbing code for within the building.

402.4 Manholes

- A. Below grade design and construction of manholes will adhere to service provider's criteria. Manhole locations within the Town Right-of-Way and exposed portions of the manholes will adhere to additional criteria of this Chapter.
 1. Manholes shall not be installed in curbs, gutters, concrete pans or in the wheel path in the road.
 2. Lids
 - a. All sanitary sewer lids shall be forged with the following: "Town of Mead Sanitary Sewer". Sewer manhole lids must be Denver Pick slot style model #1156 manufactured by Deeter Foundry or A-1480 by D&L Foundry.
 - b. Rings and covers shall be cast-iron. Manhole rings and covers shall be twenty-four (24) inch diameter manholes.
 - c. Surface patterns in the lids shall be drivable per detail. Checker patterns or other textured patterns are not allowed.

402.5 Future Connections

- A. Sanitary utilities shall be stubbed out to the right-of-way or limits of property at all locations that are planned for future tie-ins. Other reasonable stub-outs or main extensions may be requested by the sanitary service provider or the Town based on knowledge of adjacent development.
- B. The end of a service stub-out shall be marked in the field with a painted green, carsonite composite utility marker reaching no less than four (4) feet above finished grade and labeled with the size and material of the sanitary service line.
- C. The end of a main extension shall be marked in the field with a painted green, carsonite composite utility marker reaching no less than four (4) feet above finished grade and labeled with the size and material of the sanitary main extension. Posts shall not be located in improved surfaces.
- D. All sanitary services shall be marked with an "S" chiseled into the concrete curb or other paved surface it crosses under.
- E. Plugs and Caps: See specification Section 33 33 00 – Sanitary Sewerage Utilities.

403 DESIGN CRITERIA - TOWN OF MEAD JURISDICTION

403.1 General Criteria

- A. Sanitary sewerage design and construction shall adhere to the Town's Standards and Specifications. Additional criteria may be required by the Town Engineer for the overall hydraulics of the impacted wastewater system.
- B. Sanitary sewer mains and appurtenances shall be constructed in conformance with these Standards and Specifications and shall be designed by or under the direct supervision of a registered P.E. licensed to practice in the State of Colorado.

Town of Mead Design Standards and Construction Specifications

- C. Refer to Chapter 200 for construction plan requirements related to sanitary sewer.

403.2 Design Flow

- A. Sewer infrastructure design includes consideration of providing sewer service for the entire tributary area to the outfall point.
- B. Per Capita Flow/Capacity
 1. In general, sewer capacities shall be designed for the estimated maximum population in a specific drainage area or area to be served.
 2. Where future sewer infrastructure is planned, economic and engineering analysis of alternatives should accompany any request for service.
 3. In determining the required capacity of sanitary sewer, the following factors shall be considered:
 - a. Maximum hourly domestic sewage flow
 - b. Additional maximum sewage or wastewater flow from non-residential dischargers
 - c. Inflow and groundwater infiltration
 - d. Topography of area
 - e. Location of sewage treatment plant
 - f. Depth of excavation
 4. Sewer infrastructure shall be designed on the basis of seventy-five gallons per day (75 gpd) per capita. Minimum residential population density is computed using 2.83 persons per dwelling unit.
 5. For initial flow approximation in a residential development, refer to the Town of Mead Wastewater Masterplan and zoning maps for respective land uses.
- C. Peak Design Flow
 1. Sanitary sewer must be designed to carry the peak discharge with the pipe being no more than fifty percent (50%) of maximum capacity (q/Q) for mains smaller than fifteen (15) inches in diameter.
 2. Sanitary sewer must be designed to carry the peak discharge with the pipe being no more than eighty percent (80%) of maximum capacity (q/Q) for mains fifteen (15) inches in diameter and larger.
 3. Sewers shall have capacity for peak hourly sewage flow and adequate velocity at minimum sewer flows.
- D. Combined Sewer Interceptors
 1. Combined sewers are not permitted. Storm water and under-drains must be separate and isolated from the sanitary sewer system so there is no combination of the flows. No storm water or ground water shall be introduced into the sanitary sewer collection system.

403.3 Details of Design

- A. The basis of design for all sewer projects within the Town of Mead sanitary sewer jurisdiction shall comply with Town detailed specifications and accompany the plan documents submitted for review. Additional computations or changes may be required after plan review. All sanitary sewer main construction within the Town's sanitary sewer system, and all service line construction connecting to the Town's sewer mains, shall be completed in accordance with these standards. These design specifications cover all sanitary sewer service line design, construction and repairs to existing facilities within the Town.

Town of Mead Design Standards and Construction Specifications

B. Minimum Size

1. All gravity sewer mains shall be eight (8) inches or greater in diameter. Sewer service lines from residences or other facilities to Town gravity sewer may be four (4) or six (6) inches in diameter.

C. Bury Depth

1. In general, sewers should be sufficiently deep to receive sewage from basements and to prevent freezing. Sewers shall not be installed at depths greater than twenty (20) feet. Where pipe has less than five (5) feet of cover, provisions for insulation shall be made to protect pipe from impact, loading and freezing.
2. Sewer bury depths less than five (5) feet or greater than twenty (20) feet will require authorization from the Town Engineer.

D. Slope

1. All sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than two feet per second (2 fps) and no greater than ten feet per second (10 fps). The following table provides the minimum slopes allowable for collection and outfall mains. Slopes within the following ranges are desirable:

Table 400- 1: Sanitary Sewer Slope Ranges per Pipe Size

Sewer Size	Minimum Slope	Maximum Slope
8 inch (20 cm)	0.40%	5.0%
10 inch (25 cm)	0.28%	4.0%
12 inch (30cm)	0.22%	3.0%
15 inch (38 cm)	0.15%	2.5%
18 inch (46 cm)	0.12%	2.0%
21 inch (53 cm)	0.10%	1.5%
24 inch (61 cm)	0.08%	1.2%
27 inch (69 cm)	0.07%	1.0%
30 inch (76 cm)	0.06%	1.0%
36 inch (91 cm)	0.05%	1.0%

E. Alignment

1. All sewers shall be designed with straight pipe and uniform slope between manholes. Minimum drop in a manhole is 0.1 feet for straight runs and 0.2 feet for changes in direction.

F. Under-Drains, Cleanouts and Basement Sump Pumps

1. Under-drain pipe may be installed when recommended by the soils/design engineer at locations shown on the accepted plans and shall only be installed at those locations where excessive groundwater is encountered.
2. Basement sump pumps shall not be discharged to ground surface. All basement sump pumps intended to intercept groundwater shall be discharged to a private under-drain system.
3. All under-drain systems are considered private and shall be owner maintained. The Town will not maintain private underdrain systems.
4. Under-drain installations shall require the approval of the Town Engineer when in the same trench as the sewer.
5. The size and extent of underdrains shall be established by a Design Engineer, registered in the State of Colorado, based on anticipated underdrain service line flow and groundwater

Town of Mead Design Standards and Construction Specifications

flow in the Wastewater Main trench if applicable. The minimum size of a main line groundwater underdrain system shall be 6 inches. The underdrain service line shall be 3 inches in diameter to minimize any chance of confusion and cross-connection with wastewater service lines.

6. The slope of the underdrain main shall be a minimum of 0.5%.
7. Underdrain mains shall be located horizontally and vertically parallel to the wastewater main, opposite to the water main.
8. Passive systems shall be laid with solid pipe with one ten (10) foot section of active pipe downstream of each manhole. A trench dam shall be installed at the transition from active to passive system. Cleanouts shall be constructed outside a wastewater manhole as shown in Detail D4.13.
9. At any point where there may be gravel to gravel contact between the underdrain trench and the sanitary sewer trench (e.g., on private property) a concrete cut off wall is required (e.g., at the property line) in order to assure that there is no continued flow of water in the sanitary trench, so that all water is "forced" into a perforated section of underdrain pipe
10. The design shall show that under-drains discharge to an appropriate location such as a storm sewer system or drainageway.
11. Should the Responsible Party's Contractor desire to install an under-drain system to specifically collect the discharge of peripheral drain systems from individual house foundations or from sump pumps installed as a part of a peripheral drain system for house foundations, such a system shall be constructed for the exclusive advantage of the Responsible Party and will not be maintained by the Town. Any such system will not be tied into or connected with the sanitary sewer collection system in any manner
12. Cleanouts shall not be installed within a sanitary sewer manhole and will not be maintained by the Town. Under-drains and associated clean outs shall not be green in color.

G. Future Connections

1. Whenever future expansion of the system is anticipated, the stub out size and length will be determined by the Town and shall terminate with a manhole. Costs for stub-outs and termination manholes shall be borne by the Responsible Party.

403.4 Manholes

A. Location: Manholes shall be installed at the following points:

1. At the end of each line.
2. At all changes in grade, pipe size, or alignment.
3. At all sewer main intersections.
4. At distances, not greater than four hundred (400) feet for sewers that are fifteen (15) inches or less in diameter, and five hundred (500) feet for sewers eighteen (18) inches to thirty (30) inches in diameter. Greater manhole spacing may be permitted in special cases based on a review and authorization by the Town Engineer.

B. All manhole exteriors shall be damp proofed.

C. Manholes shall be inspected prior to backfill.

D. Cleanouts may not be substituted for manholes.

E. Changes in pipe size shall occur at manholes to maintain energy gradient or allow for changes in energy gradient within the manhole.

Town of Mead Design Standards and Construction Specifications

F. Where varying pipe sizes enter and exit a manhole, the crown invert elevations shall match.

G. Manhole Diameter

1. Manhole barrels shall be sized per the following tables:

Table 400- 2: Sewer Manhole Sizing for One Invert In and One Invert Out

Pipe Size	Barrel Size
8-inch – 18-inch	48-inch
21-inch – 27-inch	60-inch
30-inch and greater	As determined by Town

Table 400- 3: Sewer Manhole Sizing Multiple Inverts In and One Invert Out

(Barrel Size to be based on largest of any pipe invert)

Pipe Size	Barrel Size
8-inch – 15-inch	48-inch
18-inch – 24-inch	60-inch
27-inch – and greater	As determined by Town

2. Increase manhole barrel size whenever more than a two-way manhole of maximum pipe diameter is required. Specially designed manholes/vaults are required for pipes greater than twenty-four (24) inch diameter and when multiple inverts exist.

H. Drop Manholes

1. A drop pipe shall be provided when the sewer line entering a manhole is at an elevation of twenty-four (24) inches or more above the manhole invert, or where flow velocities exceed fifteen (15) feet per second in the upstream pipe segment of a manhole. Where the difference in elevation between the incoming sewer and the manhole invert is less than twenty-four (24) inches, the invert is required to be filleted (shaped) to prevent solids deposition/buildup.
2. Drop manholes shall be constructed with an inside drop connection. Outside drop connections are not be permitted.
3. Drop manhole barrels shall be sized per the following table:

Table 400- 4: Sewer Drop Manhole Sizing

(Barrel Size to be based on largest of any pipe invert)

Pipe Size	Barrel Size
8-inch – 15-inch	60-inch
18-inch – 30-inch	72-inch
Greater than 30-inch	As determined by Town

I. Flow Channel

1. The flow channel through manholes shall be made to conform in shape and slope to that of the sewer pipe.
2. Smooth, non-jagged surfaces are mandatory.
3. The flow channel shall be pre-formed or cast in place grout.

J. Water Tightness

Town of Mead Design Standards and Construction Specifications

1. Manholes on new sanitary lines shall be pre-cast concrete. Poured-in-place concrete may be used on an existing sewer line or as authorized by the Town Engineer. Inlet and outlet pipes shall be joined to the manhole by a gasketed, flexible watertight connection.
2. Watertight manhole covers (bolt down manhole covers) shall be used wherever the manhole lids may be flooded by street runoff, high water or any other water source. The assignment of these types of manhole covers is at the sole discretion of the Town and at the Responsible Party's expense.

K. Rim Elevations and Manhole Markers

1. If manholes are in cultivated fields, they should be left eighteen (18) inches below grade unless directed otherwise. Manholes in parks or detention basins must be above the flood plain. All other manholes in these types of areas should be no more than six (6) inches above grade. In these circumstances, bolt down ring and cover are to be used and properly marked with a green carsonite composite utility marker, located by a property line or other suitable site as close to the manhole as possible, with the offset marked in feet to the centerline of the manhole cover.
2. In paved roads, the manhole ring and cover shall be designed to final grade. In unpaved roads, the manhole ring and cover shall be designed to be six (6) inches below final grade.

L. Steps

1. Manhole steps shall be manufactured of polypropylene reinforced as manufactured by M. A. Industries, spaced twelve (12)-inch typical, sixteen (16) inch maximum on center, aligned away from invert.

M. Cones

1. All cones shall be eccentric. Each cone shall be rotated such that its opening is vertically aligned away from pipe openings thus maximizing the potential amount of manhole steps to the base of the manhole.
2. Only pre-cast manhole risers and cones shall be used and manufactured in accordance with ASTM Designation C-478.

N. Inverted Siphons

1. The use of an inverted siphon will be evaluated on a case-by-case basis and will require approval from the Town Engineer.

403.5 Sewers in Relation to Waterways

A. Alignment

1. Sewers crossing waterways shall be designed to cross the waterway as nearly perpendicular to the waterway flow as possible. Sewer systems shall be designed to minimize the number of waterway crossings.

B. Horizontal Location

1. Sewers located parallel or horizontal to waterways shall be located beyond the top banks of the natural floodway, and at a sufficient distance from any waterway to allow for the possible widening of the channel.
2. Sanitary sewer manholes may not be located within the limits of a detention pond.

C. Structures

1. The sewer outfalls, headwalls, manholes, gate boxes, or any other structures shall be located so that they do not interfere with the free discharge of flood flows of the waterway.

Town of Mead Design Standards and Construction Specifications

D. Depth of Cover

1. The top of all sewers entering or crossing waterways shall be at a sufficient depth below the natural bottom of the waterway's bedrock to protect the sewer line. In general, the following cover requirements shall be met:
 - a. One (1) foot of cover is required when the sewer is located in bedrock.
 - b. Three (3) feet of cover is required in any material other than rock. In major waterways, more than three (3) feet of cover may be required due to anticipated scour depths and pending review from the Town, Corps of Engineers and any other wetland authorities.
 - c. In paved waterway channels, the top of the sewer line shall be placed three (3) feet below the bottom of the channel pavement and protected with a casing.
 - d. Less cover will be approved only if the proposed sewer crossing will not interfere with any future improvements to the waterway. Reasons for requesting less cover shall be submitted for review by the Town.

E. Materials

1. Sewers crossing a waterway shall be constructed of C900 PVC or other approved material. The pipe shall be constructed to remain watertight and free from changes in alignment or grade.
2. Material used to backfill the trench shall be as stated in the construction drawings and shall not cause settling. Construction documents shall call out construction requirements of the trench and backfill.
3. Controlled Low Strength Material (CLSM), i.e., a lean, sand-cement slurry or "flowable fill," is the preferred method to prevent scour in utility trenches where groundwater is present.

F. Encasement of Pipe

1. All pipe installed through natural drainage ways must be concrete encased.
2. All Pipe installed through paved waterways shall be sleeved through a casing.
3. Pipe encasement will extend ten (10) feet beyond either top bank of the waterway, or two times the depth of the waterway past either bank of the water waterway, whichever is greater.

G. Suspended or Exposed Crossings

1. The Town will not approve or allow these types of crossings:
 - a. Aerial - suspended in air,
 - b. Suspended - attached to a bridge,
 - c. Exposed crossings - not covered, pipe is visible.

403.6 Sewage Lift Stations

- A. On a case-by-case basis, the Town Engineer may approve the use of lift stations within or outside its collection system that satisfy the following criteria:
 1. Compatible site location.
 2. The lift station will be privately owned. Operation and maintenance will be the responsibility of the ownership.
 3. Lift station is designed and constructed to the Town and service provider's standards.
 4. All lift stations with capacities at 2,000 gallons per day (gpd) or greater are subject to Colorado Department of Health and Environment (CDPHE) Regulation 22.

Town of Mead Design Standards and Construction Specifications

5. Compatible site location with approval from the North Front Range Water Quality Planning Association (NFRWQPA).
6. The developer shall be solely responsible for all costs associated with the design and construction of the lift station and force mains. This includes the cost of any easements, land acquisition, documents associated with permitting approval through CDPHE and NFRWQPA, and any other cost associated with the project.
7. Where additional service area outside of the proposed development is anticipated, the Town will require the lift station and associated improvements to provide additional capacity than what is necessary for the initial development. A reimbursement agreement may be appropriate in this condition.

403.7 Silting and Erosion

- A. Construction methods that minimize silting and erosion shall be employed.
- B. The design engineer shall include in the project specifications the method(s) to be employed in the construction of sewers to control silting and erosion such that the land is restored back to its original condition. Specifications shall require the cleanup, grading, seeding, and planting or restoration of all work areas to begin immediately upon the completion of construction.

404 CONSTRUCTION SPECIFICATIONS

404.1 General

- A. All Sanitary Sewer Construction shall be completed in accordance with the Construction Specifications included in Appendix A.

405 SANITARY DETAILS

- A. The following is a list of standard details for sanitary sewer work that are part of the Town of Mead Standards and Specifications:

D4.01	General Construction Notes
D4.02	Example Site Plan
D4.03	Standard Sanitary Manhole
D4.04	Sanitary Drop Manhole
D4.05	Monitoring Sanitary Manhole
D4.06	Monitoring Sanitary Manhole Diagrams
D4.07	Sanitary Manhole Base
D4.08	Flexible Joint Pipe Penetrations
D4.09	Manhole Ring and Cover - Non-Bolted
D4.10	Manhole Ring and Cover - Bolted
D4.11	Pipe Trenching
D4.12	Pipe Trenching with Underdrain System
D4.13	Sanitary Cleanout
D4.14	Typical Service Connection
D4.15	Tapping Saddle
D4.16	Pipe Encasement
D4.17	Pipe Encasement Specifications
D4.18	Standard Pipe Casing
D4.19	Cut-Off Wall
D4.20	Sanitary Utility Marker Post

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Town of Mead Design Standards and Construction Specifications

CHAPTER 500 WATER UTILITY

501 GENERAL PROVISIONS

501.1 Purpose

- A. This section pertains to all components of the water distribution and transmission systems. Designs are intended to provide safe, reliable water supplies to customers and provide fire suppression flows where available.
- B. All utility installation within the Town Right-of-Way shall require a Right-of-Way Use Permit prior to any installation activity. See Chapter 200 regarding permits and permitting processes in the Town and Chapter 300 regarding road cut standards.
- C. All utility installation outside of the Town Right-of-Way (private property) shall require a Grading Permit prior to any installation activity. See Chapter 200 for Grading Permit regulations.
- D. All utilities must be clearly labeled on the plans and include the type, size, depth, etc. Whenever possible, utilities shall be designed according to the typical utility layout plan (See detail drawing D4.02.)

501.2 General Specifications and District Jurisdictions

- A. There are two water service providers within the Town:
 - 1. Little Thompson Water District (LTWD), and
 - 2. Longs Peak Water District (LPWD).
- B. The Responsible Party is responsible for determining which water service provider will serve the proposed development and shall design and construct all the proposed water main facilities to the service provider's criteria and standards.
- C. The Mountain View Fire Rescue District (MVFRD) has authority over fire protection and emergency services within the Town and the surrounding community. Responsible Party shall design and construct the water system to provide fire suppression flows as required by International Fire Code (IFC) and MVFRD.

502 DESIGN CRITERIA

502.1 General

- A. Water distribution design and construction shall adhere to service provider's criteria and standards. Additional criteria may be required by the service provider's engineer for the overall hydraulics of the impacted water utility system. The Town may also have additional criteria based on the impact of proposed water main facilities through impacted public right-of-way or other adjacent public infrastructure.
- B. Design flow and fire line sizing must be reviewed and approved by the MVFRD or other fire protection district having authority for the area to be served.

502.2 Water System Alignment

- A. All water lines shall be placed, when possible, ten feet north or ten feet west of the centerline of the street, from the point of beginning to where the water line ends. Deflections in alignment shall be made with fittings. Water and sewer lines shall be installed with a minimum ten-foot horizontal separation and an eighteen-inch minimum vertical separation at utility crossings, as measured from outside pipe diameter to outside pipe diameter.

Town of Mead Design Standards and Construction Specifications

- B. No water mains shall be installed within fifteen (15) feet of any building, retaining wall or structure unless approved by the water service provider's engineer and the Town Engineer. No building, retaining wall or structure shall be constructed within a minimum of fifteen (15) feet from any water main, unless approved by the Water service provider's engineer and the Town Engineer.
- C. Valve boxes, vault access lids, or other surface features of the water system that will be placed in paved areas shall not be placed in curb and gutter, concrete cross pans or edges of pavement. Surface features of the water system shall be placed a minimum of two (2) feet from outside edges of concrete curb and gutter pans, street cross pans, and edges of pavement.
- D. Water meter vaults shall be located between the curb and detached walk wherever size permits.
- E. All above grade blowoff valves shall have an appropriate drainage path to an appropriate drainage feature.

502.3 Manholes

- A. Below grade design and construction of manholes will adhere to service provider's criteria. Manhole locations within the Town Right-of-Way and exposed portions of the manholes will adhere to additional criteria of this Chapter.
 - 1. Manholes shall not be installed in curbs, gutters, concrete pans or in the wheel path in the road.
 - 2. Lids
 - a. All manhole lids shall be forged with the following: "Water". Manhole lids must be Denver Pick slot style model #1156 manufactured by Deeter Foundry or A-1480 by D&L Foundry, or approved substitution.
 - b. Rings and covers shall be cast-iron. Manhole rings and covers shall be twenty-four (24) inch diameter manholes or as approved by the appropriate service provider.
 - c. Surface patterns in the lids shall be drivable, per detail. Checker patterns or other textured patterns are not allowed.

502.4 Future Connections

- A. Water utilities shall be stubbed out to the right-of-way or limits of property at all locations that are planned for future tie-ins. Other reasonable stub-outs or main extensions may be requested by the Water service provider or the Town based on knowledge of adjacent development.
- B. Service stub-outs and main extensions shall be valved such that only one valve will need to be closed when the water line is extended.
- C. The end of a service stub-out shall be marked in the field with a painted blue carsonite composite utility marker reaching no less than four (4) feet above finished grade and labeled with the size and material of the water main extension.
- D. The end of a main extension shall be marked in the field with a painted blue, carsonite composite utility marker reaching no less than four (4) feet above finished grade and labeled with the size and material of the water main extension. Posts shall not be located in improved surfaces.
- E. All water services (domestic and fire) shall be marked with a "W" chiseled into the concrete curb or other paved surface it crosses under.

Town of Mead Design Standards and Construction Specifications

502.5 Fire Hydrants and Fire Service Lines

- A. The Responsible Party shall provide system improvements, including fire hydrants, for fire suppression as needed for the proposed development and its impact, if any, on adjacent properties.
- B. The required number of fire hydrants and their locations shall be coordinated with the MVFRD, water service provider and the Town. As minimum general requirements, the number of fire hydrants, their location and spacing shall follow the latest edition of International Fire Code (IFC).
- C. Hydrant Placement:
 - 1. Hydrants shall be located at least one (1) foot inside the right-of-way or water utility easement and five (5) feet from the side lot line and shall conform to Standard Detail D5.01.
 - 2. Hydrants shall be located a minimum of five (5) feet from edges of driveways to the center of the hydrant.
 - 3. Installation of fences, signposts, landscaping or other obstructions shall in no way hinder the access or operation of the fire hydrant.
- D. Public and private fire hydrants shall meet service provider's standards and specifications.
 - 1. Comply with American Water Works Association (AWWA) Specification C-502
 - a. Mueller brand, Centurion 200 or 250 model, or
 - b. Waterous brand
 - 2. Open Direction: LEFT (counterclockwise)
 - 3. Operating Nut: Pentagon (5-sided)
 - 4. Painted chrome yellow for LTWD, or orange for LPWD
 - 5. Bonnet and caps painted per LTWD standards for measured fire flow rates with 20 pounds per square inch (psi) residual pressure.
- E. Private fire service main for use on an internal fire suppression system shall extend from the valve on the main to the base of the riser flange in the building.
- F. The use of any private fire service main to supply more than one lot is not allowed.

502.6 Submittal Requirements

- A. The Responsible Party is required to complete all review requirements of the appropriate service provider including Commitment Letters or will serve letter.
- B. The Responsible Party is required to submit engineering plans of proposed water system improvements to the Town. All water mains shall be profiled. In addition to engineering plans, legal descriptions, agreements and exhibits for all proposed water line easements shall be submitted to the Town.
- C. The Responsible Party shall concurrently submit water system engineering drawings to the appropriate service provider. A signature block for use by the service provider shall be incorporated into the utility plans and other applicable sheets within Town approved plans. Once the final utility plans have been reviewed, the Responsible Party shall submit final drawings for approval signature by the Town. The final plans shall have original signatures from the water service provider. MVFRD signature block and original signatures shall also be required for development that includes or effects proposed or existing hydrants and/or fire service lines.

Town of Mead Design Standards and Construction Specifications

503 CONSTRUCTION SPECIFICATIONS

503.1 General

- A. Water transmission lines, mains, services and appurtenances shall be installed per service provider's standards, specifications and drawings. In general, materials, installations and testing shall be in accordance with established American Water Works Association (AWWA) standards.

503.2 Coordination of Work

- A. Coordinate with Town, service provider and MVFRD representatives for any impacts to the existing water system and provide advanced notice to impacted properties if applicable.

504 WATER DETAILS

- A. The following is a list of standard details for water utility work that are part of the Town of Mead Standards and Specifications:

- D5.01 Fire Hydrant Placement
- D5.02 Water Utility Marker Post

Town of Mead Design Standards and Construction Specifications

CHAPTER 600 STORM DRAINAGE FACILITIES AND WATER QUALITY

601 GENERAL PROVISIONS

601.1 General

- A. These Standards and Specifications are promulgated by the Town Manager in accordance with the authority contained in the Town of Mead Municipal Code. Improvements shall also be in conformance with Chapter 13, Article 1 of the Town of Mead Municipal Code.
- B. All proposed construction submitted for approval by the Town shall include adequate storm drainage system analyses and appropriate drainage system design. Such analyses and design shall conform to the criteria set forth within these Standards and Specifications. Individuals using these Standards and Specifications are assumed to possess a working knowledge of hydrology and hydraulics and to have experience in storm drainage design and analysis.
- C. Publications referenced in this Chapter can provide additional guidance as needed. Where the criteria in these Standards and Specifications vary from those found in other Weld County or USDCM publications, the criteria in these Standards and Specifications shall govern.
- D. Drainage easements or tracts, including access easements, shall be provided for all stormwater management facilities required as part of these Standards and Specifications. On-site drainage facilities that are private, affect only the individual property owner, and are not required by these Standards and Specifications need not be placed within public easements. Private detention ponds and outlet works are required by these Standards and Specifications for proper functioning of the public drainage system, and therefore are required to be placed within drainage easements or tracts.

601.2 Purpose

- A. This Chapter pertains to the Town drainage policy and State of Colorado law described below as it pertains to drainage systems, stormwater quality control, flood control and site grading. Designs are intended to provide safe, reliable stormwater management in an efficient, cost effective and environmentally responsible manner. Determination of the best materials and construction methods are based upon lowest life cycle costs, not necessarily upon lowest initial costs.
- B. All utility installation within the Town Right-of-Way shall require a Right-of-Way Use Permit prior to any installation activity. See Chapter 200 regarding permits and permitting processes in the Town and Chapter 300 regarding road cut standards.
- C. All utility installation outside of the Town Right-of-Way (private property) shall require a Grading Permit prior to any installation activity. See Chapter 200 for Grading Permit regulations.
- D. All utilities must be clearly labeled on the construction plans and include the type, size, depth, etc. For more complete information on plan submittal requirements, refer to Chapter 200 of these Standards and Specifications.

601.3 Submittal Criteria

- A. Responsible Parties of new roadways and new developments and subdivisions within the Town must submit stormwater reports and designs, construction drawings, hydrologic and hydraulic calculations, and as-built information in accordance with Chapter 200 of these Standards and Specifications. Checklists of submittal requirements for drainage designs are included in Chapter 200.

Town of Mead Design Standards and Construction Specifications

- B. Construction of agricultural exempt buildings does not require a stormwater report except where the building is located within a subdivision.
- C. Stormwater reports are not needed for individual single-family-home construction sites. However, a stormwater report is needed for entire subdivisions of single-family homes.
- D. Roadway Drainage Criteria
 - 1. Borrow ditches need to be sized to reduce the potential for roadway overtopping. Overtopping of the roadway cannot result in more than 6 inches of water on the road during the 10-year event.
 - 2. Culverts need to be sized to reduce the potential for backwater effects on adjacent houses or businesses. Culverts passing under Town roads must be designed for the 10-year storm and have a minimum diameter of 18 inches. Additionally, the culvert must be sized so that road overtopping does not result in more than 6 inches of water on the flowline of the gutter in the 10-year event and 12 inches of water in the flowline of the gutter in the 100-year event. In addition to said criteria, a minimum of one, 12-foot-wide drivable lane must be provided at all major arterials in the 100-year storm event.
 - 3. If the roadway is being constructed in a floodplain, all applicable floodplain regulations and codes apply, including the need to submit a Town Flood Hazard Development (FHD) permit and a LOMR to FEMA for review and acceptance if applicable.

601.4 Drainage Policy

- A. Adequate drainage is necessary to preserve and promote the general health, safety, welfare, and economic wellbeing of the community. Drainage is a regional issue involving multiple governmental jurisdictions and affecting all property parcels. Therefore, drainage systems and programs shall address both public and private needs.
- B. Drainage plans should adhere to generally accepted engineering principles and practices and should conform to applicable laws and regulations. Designers should reference the drainage policy chapter of the *MHFD Urban Storm Drainage Criteria Manual (USDCM) (Volume 1)* and *Weld County Engineering and Construction Criteria*.
- C. The Principals of the Town of Mead storm drainage policy are summarized below:
 - 1. Storm drainage design shall observe Colorado water rights law.
 - 2. Drainage is a regional phenomenon that does not respect the boundaries between government jurisdictions or between properties.
 - 3. The storm drainage system is a subsystem of the total natural water resource system.
 - 4. Planning and design of stormwater drainage systems should not be based on the premise that problems can be transferred from one location to another.
 - 5. Storm drainage strategy should be a flexible, multi-objective, and multi-means effort.
 - 6. Storm drainage design for new development shall accommodate agricultural facilities and practices.
 - 7. Design of the constructed stormwater drainage system should consider the features and functions of the existing natural drainage system.
 - 8. To the maximum extent practicable, storm drainage design for new development should strive to reduce stormwater runoff rates and prevent pollutant load increases. The release rates outlined in the *Town of Mead Storm Drainage Master Plan* shall be adhered to unless otherwise required by the Town Engineer. If not specified in the *Town of Mead Stormwater Masterplan*, the storm drainage design shall be based on detention of the 100-year

Town of Mead Design Standards and Construction Specifications

- developed site runoff released at 90% or less than predeveloped, historic rates as determined by the latest methods endorsed by MHFD.
9. Storm drainage design for new development shall give full consideration to downstream impacts and safe conveyance of upstream off-site flows entering the system. Prevention of harm is paramount.
 10. The stormwater management systems should receive regular maintenance.
 11. Storm drainage design for new development should give full consideration to erosion prevention.
 12. Adequate floodplain capacity needs to be preserved consistent with FEMA and Colorado Water Conservation Board (CWCB) regulations.
 13. Land development should reserve sufficient floodplain width to accommodate lateral stream channel movement.
 14. Retention of stormwater is discouraged and shall not be pursued without prior approval by the Town Engineer. Retention ponds are not acceptable unless there is no feasible method for draining the pond by gravity. If a retention pond is found to be the only alternative, the minimum volume of the facility must be adequate to retain the storm runoff from twice the 100-year 24-hour developed storm event. Percolation/evaporation alone may be an accepted method for draining the pond, but percolation will not be acceptable in situations where an increase in groundwater flow as a result of pond percolation could cause an adverse impact upon structures with basements down gradient of the pond site.
 - a. The Pond must drain within 72 hours for storm event equal to or less than the 5-year event and 120 hours for all events greater than the 5-year event, to be consistent with Colorado Water Law.
 - b. Water augmentation will be required if a retention pond is constructed on site and the site does not have soils that will allow for percolation to occur within the required time period. Drainage Law

601.5 Drainage Law

- A. Refer to the drainage law chapter of the USDCM (Volume 1) for more information on drainage law as it relates to stormwater runoff and floodplain management.
- B. Refer to *Weld County Engineering and Construction Criteria, Chapter 5* for additional principle of Colorado drainage law applicable within the Town of Mead and Weld County.

Town of Mead Design Standards and Construction Specifications

602 DESIGN CRITERIA

602.1 General Drainage Criteria and MHFD Design Aids

- A. As stated in the previous section, designers are advised to reference the MHFD USDCM and *Weld County Engineering and Construction Criteria* as much of the criteria herein is adopted from said sources.
- B. The Owner/Applicant is encouraged to use the spreadsheets and programs provided by the MHFD to assist in designing street drainage, inlets, and storm sewers. Other software programs may be used by the design engineer, but the designs shall be verified using the MHFD programs and spreadsheets. The most current version of the MHFD spreadsheets can be downloaded from the MHFD website.
- C. The Town will allow the use of other modeling methodologies on a case-by-case basis when complete documentation of all assumptions is provided. The Town reserves the right to review alternative methods and compare with other commonly used approaches, including those discussed in the USDCM.

602.2 Rainfall

- A. This section presents the methods used to develop rainfall information for hydrological analyses. For more information regarding the development of rainfall information, refer to the rainfall chapter of the USDCM (Volume 1).
- B. Design Storms
 1. The rainfall depth-duration frequency maps presented in the USDCM do not include rainfall data for the Town of Mead. Drainage designs for areas in and around the Town of Mead should use the depth-duration frequency information provided in the *Precipitation-Frequency Atlas of the Western United States (Volume 2 - Colorado)*, published by NOAA. The NOAA Atlas can be accessed on the NOAA website.

Table 600-1, below, shall be used but may be superseded if more recent NOAA data is published for the Town. The table below is based on NOAA Atlas 14, Volume 8, Version 2 for Mead, Colorado.

Table 600- 1: Point Precipitation Frequency Estimates in Inches

Estimated Rainfall Depth in Inches									
Duration	Average Return Interval (ARI) (Years)								
	1	2	5	10	25	50	100	200	500
5-minutes	0.232	0.279	0.376	0.473	0.634	0.779	0.942	1.13	1.40
10-minutes	0.340	0.409	0.550	0.693	0.929	1.14	1.38	1.65	2.05
15-minutes	0.414	0.499	0.671	0.845	1.13	1.39	1.68	2.01	2.50
30-minutes	0.556	0.668	0.896	1.13	1.51	1.86	2.25	2.69	3.34
60-minutes	0.685	0.819	1.10	1.38	1.86	2.29	2.78	3.34	4.16
2-hours	0.813	0.970	1.30	1.64	2.21	2.73	3.32	4.00	4.99
3-hours	0.889	1.06	1.41	1.78	2.40	2.97	3.61	4.34	5.43
6-hours	1.06	1.25	1.65	2.06	2.75	3.37	4.07	4.87	6.05
12-hours	1.27	1.51	1.98	2.43	3.16	3.80	4.51	5.30	6.46
24-hours	1.53	1.81	2.35	2.84	3.61	4.26	4.98	5.76	6.89

Town of Mead Design Standards and Construction Specifications

C. The Rational Method

The Rational Method is one method for determining runoff from a proposed development or road construction project. Note that it should not be used for basins greater than 160 acres. The MHFD spreadsheets can also be used for basins that are no greater than 160 acres. Refer to the rainfall chapter of the USDCM (Volume 1) for more information regarding the rainfall parameters required to use the Rational Method.

D. Larger Basin Rainfall Methods (Basins sizes 160 acres and greater)

1. As noted above, the Rational Method should not be used to determine runoff for basins larger than 160 acres. In areas located in the southwest portion of Weld County and where areas are larger than 160 acres that have drainage characteristics similar to an urban area, the Colorado Urban Hydrograph Procedure (CUHP) is an acceptable model for determining runoff amounts. The CUHP model can be used for basins from 0 to 3,000 acres. The parameter adjustments provided in the runoff chapter of the USDCM (Volume 1) should be used when dealing with basins that are larger than 160 acres.
2. The CUHP model is not applicable in non-urban areas, including those areas in Weld County that are outside of the Denver metropolitan area. The U.S. Army Corps of Engineers (USACE) HEC-HMS model is more applicable for mixed suburban-agricultural areas. The HEC-HMS model can be used on watersheds and drainage basins larger than 160 acres provided the modeling follows the parameters in the HEC- HMS User's Manual, the HEC-HMS Technical Reference Manual, and the HEC-HMS Application's Guide.
3. The HEC-HMS model is also recommended for determining the peak flow of large off-site stream flows moving through a proposed development site.
4. The stormwater report should fully describe the rationale for the chosen rainfall method of determining runoff, including the choices for all the various model parameters. The report must contain copies of all applicable tables and reference materials in an appendix, as well as electronic copies of any spreadsheets prepared, and must fully document the assumptions for reviewing purposes.

602.3 Runoff

This section presents the methods used to develop runoff information for hydrological analyses. For more information regarding the development of runoff information, refer to the runoff chapter of the USDCM (Volume 1).

A. Rational Method

1. The Rational Method can be used for basins that are smaller than 160 acres. The Rational Method is based on the formula:

$$Q = CIA$$

Where

Q = the maximum rate of runoff (cfs),

C = a runoff coefficient that is the ratio between the runoff volume from an area and the average rate of rainfall depth over a given duration for that area,

I = the average intensity of rainfall in inches per hour for a duration equal to the time of concentration, and

A = area (acres).

Town of Mead Design Standards and Construction Specifications

2. Runoff Coefficients:
 - a. Table 600-2 lists recommended percentages of imperviousness for various types of land usages. However, if the Responsible Party's Engineer can provide data for more specific percentage of imperviousness of proposed development, the data may be considered by the Town. Examples of a project specific imperviousness would be a green roof system or a porous paver system with manufacturers' data for a recommended imperviousness.
 - b. Volume-based runoff coefficients have been derived by MHFD using the calculated percentage imperviousness and the hydrologic soil groups A, B, and C/D. The equations published in the USDCM Volume 1, Chapter 6 shall be utilized to compute runoff coefficients for use in rational method calculations.
3. Time of Concentration (t_c) is used to determine the average intensity of rainfall.
 - a. Time of Concentration is equivalent to the amount of time needed for runoff to travel from the most remote point of the basin to the design point. The time of concentration consists of two components, the initial or overland flow time " t_i " (usually as sheet flow) and the time of travel " t_t " in a concentrated form (i.e., in a storm sewer, gutter, swale, channel, etc.). The time of concentration is summarized by the following equation:
$$t_c = t_i + t_t$$
Where,
$$t_c = \text{time of concentration (minutes)}$$
$$t_i = \text{overland flow time (minutes)}$$
$$t_t = \text{travel time in the ditch, channel, gutter, storm sewer, etc. (minutes)}$$
 - b. The specific parameters and equations for calculating the overland travel time (t_i) and the channelized travel time (t_t) are provided in the USDCM.
 - c. The minimum time of concentration is as follows:
 - i. t_c (min) = 5 minutes for urbanized watersheds
 - ii. t_c (min) = 10 minutes for non-urban watersheds
4. The average rainfall intensity (I), in inches per hour, for a storm duration equal to the time of concentration for the Town of Mead can be found in Figure 600-1 and is based on the data shown in Table 600-1. Once the time of concentration has been calculated, the rainfall intensity can be read from the intensity-duration curve and then used in the Rational Method equation.
5. The general procedure for using the Rational Method for basins is as follows.
 - a. Delineate the catchment basin and measure its area.
 - b. Define the flow path from the uppermost portion of the basin to the design point. This flow path should be divided into reaches of similar flow types (overland flow, shallow swale flow, gutter flow, etc). The length and slope of each reach should be measured. Flow path parameters shall be used to determine the time of concentration, t_c , for each individual basin.
 - c. Find the rainfall intensity, I , for the design storm using the calculated t_c and the Rainfall-Intensity-Duration Frequency Curve (Figure 600-1) included at the end of Chapter 600.

Town of Mead Design Standards and Construction Specifications

- d. Determine the runoff coefficient, C, using the imperviousness values shown in Table 600-2, NRCS hydrologic soil classification (A, B, C or D) and MHFD equations for runoff coefficients based on NRCS soil types and storm return period.
- e. Calculate the peak flow rate from the basin using the Rational Formula, $Q = CIA$

B. Runoff Calculation Methods for Basins 160 Acres and Greater in Size

1. The CUHP model is based on the unit hydrograph principle. It was developed by the MHFD for use in the urban areas around Denver and Boulder. The most current version of the CUHP model can be downloaded from the MHFD website under downloads. The CUHP model is generally used for basins that are larger than 160 acres. The CUHP model is not applicable in non-urban areas that are outside of the Denver metropolitan area.
2. The USACE HEC-HMS model or other hydrologic models are more applicable for mixed suburban-agricultural areas.

Table 600- 2: Recommended Percentage Imperviousness Values

Land Use or Surface Characteristics	Percentage of Imperviousness
Business:	
Commercial Areas	95
Neighborhood Area	85
Residential Lots: (lot area only)	
Single-Family, 0.25 acres or less	45
Single-Family, 0.25 - 0.75 acres	30
Single Family, 0.75 acres or larger	20
Multi-Family (attached)	60
Multi-Family (detached)	75
Apartments	80
Industrial:	
Light Areas	80
Heavy Areas	90
Parks and Cemeteries	10
Playgrounds	25
Schools	55
Railroad Yard Areas	50
Undeveloped Areas	
Historic Flow Analysis	2
Greenbelts, Agricultural	2
Off-site flow analysis (when land use not defined)	45
Streets:	
Paved	100
Gravel (packed)	40
Drive and Walks	90
Roofs	90
Lawns, sandy soil	2
Lawns, clayey soil	2

3. The EPA's SWMM 5 model or newest version can be used to route multiple sub-basins and design detention facilities as part of the routed system for all sizes of development. The model shall not be used as a standalone design method for detention pond sizing.

Town of Mead Design Standards and Construction Specifications

More information on the routing methodologies can be found in the runoff chapter of the MHFD USDCM (Volume 1).

C. HEC-HMS Method

The USACE HEC-HMS model can be used in areas of Weld County where the Rational Method and CUHP Method are not applicable. The HEC-HMS model is more applicable for the mixed suburban-agricultural areas typical of much of Weld County. The HEC-HMS model can be used on watersheds and drainage basins larger than 160 acres. Designers must follow the parameters provided in the HEC-HMS User's Manual, the HEC-HMS Technical Reference Manual, and the HEC-HMS Application's Guide.

D. Differences between the Town of Mead and the MHFD

1. The Town of Mead will allow the use of other modeling methodologies on a case-by-case basis when complete documentation of all assumptions is provided. The Town of Mead reserves the right to review alternative methods and compare with other commonly used approaches, including those discussed in the USDCM.

602.4 Roadway and Street Drainage

A. General Criteria

1. When runoff in the street exceeds allowable limits, a storm sewer system or open channel is required to convey the excess flows.
2. Design Criteria Based on Frequency and Magnitude: The design criteria for the collection and conveyance of storm water runoff on public streets are based on an allowable frequency and magnitude of traffic interference. The primary design objective shall be to keep the depth and spread (encroachment) of stormwater on the street below an acceptable value for a given storm event.
3. Street Function in Minor (5-year) Storm Event: The primary function of streets in a minor storm event is to convey the nuisance flows quickly and efficiently to the next intended drainage conveyance system with minimal disruption to street traffic.
4. Street Function in Major (100-year) Storm Event: For the major storm event, the function of streets is to provide an emergency passageway for flood flows while maintaining public safety and minimizing flood damage. In the major event, the street may become an open channel and must be analyzed to determine when flooding depths exceed acceptable levels.
5. If the roadway is being constructed in a floodplain, all applicable floodplain regulations and codes apply, including the need to submit a LOMR to FEMA for review and acceptance if applicable.
6. For more information regarding the geometry of street and roadway design, refer to Chapter 300 of these Standards and Specifications.

B. Identification of Downstream Constraints

Downstream constraints may affect the capacity and release rate of upstream drainage facilities. Any downstream constraints shall be considered in the drainage design and identified in the stormwater report.

C. Allowable Street Flow

1. Drainage Classifications: The streets in the Town are assigned a drainage classification of Type A, B, or C based on the average daily traffic (ADT) for which the street is designed or for the roadway classification. In general, the higher the ADT or mobility that the

Town of Mead Design Standards and Construction Specifications

roadway provides, the more restrictive the allowable drainage encroachment into the driving lanes. The following Table 600-3 summarizes the drainage classification for each type of roadway:

Table 600- 3: Drainage Classification for Town of Mead Roadways

Street Classification	Drainage Classification
Local	A
Collector	B
Arterial (Major or Minor)	C

2.

Table 600- 4: Minor (5-year) Storm Allowable Street Flow

Drainage Classification	Allowable Flow Depth in Gutter Flowline	Maximum Street Encroachment
Type A	No curb overtopping.	Flow may spread to crown of street.
Type B	No curb overtopping.	Flow spread must leave at least one 10-foot lane free of water. (5-feet either side of the street crown)
Type C	No curb overtopping.	Flow spread must leave at least two 10-foot lanes free of water. (10-feet each side of the street crown or median)

3.

Table 600- 5: Major (100-year) Storm Allowable Street Flow

Drainage Classification	Allowable Flow Depth in Gutter Flowline	Maximum Street Encroachment
Type A, B and C	The depth of water at the gutter flowline shall not exceed 12 inches	Flow must be contained within the public right-of-way or dedicated drainage easements, and all structures shall be a minimum of 1 foot above the adjacent 100-year water surface elevation.

D. Curb and Gutter

1. The minimum longitudinal slope of a gutter shall be 0.5%
2. The minimum cross slope of pavement to the gutters shall be two percent (2.0%).
3. Construction shall be six (6) inches minimum thickness and per applicable standard detail drawings in Appendix B.
4. Concrete cross pans:
 - a. May be used to convey runoff across intersections. However, cross pans will only be permitted at locations where traffic is controlled by a stop sign.

Town of Mead Design Standards and Construction Specifications

- b. The minimum longitudinal slope shall be 0.5%
 - c. Shall be constructed per applicable standard detail drawings in Appendix B.
 - d. The flowline depth criteria in Tables 600-4 and 600-5 shall apply.
- E. Storm Sewer Systems
- 1. Introduction
 - a. Storm sewers shall be designed to convey the minor storm event without surcharging the pipe.
 - b. All storm sewer infrastructure in public right-of-way shall be designed for the ultimate cross section or full build-out of the roadway.
 - c. The minimum allowable pipe size for all public storm sewer piping shall be 18 inches in diameter or equivalent open area.
 - d. Privately owned and maintained detention pond outlet pipes which do not discharge to public right-of-way may be smaller than 18 inches.
 - 2. Vertical Alignment
 - a. The storm sewer grade shall be such that a minimum cover is maintained to withstand AASHTO HS-20 loading on the pipe. The minimum cover depends upon the pipe size, type and class, and soil bedding condition, but shall be not less than 18 inches for Reinforced Concrete Pipe (RCP).
 - b. Refer to Chapters 400 and 500 for clearance requirements from other utilities.
 - c. Uniform slopes shall be maintained between structures, i.e. manholes and inlets.
 - 3. Horizontal Alignment
 - a. The minimum horizontal separation between storm sewers and water mains shall be ten (10) feet, as measured from outside diameter of pipe to outside diameter of pipe.
 - b. Refer to Chapters 400 and 500 for more complete clearance requirements.
 - 4. Hydraulic Grade Line (HGL) and Energy Grade Line (EGL) Calculations
 - a. The HGL and EGL shall be calculated for each storm sewer system and shall be included in the final stormwater report.
 - b. Each storm sewer system shall be profiled on the final construction drawings and shall include the design flow (Q) and the associated hydraulic grade line (HGL).
 - c. The energy grade line (EGL) for the design flow (Q) shall be at least one (1) foot below the final finished elevation of the manhole rims and inlet flowlines.
 - 5. Inlets
 - a. Inlet grates shall have a symbol of a fish with the words "DUMP NO WASTE, DRAINS TO WATERWAYS"
 - b. The design guidelines provided in the streets/inlets/storm sewers chapter of the USDCM (Volume 1) should be used when designing stormwater inlets. The UD-Inlet Spreadsheet shall be used for the design of streets/inlets/storm sewer unless otherwise approved by the Town Engineer.
 - c. An emergency overflow path that does not encroach on residential lots shall be provided for all inlets in sump conditions. All emergency overflow paths shall be designed for a major storm with the assumption that the storm sewer system is plugged. The limits of ponding for the major storm event shall be shown on the storm drainage plans. All emergency overflows shall be armored to protect from scouring.

Town of Mead Design Standards and Construction Specifications

- d. Design measures should be taken to minimize inlet placement in areas which will be in shadow during winter months by structures, landscaping or fencing along the south side of east-west streets. This effort may require additional inlets along north-south roadways to minimize flows to the south side of an east-west roadway.
 - e. The standard CDOT inlets and inlets included in Appendix B are permitted for use in the Town based on street conditions as follows:
 - i. Type R inlets are permitted in all street types with 6-inch vertical curbs,
 - ii. Grated, Type C inlets are permitted in all streets with a roadside ditch or swale,
 - iii. Grated, Type 13 inlets are permitted in alleys or private drives with valley gutters,
 - iv. Combination, Type 13 inlets are permitted in all street types with 6-inch vertical curbs.
 - f. Consistent with MHFD recommendations, inlets shall be designed with a 50% clogging factor.
 - g. Curb chase drains or sidewalk chases shall not be used in place of an inlet to remove runoff from a street sections.
 - h. Maximum inlet length shall not exceed the length of a triple unit (i.e. 15 feet for a Type R inlet.)
6. Manholes
- a. Manholes are required where there is a change in size, direction, or grade of a storm sewer pipe. A manhole shall also be constructed where there is a junction of two or more storm drainage pipes.
 - b. Manholes are required along straight segments of storm sewer pipe in order to provide maintenance access. Maximum spacing between manholes or inlets will be as follows:
 - i. 400 feet maximum distance between structures for pipe diameters ranging from 18 inches to 36 inches.
 - ii. 500 feet maximum distance between structures for pipe diameters greater than 36 inches.
 - c. Manhole sizing shall be per Table 600-6

Table 600- 6: Required Manhole Sizes

Storm Sewer Diameter	Minimum Manhole Diameter
15-inch – 18-inch	4 feet
21-inch – 42-inch	5 feet
48-inch – 54-inch	6 feet
60-inch and greater	CDOT Standard Details M-604-20 and M-604-21

Note: Larger manhole diameters or a junction structure may be required where storm sewer alignments change direction or more than two storm sewer pipes enter the manhole.

- d. The elevation of pipe crowns shall be matched when the downstream pipe is larger than upstream pipe.

Town of Mead Design Standards and Construction Specifications

- e. The manhole inverts shall be sloped between the upstream and downstream pipes. The slope shall be the average of the upstream and downstream pipe slopes or based on a fall of 0.1 feet through the manhole.
 - f. Manhole covers are not allowed in concrete areas such as sidewalks, crosspans, gutters and curbs.
 - g. A locking ring and cover shall be installed on manholes located below the HGL of the major (100-year) storm event.
 - h. Manhole cover shall have a symbol of a fish with the words "DUMP NO WASTE, DRAINS TO WATERWAYS". Covers shall have a Denver Pick slot style and be equivalent to the East Jordan Iron Works model #1480.
 - i. Covers to be cast with "STORM" in 2-inch-tall flush letters
7. Pipes
- a. The design guidelines provided in the streets/inlets/storm sewers chapter of the USDCM (Volume 1) should be used when designing stormwater pipes.
 - b. Allowable Storm Sewer Velocity and Slope
 - i. Maximum flow velocity shall be limited to 18 feet per second (fps).
 - ii. Minimum flow velocity shall be 4 fps with the pipe flowing 25% full.
 - iii. Minimum allowable longitudinal slope shall be 0.50% for pipe sizes of 30 inches and greater and 1.00% for pipes smaller than 30 inches.
 - c. The minimum allowable size for a sewer within a public right-of-way or public drainage easement shall be 15 inches in diameter or equivalent open area.
 - d. The Manning's roughness coefficient "n" for all storm sewer capacity calculations shall be 0.013 regardless of pipe material (e.g., concrete, PVC, or HDPE) — with the exception of corrugated metal pipes, which shall have a coefficient of 0.025.
- F. Roadside Ditches
- 1. The primary function of roadside ditches is to convey drainage from the right-of-way to an approved drainage system or approved drainage way. Roadside ditches are not permitted in or through developed property.
 - 2. Roadside ditches shall be used in lieu of curb and gutter when rural street sections are approved and shall be included in the street right-of-way section. Design criteria shall include:
 - a. Adequate area and side slopes to allow for maintenance access and vehicles,
 - b. Maximum side slopes of 4:1 (horizontal to vertical ratio) are preferred, although maximum side slopes of 3 to 1 are acceptable if provided with permanent erosion control protection such as erosion control blanket,
 - c. Minimum of six (6) inches of freeboard for the minor (5-year) storm event,
 - d. Maximum allowable velocity to prevent erosion for up to the minor (5-year) storm event, as determined by soil erosivity and vegetative, erosion control blanket or riprap cover,
 - i. Recommended maximum velocity is 2.5 feet per second (fps) during 5-year storm event in grass lined swales with erosive soils, and
 - ii. Recommended maximum velocity is 3.5 fps during 5-year storm event in grass lined channels with non-erosive soils.
 - e. Incorporation of grade control structures as needed for velocity control.

Town of Mead Design Standards and Construction Specifications

3. Roadside Ditch Allowable Flow Criteria: The allowable flow depth and roadway encroachment in the minor and major storm events for rural roadside ditches can be found in Tables 600-4 and 600-5. Tables 600-4 and 600-5 reference allowable flow depth based on the gutter flow line; these tables should be used for rural roadside ditches by applying the depth at the edge of pavement (rather than gutter flowline). The spread of flow shall not extend outside the street right-of-way and at least 12-inches of freeboard shall be provided from the major storm water surface elevation to the lowest point of water entry at any adjacent structures.
4. Grade control structures as required to maintain velocities less than the maximum allowable or riprap lining (soil filled) shall be provided in accordance with the Major Drainage section of the MHFD USDCM.
5. There are cases when the roadside ditch criteria may need to be more stringent due to the function of the rural road. Even if a rural road has a low traffic volume, it may be important for emergency access to several properties and therefore require special design criteria. The Town reserves the right for more stringent criteria for single point access roads.

602.5 Major Drainage

This section presents guidelines for the design of major drainage systems. For more information regarding the design of major drainage systems, refer to Chapter 5 of the *Weld County Engineering and Construction Criteria*, and the major drainage chapter of the USDCM (Volume 1).

A. Design Flows and Design Criteria

1. The major drainage system must be able to convey the fully developed flow from a watershed for the 100-year storm event without significant damage to the system.
2. The Table 600-7 below summarizes the general design guidelines and for major drainage channels. More information and design examples are provided in the major drainage chapter of the USDCM (Volume1).

Table 600- 7: Summary of Channel Lining and Design Criteria

	Criteria for Various Types of Channel Lining			
	Grass: Erosive Soils	Grass: Erosion Resistant Soils	Riprap	Concrete
Maximum 100-yr velocity	5.0 ft/sec	5.0 ft/sec	16.0 ft/sec	18.0 ft/sec
Minimum Manning's n – stability check	0.020	0.020	0.03	0.011
Maximum Manning's n- capacity check	0.035	0.035	0.04	0.013
Maximum Froude number	0.5	0.8	0.8	N/A
Maximum depth outside low- flow zone	5.0 ft	5.0 ft	N/A	N/A
Maximum channel longitudinal slope	0.6%	0.6%	1.0%	N/A
Maximum side slope ⁶	4H:1V	4H:1V	2.5H:1V	1.5H:1V ¹

Town of Mead Design Standards and Construction Specifications

	Criteria for Various Types of Channel Lining			
	Grass: Erosive Soils	Grass: Erosion Resistant Soils	Riprap	Concrete
Minimum centerline radius for a bend	2 x top width	2 x top width	2 x top width	2 x top width
Minimum freeboard ²	1.0 ft ^{3,5}	1.0 ft ^{3,5}	2.0 ft ³	2.0 ft ⁴

This table was obtained from Weld County Engineering and Construction Criteria, Table 5-9.

- 1 Side slopes may be steeper if designed as a structurally reinforced wall to withstand soil and groundwater forces.
- 2 Add superelevation to the normal water surface to set freeboard at bends.
- 3 Suggested freeboard is 2.0 feet to the lowest adjacent habitable structure's lowest floor.
- 4 For super critical channels, use the freeboard recommended in the major drainage chapter of the USDCM (Volume 1), Section 4.3.1.5.
- 5 Grass-lined open channels conveying less than 50 cfs may reduce the minimum 1.0 foot freeboard requirement to the freeboard required to convey 1.33 times the 100-year design flow. The reduced freeboard may only occur if a 1.0-ft minimum freeboard is not physically possible and a variance request is submitted.
- 6 Maximum side slopes may be as steep as 3H:1V; however, the design engineer should address how the channels will be maintained since it may not be safe to mow on slopes that are greater than 4H:1V.

B. HEC-RAS

1. It is acceptable to use HEC-RAS to determine the hydraulics of the major drainage system. HEC-RAS is useful in sizing the major drainage system to carry the design storm. Standard modeling practices accepted by FEMA should be used when performing HEC-RAS modeling.

C. It is not acceptable to rely on HEC-RAS output to estimate maximum velocities for erosive or hazard considerations or local scour in a channel. A more detailed hydraulic analysis of the specific cross section, accounting for variable velocities across the channel, is required.

D. FEMA Floodplain Considerations

1. Construction of major drainage systems within FEMA floodplains must not increase the 100-year water surface elevation.
2. Per FEMA regulations, a Flood Hazard Development Permit will be required for the construction of channels and other major drainage system components within the FEMA mapped 100- year floodplain. It may be necessary to submit to FEMA a Conditional Letter of Map Revision (CLOMR) followed by an LOMR as part of the development process.
3. All design and engineering of the major drainage system components must follow accepted FEMA methodology.
4. For more reference information and criteria, refer to the FEMA Floodplain Requirements section at the end of this chapter.

E. Erosion Protection Design Criteria

1. Protecting major drainage channels from erosion is critical for maintaining channel stability. Channels need to be designed so that they remain stable until they are fully constructed or vegetated. It may be necessary to install riprap, straw bales, erosion control logs, or erosion control blankets in the channels to ensure that they remain stable. The best management practices (BMPs) outlined in the USDCM (Volume 3) should be used to ensure stability.
2. The grading and erosion control plan that is submitted with the stormwater reports and construction drawings shall include the placement of BMPs, typical installation details, and typical installation/maintenance notes for each type of BMP to be used on the site.

Town of Mead Design Standards and Construction Specifications

602.6 Minor Drainage

This section guidelines for the design of minor drainage systems.

A. Design Flows and Design Criteria

New minor drainage channels and/or storm sewer systems shall be designed at a minimum to convey the storm frequencies listed in Table 600-8, below.

Table 600- 8: Minimum Design Storm Frequency by Land Use

Land Use	Design Storm Frequency
Residential	5-year
Open Space	5-year
Commercial	10-year
Public Buildings	10-year
Industrial	10-year

B. Erosion Protection Design Criteria

1. Protecting minor drainage channels from erosion is critical for maintaining channel stability. Channels need to be designed so that they remain stable until they are fully constructed or vegetated. It may be necessary to install riprap, straw bales, erosion control logs, or erosion control blankets in the channels to ensure that they remain stable. The BMPs outlined in the USDCM (Volume 3) should be used to ensure stability.
2. The grading and erosion control plan that is submitted with the stormwater report/s and construction drawings shall include the placement of BMPs, typical installation details, and typical installation/maintenance notes for each type of BMP to be used on the site.

602.7 Hydraulic Structures

This section presents the guidelines for the design of hydraulic structures such as bridges, rundowns, emergency spillways, etc. For more information regarding design, refer to the hydraulic structures chapter of the USDCM (Volume 2).

A. Design Flows and Design Criteria

1. Hydraulic structures shall be designed for the 100-year storm event and other minor design discharges as applicable.
2. The design criteria for check and drop structures, conduit outlet structures, bridges, transitions and constrictions, bends and confluences, and rundowns should follow the design criteria and recommendations outlined in the hydraulic structures chapter of the USDCM (Volume 2).
3. Bridges shall be designed so that the low chord elevation of the bridge is a minimum of one (1) foot above the 100-year water course energy grade line (EGL).
4. The Town will allow the use of other modeling methodologies on a case-by-case basis when complete documentation of all assumptions is provided. The Town reserves the right to review alternative methods and compare with other commonly used approaches, including those discussed in the USDCM.
5. Seepage and Breach Analysis
 - a. Seepage analysis should be considered and shall be performed on all hydraulic structures (i.e. irrigation ditches, ponds, etc.) for both existing and proposed conditions

Town of Mead Design Standards and Construction Specifications

which may impact the development. Linings, cut-off walls and/or underdrains may be required if seepage potential exists.

- b. Breach analysis should be considered and shall be performed for all hydraulic structures

B. Culvert or Storm Sewer Outlet Structures

1. Rip rap or other approved method to slow exit velocities and provide erosion protection shall be provided at all outfalls from culverts and storm sewer outfalls. The outfall protection shall be designed to minimize or eliminate standing water.

C. HEC-RAS

1. HEC-RAS is useful in sizing hydraulic structures and it is acceptable to use it to determine hydraulic characteristics of the hydraulic structure. Standard modeling practices accepted by FEMA should be used when performing HEC-RAS modeling.
2. It is not acceptable to rely on HEC-RAS output for estimating maximum velocities for erosive or hazard considerations or local scour in a channel. A more detailed hydraulic analysis of the specific cross section, accounting for variable velocities across the channel, is necessary.

D. FEMA Floodplain Considerations

1. Construction of hydraulic structures within FEMA floodplains must not increase the 100-year water surface elevation. Per FEMA regulations, a Flood Hazard Development Permit will be required for the construction of channels and other major drainage system components within the FEMA mapped 100-year floodplain. It may be necessary to submit to FEMA a Conditional Letter of Map Revision (CLOMR) followed by an LOMR as part of the development process. All design engineering of the hydraulic structures must follow accepted FEMA methodology.
2. For more reference information and criteria, refer to the FEMA Floodplain Requirements section at the end of this chapter.

E. Erosion Protection Design Criteria

Protecting hydraulic structures and adjacent channel from erosion is critical for maintaining channel stability. Hydraulic structures need to be designed so that the adjacent channel remains stable until it is fully constructed or vegetated. It may be necessary to install riprap, straw bales, erosion control logs, or erosion control blankets in the channels and around the hydraulic structures to ensure that they remain stable. The BMPs outlined in the USDCM (Volume 3) should be used to ensure stability.

F. Guardrails

1. All bridges and box culvers shall include railing or guardrail per CDOT Standard Specifications for Road and Bridge Construction (CDOT S&S)
2. Guardrail shall be designed to include decorative architectural features. Final design shall be submitted to the Town Engineer for approval

Town of Mead Design Standards and Construction Specifications

602.8 Culverts

A. Sizing

1. The minimum culvert capacity is the capacity required to convey the 10-year storm. However, the minimum culvert diameter allowed in public right-of-way is 18 inches.
2. The Manning's roughness coefficient "n" for all culvert capacity calculations shall be 0.025 for corrugated type pipes and 0.013 for smooth wall pipe types.
3. The minimum slope and velocity requirements for culverts are the same as for storm sewer pipes under the Roadway and Street Drainage section of this chapter. Minimum slope shall be per storm sewer piping requirements or a minimum slope of 2%, whichever is greater.
4. The Town may require additional culvert capacity in order to prevent flooding of adjacent properties.
5. Any flooding of adjacent roadways will be limited to criteria in Tables 600-4 and 600-5 to gutter flowline or edge of pavement.
6. The maximum culvert headwater-to-diameter ratio is 1.0 for the 10-year design storm and 1.5 for the 100-year design storm.
7. Culverts should be installed to the minimum slope required to prevent sediment deposition within the pipe. The slope should be checked for each design, and if the proper minimum velocity is not obtained, other design options should be evaluated.
8. The designer is encouraged to use the spreadsheets and programs provided by the MHFD to assist in culvert design. Other software programs may be used, but the designs shall be verified using the MHFD programs and spreadsheets. The most current version of the MHFD spreadsheets can be downloaded from the MHFD website.
9. The Town will allow the use of other modeling methodologies on a case-by-case basis when complete documentation of all assumptions is provided. The Town reserves the right to review alternative methods and compare with other commonly used approaches, including those discussed in the USDCM.
10. Culverts need to be sized to reduce the potential for backwater effects on adjacent houses, buildings or businesses. Culverts passing under Town of Mead roads shall be designed for the 10-year storm and have a minimum diameter of 18 inches.

B. Materials

1. The Town allows the installation and use of commonly available culvert types such as reinforced concrete pipe (RCP), and corrugated metal pipe (CMP). The Town will allow the use of other culvert types on a case-by-case basis when complete documentation of all culvert specifications is provided.
2. Culverts that are to be installed in a public right-of-way that is routinely burned must be made of either concrete or metal. Plastic pipes will not be allowed in public right-of-way that is subject to weed burning.

C. Cover

All culverts shall be installed with a minimum of eighteen (18) inches of cover. If minimum cover is not possible, the culvert material and bedding shall be rated for a minimum of HS-20 loading or the largest expected traffic loads crossing it (i.e. oil rigs, semis, etc.).

D. End Sections and Trash Racks

Town of Mead Design Standards and Construction Specifications

1. Culverts installed in public right-of-way shall be equipped with a flared end section or headwall on the culvert entrance and outlet. Erosion protection such as riprap may be required. If riprap is required, it shall be installed on top of a geotextile and properly designed filter bed. Riprap designs should use the design methodologies outlined in the hydraulic structures chapter of the USDCM (Volume 2).
2. The Town does not recommend trash racks on culverts. However, the requested use of trash racks will be considered on a case-by-case basis.
3. The Town does not recommend the use of collapsible gratings.

E. Maintenance Responsibility

1. Culverts in the Town-maintained road right-of-ways are generally maintained by the Town on an as-needed basis to ensure that the roadside barrow ditches function properly.
2. Culverts located outside of public-maintained road right-of-ways are not maintained by the Town. Culverts on private land shall be maintained by the owner of the land. Culverts that are part of a subdivision drainage plan shall be maintained by the respective homeowner's association or Title 32 special district, as applicable. Culverts that are outside of public right-of-way or public drainage easements shall be maintained and cleaned out annually or on an as-needed basis to ensure proper drainage of the subdivision.

F. Erosion Protection Design Criteria

Erosion protection for culverts is to be designed to ensure that the adjacent drainage channel remains stable until such time as it is vegetated or fully constructed. It may be necessary to install straw bales, riprap, erosion control logs, erosion control blankets, etc. in the channels impacted by the culverts to ensure that erosion does not occur at or near the culvert. The BMPs outlined in the USDCM (Volume 3) should be used.

602.9 Detention Basins and Detention Storage

A. General Information and Criteria

1. This section summarized evaluation methods and design criteria for flood control detention facilities, referencing the Storage chapter of the USDCM for much of the background information. Criteria presented in the USDCM shall govern except as modified or added herein.
2. Detention facilities are used both for attenuating peak flows during large flood events and for providing extended detention and sedimentation during small, frequent events to enhance stormwater quality. Extended detention facilities used for water quality management may be incorporated into flood control detention basins or kept separate when combined with other Best Management Practices (BMPs) for stormwater quality.
3. Detention storage shall be provided for all new development, redevelopment or expansion as defined by these Standards and Specifications.
4. Parking lot and underground detention are not allowed in residential subdivisions. Underground detention will only be allowed on a case-by-case basis.
5. Rooftop detention is not allowed.
6. Detention basins shall be located outside of FEMA mapped 100-year floodplain.
7. For more information regarding design, refer to the storage chapter of the USDCM (Volume 2).
8. Storage volume and release rate criteria are based on three design events, as follows:

Town of Mead Design Standards and Construction Specifications

- a. Water quality capture volume (WQCV). This is defined in Volume 3 of the USDCM.
 - b. Excess Urban Runoff Volume (EURV). This is the difference between the developed and pre-developed runoff volume, a relatively constant value for a given developed imperviousness over a wide range of storm events.
 - c. The major storm event or 100-year storm event.
9. The designer is encouraged to use the spreadsheets and programs provided by the MHFD to assist in culvert design. Other software programs may be used, but the designs shall be verified using the MHFD programs and spreadsheets. The most current version of the MHFD spreadsheets can be downloaded from the MHFD website.
- B. Detention Basin Design Criteria
1. Sizing Methodology. Three different procedures for sizing full-spectrum detention volumes are described in the Storage chapter of the USDCM. A set of simplified equations or a design spreadsheet may be used for drainage areas up to 130 acres and a hydrograph approach is outlined for watershed areas up to one square mile. The maximum drain time for the Excess Urban Runoff Volume shall be 72 hours, as specified in the USDCM.
 2. The Water Quality Capture Volume (WQCV) and the incremental portions of the Excess Urban Runoff Volume (EURV), and the 100-year volume of a full-spectrum detention basin are normally combined into one facility with one outlet structure. However, the required volumes may be designed into separate facilities draining from a combined WQCV and EURV detention basin to the 100-year storm event detention.
 3. Onsite Detention and Addressing Offsite Flows: Two approaches are generally acceptable for addressing offsite flows that must be conveyed through a site, and the potential impacts to the onsite detention.
 - a. Design for No Pass-through: In this approach, offsite runoff is not allowed to be “passed through” the detention pond. Flows not intended to be detained in the basin shall be routed around the detention basin and reconnected below the basin at the outfall if necessary.
 - b. Design for Offsite Flows: An alternative method is to design the detention basin for the entire upstream watershed area, including the future development flows from offsite areas without giving any credit to offsite detention facilities. This method may be practical if the offsite tributary area is relatively small.
- C. Multiple Small Detention Basins
1. Extended detention basins providing Water Quality Capture Volume, Excess Urban Runoff Volume, and 100-year detention typically function best if configured in one or a few large basins as opposed to multiple small basins with very small orifices. Therefore, the minimum number of detention installations is generally preferable. The same is not necessarily true for porous landscape and porous pavement detention, which may be configured in multiple small installations.
- D. Detention Basins in Series
1. Locating two or more detention basins in series on an individual development site is generally discouraged, especially for the WQCV and the EURV portion of a full-spectrum detention facility.
 2. If site runoff is detained by two or more detention facilities in sequence before leaving the site, hydrograph approaches, as described in the Storage Chapter in Volume 2 of the USDCM, shall be used to determine the effect of sequential detention and to determine the

Town of Mead Design Standards and Construction Specifications

detention capacity that is needed to reduce runoff peaks to the specified predevelopment flow rates at the end of the system.

E. Interconnected Detention Basins

1. When sequential ponds are located in close proximity, separated by a short culvert or pipe at a roadway crossing, or when sequential ponds have similar invert elevations, the ponds may have to be modeled as “interconnected ponds”.
2. This situation could also occur if other downstream conditions cause variable backwater effects that influence the discharge of the detention pond outlet pipe. In these scenarios, the water surface elevation in the downstream pond can reduce the discharge rate from the upper pond and in some cases reverse flow can occur from the downstream pond into the upstream pond.
3. It is the responsibility of the design engineer to ensure that the appropriate analyses are performed and submitted when ponds are “interconnected”.

F. Outlets into Streets

1. Detention ponds that have an outlet pipe terminating in the gutter of a street, such as through a chase section, present potential ponding and icing problems in the gutter, and create hazards to the traveling public during periods in which the pond is emptying rapidly. Therefore, detention ponds shall be designed to outlet into a storm sewer, drainageway, or other designated drainage system that is reasonably available, as determined by the Town. It must be shown that the storm sewer, drainageway, or other designated drainage system to which the pond outlets, has the capacity to convey the detention pond flows.
2. The Town may allow an outlet to discharge into the gutter in cases where the minor storm (5-year) peak flow for the tributary area is less than 3.5-cubic feet per second and a storm sewer or other drainage system is not reasonably available. It must be demonstrated that the street has adequate capacity to convey the excess runoff within the allowable limits. A transition from the outlet pipe to a curb chase will normally be required, and the chase section shall be designed to reduce the velocity and spread of flow as much as possible. The location of the outlet shall be designed to minimize potential problems or conflicts with other improvements and shall be angled toward the downstream slope of the gutter to direct flows downstream instead of perpendicularly into the street.

G. Excavated and Embankment Slopes

1. All excavated or embankment slopes from the pond bottom to the 100-year water surface elevation shall be no steeper than 4 (horizontal) to 1 (vertical). Excavated slopes above the 100-year water surface elevation and the slope on the downstream side of embankments shall be 3 to 1 or flatter. Embankments shall be provided with a top width of at least 10 feet. Any detention pond embankment located adjacent to a sidewalk or trail shall have side slopes of 4 to 1 or flatter. An emergency overflow spillway shall be provided as described later in this chapter.
2. It is the responsibility of the design engineer to ensure that the design of any earthen embankment is based on specific recommendations of a geotechnical engineer and that the design requirements are clearly identified within the construction plans. In addition, the construction of large embankments or dams may fall under the jurisdiction of the Office of the State Engineer and will be subject to State review and approval.
3. All earthen slopes shall be covered with topsoil and revegetated for erosion protection. Adequate provisions for the establishment and maintenance of the vegetation, such as temporary or permanent irrigation should be provided.

Town of Mead Design Standards and Construction Specifications

H. Freeboard Requirements.

1. The minimum required freeboard for detention facilities is 1.0 foot above the computed water surface elevation when the emergency spillway is conveying the maximum design flow. The crest of the emergency spillway may be set at or above the 100-year storm water surface elevation.

I. Low Flow Channels

1. All grassed-bottom detention basins shall include a low flow channel sized to convey a minimum of 1% of the 100-year peak inflow. The low flow channel shall be constructed of concrete, concrete with boulder edges, soil-riprap, or other materials accepted by the Town. The trickle channel shall have a minimum depth of four (4) inches and a minimum width of 2-ft. for private detention basins, and 4-ft for regional detention basins. The minimum slope shall be 0.5% and the design longitudinal slope should ensure that non-erosive velocities are maintained adjacent to the low flow channel when the design capacity is exceeded.
2. If accepted by the Town, an unlined low flow channel may be used. The unlined low flow channel shall be at least 1.5-feet deep below adjacent grassed benches and shall be vegetated with herbaceous wetland vegetation or riparian grasses, appropriate for the anticipated moisture conditions. The minimum longitudinal slope shall be 0.5-percent and the minimum width of the grassed bench adjacent to the low flow channel shall be 12-feet on one or both sides where equipment can access. The maximum side slope below the bench shall be 4 to 1 and the maximum bottom width of the channel shall be 12-feet if equipment can access one side of the channel and 24-feet if equipment can access both sides.

J. Bottom Slope

For grassed detention facilities, the pond bottom shall be sloped at least 4.0% for the first 25-feet adjacent to a lined low flow channel and at least 1.0%- to 2% thereafter to drain toward the low flow channel or outlet, measured perpendicular to the low flow channel. The benches above unlined low flow channels, if approved, shall slope at least 1.0% to 2.0% toward the low flow channel.

K. Inlet Facilities

Unless otherwise accepted by the Town, runoff shall enter a detention facility via a stabilized drainageway, a 100-year drop structure, or a storm sewer with energy dissipater. Riprap rundowns are generally not accepted due to a history of erosion problems.

L. Outlet Configuration and Safety/Debris Grates

1. Detention basin outlets shall be functional for controlling the design release rates, provided with oversized safety/debris grates to reduce the potential for debris plugging, easy to maintain, and designed with favorable aesthetics.
2. The minimum net open area of the trash rack protecting the EURV orifices and the flood control orifice shall comply with Typical Structural Best Management Practice Details in Volume 3 of the USDCM. The safety grate criteria discussed in the Culverts section of the Volume 1 of the USDCM, shall also apply.
3. Water Quality Outlet Control Orifices
 - a. If the outlet control orifices are 2.5 inches or greater in diameter or 2-inches square, standard fabricated bar grating (with nominal openings of 1 inch by 4 inches) may be used as a debris grate instead of well-screen. The larger grate may reduce the potential for clogging with debris.

Town of Mead Design Standards and Construction Specifications

- b. If approved by the Town, the vertical spacing between outlet control orifices may be increased to 8-inches or 12-inches and the orifice areas increased by a factor of two (for 8-inch spacing) or three (for 12-inch spacing) to enable larger orifices and larger trash rack openings.
4. Water Quality Outlet Bar Grating
 - a. Bar grating may be used on parallel sloping wingwalls, either as the primary debris grate (if orifices are at least 2.5 inches in diameter) or as a course screen and safety grate in lieu of handrail. Sloping bar grating shall have a lockable hinged section at least 2-feet square to allow access to the orifice plate or well screen.
 - b. Manhole steps shall be provided on the side of the wingwall directly under the hinged opening.
 - c. The bearing bars for steel bar grating shall be designed to withstand hydrostatic loading up to the spillway crest (assuming the grate is clogged and bears the full hydrostatic head), but generally not designed for larger loads (like vehicular loads) so that the hinged panels are not excessively heavy.
 - d. Panels of bar grating shall be no more than 3-feet wide and all parts of the grating and support frames shall be hot-dipped galvanized.
 - e. Bar grating shall be fastened down to the water quality outlet structure.
5. The flood-flow orifice shall be sized to provide the allowable 100-year release rate when the 100-year detention volume is completely full.

M. Emergency Spillway and Embankment Protection

1. Detention basin embankments shall be protected from catastrophic failure due to overtopping. Erosion protection for the embankment may be provided in the form of a buried riprap layer on the entire downstream face of the embankment or a separate emergency spillway constructed of buried riprap or concrete. In either case, the emergency protection shall be constructed to convey the 100-year developed flow from the upstream watershed without accounting for any flow reduction within the detention basin.
2. The invert of the emergency spillway shall be set at or above the 100-year water surface elevation. A concrete wall or vertical curb shall be constructed at the emergency spillway crest extending at least to the bottom of the riprap and bedding layers located immediately downstream. The crest wall shall be extended at the sides up to one foot above the emergency spillway design water surface.
3. Riprap embankment protection shall be sized based on methodologies developed specifically for overtopping embankments. Two such methods have been documented by Colorado State University (USNRC, 1988) and by the US Department of Agriculture (ASAE, 1998) and designers are referred to these publications for a complete description of sizing methodology and application information. The thickness and bedding requirements shall be based on the criteria identified in the USDCM.
4. The emergency spillway is also needed to control the release point and direction of the overflow. The emergency spillway and the path of the emergency overflow downstream of the spillway and embankment shall be clearly depicted on the drainage plan. Structures shall not be permitted in the path of the emergency spillway or overflow. The emergency overflow water surface shall be shown on the detention facility construction drawings.

N. Retaining Walls

1. The use of retaining walls within detention basins is generally discouraged. If retaining walls are required, footings shall be located above the EURV water surface elevation. Wall

Town of Mead Design Standards and Construction Specifications

heights shall not exceed 30 inches, and walls shall not be used on more than 50-percent of the pond circumference.

2. If retaining walls are terraced, a separation of at least 5-feet shall be provided between walls. Additional width may be required to address the wall design, anchoring system and maintenance requirements. The engineering analysis shall include a discussion and the necessary calculations to determine the appropriate “bench” width. The maximum ground slope between adjacent walls shall be 4-percent.
 3. All detention pond retaining walls shall require a Building Permit (unless waived by the Building Department) and shall be provided with handrails or guardrails designed to meet safety criteria as well as building code requirements.
 4. Retaining walls are not to be used where live loading or additional surcharge from maintenance equipment of vehicle traffic could occur unless the wall is designed to accommodate the live loading condition.
 5. Foundation walls of buildings shall not be used as detention basin retaining walls. The distance between the top of any retaining wall in a detention area and any adjacent sidewalk, roadway curb or structured feature is to be a minimum of three times the height of the wall. The horizontal distance to any maintenance access drive not used as a sidewalk or roadway shall be at least four feet.
 6. Any future outfalls to the pond shall be designed and constructed with the detention basin. This reduces the likelihood of disturbing the retaining walls when constructing the “future” outfall.
 7. Perimeter fencing to limit access, safety railing, or guardrail may be required depending upon the location of the wall relative to roadways, parking areas and pedestrian use areas.
 8. A Professional Engineer licensed in the State of Colorado shall perform a structural analysis and design the retaining wall for the various loading conditions the wall may encounter, including the hydrostatic pressure differential between the front and the back of the wall and live loading conditions, if applicable. A drain system should be considered behind the wall to ensure that hydrostatic pressures are equalized as the water level changes in the pond.
 9. The wall design and calculations shall be stamped by the professional engineer and submitted to the Town’s Building Division for review. The design details and requirements for the retaining wall(s) shall be included in the construction drawings.
 10. Retaining walls shall not be used within the limits of any impermeable lining of water quality basins or detention basins.
- O. Landscaping Guidelines
1. Integration of detention and site landscaping requirements is encouraged. Refer to Chapter 800 for more complete landscaping requirements in the Town of Mead.
 2. The landscaping guidelines below shall be followed to provide a detention facility that blends with the site, is attractive, and well vegetated.
 - a. It is recommended to involve a landscape architect in the design of detention facilities to provide input regarding layout, grading, and the vegetation plan.
 - b. Create a basin with a pleasing, natural shape that is characterized by variation in the top, toe, and slopes of banks.
 - c. Grass selection and plant materials are key in softening the appearance of a detention area and blend it in with the surrounding landscaping and natural features. Species

Town of Mead Design Standards and Construction Specifications

are to be suitable for the hydrologic conditions in the basin; with wetland or riparian species selected for the bottom areas subject to frequent and prolonged inundation. Bluegrass rarely works well in the lowest, water quality portion of a basin. Guidelines for revegetation, along with recommended seed mixes, are provided in the USDCM.

- d. Multipurpose detention facilities are encouraged with recreation activities such as passive open space areas, pedestrian paths, children's play areas, and active recreation areas. It is recommended that active recreation facilities be located above the 2-year water surface to avoid frequent inundation.
- e. To reduce the potential for clogging of debris grates, no straw mulch shall be used within the zone of the EURV of a detention basin. Instead, erosion control blanket shall be installed for a width of at least 6-feet on either side of concrete low flow channels or up to a depth of 1-foot in soil riprap or benched low flow channels.
- f. Trees shall not be planted within the zone of the EURV. Trees such as Cottonwood, Willow, and Aspen shall not be planted within the 100-year water surface of a detention basin to avoid nuisance spreading of root systems within the facility.

P. Signage

1. Appropriate warning signage shall be provided for each detention facility. All signs shall be fabricated using red lettering on a white background.
 - a. Outlet Modification Sign: A sign, with a minimum area of 0.75-square feet shall be attached to the outlet or positioned nearby with the following message:

WARNING

UNAUTHORIZED MODIFICATION OF
THIS OUTLET IS A TOWN OF MEAD
CODE VIOLATION

- b. Flood Hazard Warning Signs: Two signs, each with a minimum area of 3-square feet shall be provided around the perimeter of the pond with the following message:

WARNING

THIS AREA IS A STORMWATER
FACILITY AND IS SUBJECT TO
PERIODIC FLOODING

Q. Easement Requirements

1. Drainage easements shall be granted to the Town for inspection and maintenance purposes, and shall be shown on the drainage plan, site plan, final plat and construction plans.
2. Drainage easements shall be kept clear of obstructions to the flow and shall allow maintenance access.
3. The minimum requirements for detention basin easements are as required to contain storage and WQCV including freeboard, associated facilities, and adequate maintenance access around the perimeter based on any access road width. Access to the basin shall be provided in an easement.

R. Maintenance

1. The property owner, or other party as otherwise designated by agreement or plat, is responsible for the maintenance of detention facilities.

Town of Mead Design Standards and Construction Specifications

2. Routine maintenance of detention basins shall include sediment and debris removal. Non-routine maintenance may include the repair and/or replacement of outlet structures, trickle channel, outlet pipes, channel slopes, and other related facilities. When appropriate maintenance is not provided, the Town shall provide the necessary maintenance and assess the associated cost to the property owner.
- S. Design Standards for Parking Lot Detention
1. Easement Requirements

Easements shall include the area of the parking lot that is inundated by the 100-year water surface elevation, and the outlet structure and conveyance facilities.
 2. Maintenance Requirements

Maintenance of parking lot detention basins and facilities shall be provided in accordance with the Maintenance paragraphs above. The property owner shall be required to ensure that the release structures are maintained.
 3. Depth Limitation
 - a. The maximum allowable design depth above pavement surfaces for the EURV is 3-inches and for the 100-year flood is 9-inches. However, to account for future overlays or parking lot resurfacing, the design volumes shall be attained even with an assumed 2-inch overlay (translating to an allowable depth of 1-inch for the EURV and 7-inches for the 100-year event).
 - b. The WQCV shall be located entirely out of (below) the pavement area, possibly in one or more landscaped parking islands or adjacent landscaping. An emergency spillway sized for the 100-year inflow peak shall be provided with a crest set at the 100-year water surface elevation and a maximum flow depth over the emergency spillway of 6-inches. A minimum of 1.0-foot of freeboard is required above the 100-year emergency water surface to the first-floor elevation of any adjacent structures (equivalent to 18-inches over the 100-year water surface).
 4. Outlet Configuration

The outlet configuration shall be designed in accordance with criteria shown in Volume 3 of the USDCM. Outlets for the EURV and 100-year events shall limit peak flows to the maximum design release rates.
 5. Signage
 - a. Appropriate warning signage shall be provided for parking lot detention. All signs shall be fabricated using red lettering on a white background.
 - i. Outlet Modification Sign: A sign, with a minimum area of 0.75-square feet shall be attached to the outlet or positioned nearby with the following message:

WARNING
UNAUTHORIZED MODIFICATION OF
THIS OUTLET IS A TOWN OF MEAD
CODE VIOLATION
 - ii. Flood Hazard Warning Signs: Two signs shall be provided identifying the detention pond area. Each sign shall have a minimum area of 1.5-square feet with the following message:

WARNING

Town of Mead Design Standards and Construction Specifications

THIS AREA IS USED FOR
STORMWATER DETENTION
AND IS SUBJECT TO PERIODIC
FLOODING TO A DEPTH OF 9-
INCHES OR MORE.

- b. Any suitable materials and geometry of the sign are permissible, subject to approval by the Town. The property owner shall be responsible to ensure that the signs are provided and maintained at all times.

T. Retention Criteria

1. Retention facilities are not allowed in the Town of Mead without the issuance of a variance. To obtain a variance, the applicant must provide a letter of variance addressed to the Town Engineer stating the need for the variance request. The letter shall include the following.
 - a. A statement of understanding of the Town of Mead Standards and Specifications (i.e., detention is required and deviations from the Town Code require a variance).
 - b. A statement acknowledging and agreeing that the intention of the Town Standards and Specifications is to reduce impacts of development on neighboring downstream properties by reducing stormwater flows from the development.
 - c. A statement clearly identifying why detention on the proposed site is not possible and why it is not possible to meet the Town Code.
 - d. A specific request for a variance.
 - e. A brief but specific discussion of the proposed alternative.
 - f. A statement acknowledging that the variance request is not precedent-setting and is based on site- specific constraints.
 - g. A dated letter of support from a registered professional engineer licensed in the State of Colorado, stamped and signed by said engineer, detailing the proposed alternative to current code design standards and outlining the new approach from the engineer's perspective.
2. Retention facilities must be designed to contain 1.5 times the volume of the runoff generated by the 24- hour, 100-year storm plus 1 foot of freeboard.
3. The design of the retention facility must include an emergency spillway and must show that a spill will not adversely impact downstream properties or residences. The spillway must be designed in accordance with the detention pond spillway requirements.
4. The retention pond embankments should be 4:1 or flatter to facilitate maintenance. Retention ponds cannot be placed in the FEMA mapped 100-year floodplain.
5. An operations and maintenance manual for the retention facility and associated infrastructure must be developed and included with the final stormwater report.
6. The design of the retention facility must provide evidence that the pond will drain through the bottom (sides slopes cannot be used in calculation) in less than 72 hours. A retention pond that does not drain in less than 72 hours, can cause injury to water rights, or is in violation of state or federal law will not be approved.

U. Erosion Protection Design Criteria

Erosion protection for storage facilities needs to be designed to ensure that the sediment does not leave the site or impact downstream properties. It may be necessary to install straw bales, riprap, erosion control logs, erosion control blankets, etc. on the storage facility side slopes to

Town of Mead Design Standards and Construction Specifications

ensure that erosion does not occur until the reseeded vegetation is established. The BMPs outlined in the USDCM (Volume 3) should be used.

602.10 Revegetation

- A. Site Preparation (see also Chapter 800)
 - 1. In addition to the site preparation guidelines outlined in the revegetation chapter of the USDCM (Volume 2), an inventory of existing vegetation should be taken before any revegetation work is started. If noxious weeds exist on-site, the appropriate steps need to be taken before, during, and after work is completed to control their spread.
 - 2. If soil amendments are needed, recommendations outlined in the revegetation chapter of the USDCM (Volume 2) should be followed.
- B. Seeding and Planting
 - 1. In addition to the site preparation guidelines outlined in the revegetation chapter of the USDCM (Volume 2), seed mixtures should be coated with Mycorrhiza at the rate of 2 pounds per acre at the time of seeding. If mulching with straw, the straw must be free of seeds and weeds.

602.11 Stormwater Quality

- A. General
 - 1. Post construction water quality best management practices (Permanent BMPs) are required with all new development or redevelopment within the Town. The Town also recommends stormwater quality and peak flow reduction practices associated with minimizing directly connected impervious area (MDCIA).
 - 2. Best management practices that provide water quality capture volume (WQCV) will be required for the excess runoff that remains after the volume reduction practices are accounted for.
 - 3. Common WQCV BMPs are porous pavement detention, porous landscape detention, extended detention basins, sand filter extended detention basins, and constructed wetland basins.
 - 4. Issues associated with the long-term maintenance of permanent BMPs must be considered when selecting appropriate BMPs for a site. Implementation of water quality BMPs must be addressed hand in hand with the stormwater conveyance and detention storage facilities. Consult USDCM (Volume 3) and the criteria in this manual for detailed design requirements, considerations, limitations, and information regarding proper implementation.
- B. Sediment and Erosion Control Plans
 - 1. Construction sites must have a sediment and erosion control plan showing the location and type of all BMPs deployed at the project. A copy of the plan must be kept on-site, along with a copy of the Storm Water Management Plan (SWMP). Changes to the sediment and erosion control plan and BMPs are allowed as construction and site stabilization progress; notes on the drawing set should show revisions and the dates of each revision
 - 2. Storm Water Management Plan requirements are included in Chapter 200 of these Standards and Specifications.

Town of Mead Design Standards and Construction Specifications

602.12 Best Management Practices

- A. The Town of Mead uses the BMPs that are outlined in the best management practices chapter of the USDCM (Volume 3). The AutoCAD files for the BMPs can be downloaded from the MHFD website.
- B. The applicant/design engineer is encouraged to use the spreadsheets and programs provided by the MHFD to assist in designing the BMPs. Other software programs may be used, but the designs shall be verified using the MHFD programs and spreadsheets. The most current version of the MHFD spreadsheets can be downloaded from the MHFD website.
- C. BMP technology is constantly changing. The Town will evaluate the use of newly developed BMPs on a case-by-case basis when complete documentation of all assumptions is provided. The Town reserves the right to review alternative methods and compare with other commonly used approaches, including those discussed in the USDCM.

602.13 FEMA Floodplain Requirements

- A. General Information
 1. For more information regarding floodplain regulations, refer to the 2011 Colorado Water Conservation Board (CWCB) Rules and Regulations for Regulatory Floodplains in Colorado; and 44CFR 59, 60, and 65 of the FEMA NFIP regulations.
 2. For more information regarding floodplain modeling and mapping requirements, refer to FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners.
- B. FEMA Floodplains
- C. Refer to the Flood Insurance Rate Maps (FIRMs) and Flood Boundary and Floodway Maps that are published by FEMA to determine if a proposed project is located within a mapped floodplain. The floodplain maps can be obtained from FEMA. The Town Engineer or Town Floodplain Manager should be contacted to determine if there have been any letters of map change that have been approved by FEMA for the proposed project area.
- D. Floodplain Requirements
 1. All development as defined by FEMA requires a Flood Hazard Development Permit from The Town. A copy of the application can be requested from the Town Engineer or Town Floodplain Manager.
 2. The regulations and definitions for floodplain development can be found in Part 44CFR 59, 60, and 65 of the Code of Federal Regulations; and the 2011 CWCB Rules and Regulations for Regulatory Floodplains in Colorado.
 3. Hydraulic modeling is required for the majority of Flood Hazard Development Permit applications. The modeling must conform to the standards outlined in FEMA's guidelines and specifications and must show compliance with the various floodplain regulations. In areas where there is a FEMA-approved model, the hydraulic model must contain the current effective model, a duplicate effective model, a corrected effective model, and the proposed conditions model. In areas where there is not a FEMA-approved model, the hydraulic model must contain the existing condition model and proposed condition model. A 0.5-foot floodway model is required for all sites where a FEMA-approved floodway has not been established. All hydraulic modeling must be certified by a registered professional engineer licensed in the State of Colorado.
 4. All hydraulic models that are related to a LOMR or Physical Map Revision (PMR) must tie to a logical hydraulic control at the downstream and upstream ends of the model. It is not sufficient to start and stop the hydraulic modeling at the project boundaries.

Town of Mead Design Standards and Construction Specifications

5. A narrative outlining the modeling parameters used must be included with the Flood Hazard Development Permit application. The narrative must include a comparison of the current effective, duplicate effective, corrected effective, and proposed condition water surface elevations and floodplain top widths. The narrative must address how the warnings, errors, and notes statements generated by the hydraulic model were handled. The narrative must be stamped, signed, and dated by a registered professional engineer licensed in the State of Colorado.
6. A work map or Flood Hazard Development Permit map must be submitted with the hydraulic modeling. In addition to the information outlined in the Flood Hazard Development Permit application, the map must include the FEMA floodplain boundaries, the floodplain boundaries generated by the hydraulic modeling, cross section lines, and any proposed structures. The map must be provided at a common map scale on an 11" x 17" or 24" x 36" sheet. The floodplain top width shown on the map will be compared to the hydraulic model floodplain top width. If the difference between the two is greater than 5% of the FIRM scale, comments to review and revise the submittal will be made. The map must be stamped, signed, and dated by a registered professional engineer licensed in the State of Colorado.
7. If structures are proposed in the Flood Hazard Development Permit, elevation certificates for the proposed, under construction, and as-built conditions will be required. The proposed condition elevation certificate can be stamped, signed, and dated by a registered professional engineer licensed in the State of Colorado. The under-construction and as-built condition elevation certificates must be stamped, signed, and dated by a registered professional land surveyor licensed in the State of Colorado. Photos of the structure must be included with the under-construction and as-built elevation certificates.
8. Residential structures must be elevated a minimum of 1 foot above the base flood elevation. Commercial structures must be elevated or dry floodproofed a minimum of 1 foot above the base flood elevation. Critical facilities as defined by the CWCB must be elevated or dry floodproofed a minimum of 2 feet above the base flood elevation.
9. Structures that can float—such as fuel tanks, tank batteries, storage sheds, and the like—must be anchored. The anchoring design must be certified by a registered professional engineer licensed in the State of Colorado. Photos of the anchored structure will be required.
10. Non-habitable structures such as barns and large storage sheds can be flood vented using the FEMA requirements. If engineered flood vents are used, a registered professional engineer licensed in the State of Colorado must certify them. Photos of the flood vents will be required.

602.14 Future Connections

- A. The end of a service stub-out shall be marked in the field with a painted brown carsonite composite utility marker reaching no less than four (4) feet above finished grade and labeled with the size and material of the storm pipe extension.

603 CONSTRUCTION SPECIFICATIONS

603.1 General

- A. All Storm Sewer Construction shall be completed in accordance with the Construction Specifications included in Appendix A.

Town of Mead Design Standards and Construction Specifications

604 STORM DETAILS

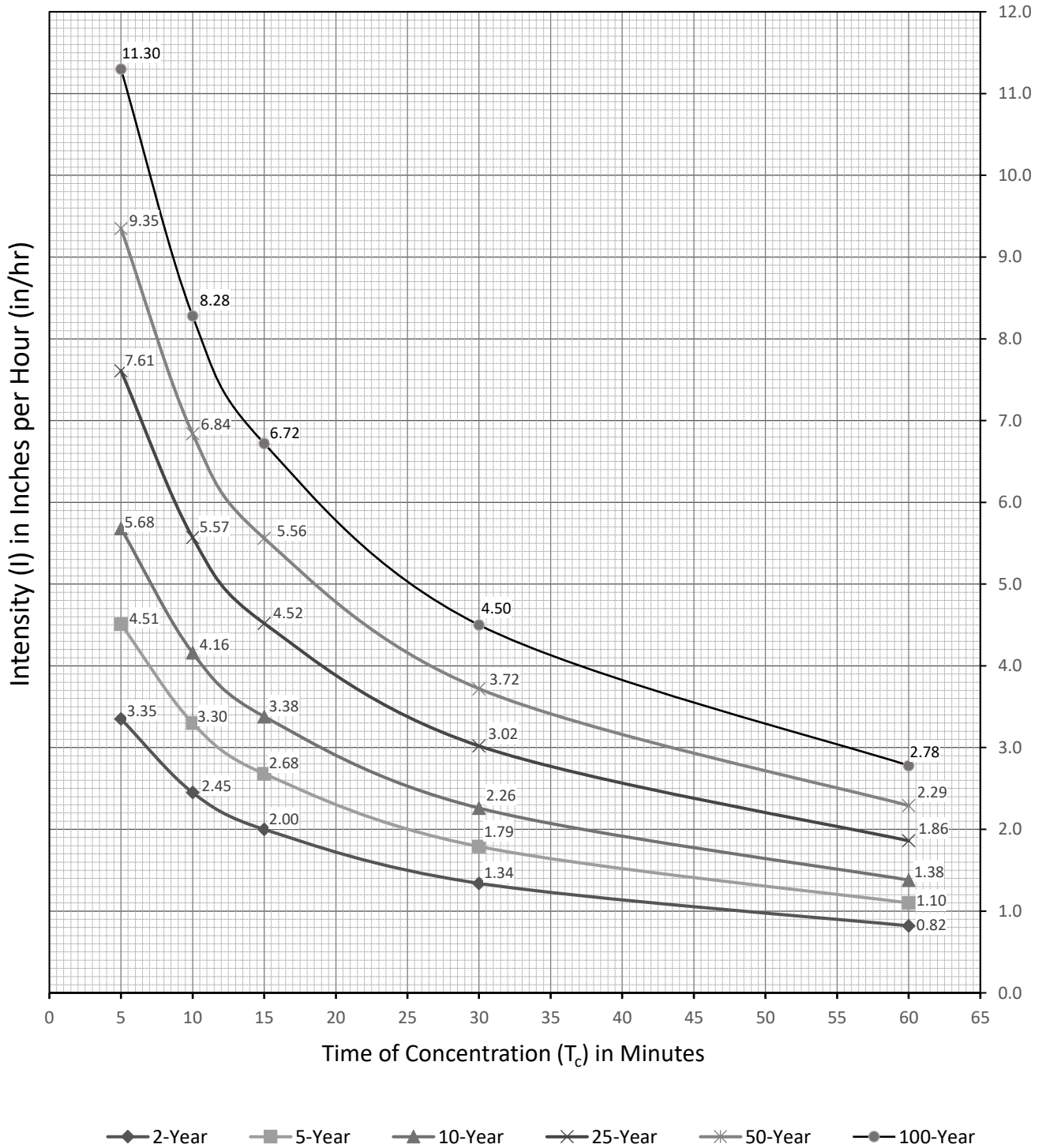
A. The following is a list of standard details for storm sewer work that are part of the Town of Mead Design Standards and Construction Specifications:

D6.01A	Storm Manhole
D6.01B	Storm Manhole Ring and Cover
D6.02	Storm Cleanout
D6.03	Storm Sewer Bedding Detail
D6.04A	CMP Type 1 Flared End Section
D6.04B	RCP Flared End Section
D6.05	Rip Rap Flared End Section
D6.06	Type C Inlet
D6.07a	Combination Inlet (1 of 2)
D6.07b	Combination Inlet (2 of 2)
D6.08	Direct Connection RCP To PVC Connection
D6.9a	Valley Inlet (CDOT Type 13) (1 of 2)
D6.9b	Valley Inlet (CDOT Type 13) (2 of 2)
D6.10a	Type R Curb Inlet (1 of 3)
D6.10b	Type R Curb Inlet (2 of 3)
D6.10c	Type R Curb Inlet (3 of 3)
D6.11	Small Pipe Headwall
D6.12	Headwall with Circular Pipe
D6.13	Storm Utility Marker Post

Town of Mead Design Standards and Construction Specifications

Figure 600- 1:

Figure 600-1 Town of Mead - Intensity-Duration-Frequency Curves



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Town of Mead Design Standards and Construction Specifications

CHAPTER 700 DRY AND NON-TOWN UTILITIES

701 GENERAL PROVISIONS

701.1 General

- A. This chapter sets forth the criteria and location requirements for all dry utilities, such as: power (electric and natural gas), phone, CATV, traffic signals and mailboxes, within the right-of-way and/or public utility easements. The appropriate utility and the Town of Mead utility department shall determine all final alignments of utilities.

701.2 Design Standards

A. Minimum Depth

1. All utilities shall be located at least 2 feet below the scarified subgrade elevation, unless specifically approved to be less by the Town Engineer. Greater depth of cover may be specified by the Town Engineer.

B. Access Covers

1. Clearance: All manhole lids, utility access covers, and range box access covers shall be flush with the roadway finished surface or depressed no more than 1/2 inch below the finished surface. If located in concrete, all access covers shall be set flush with surrounding concrete.
2. Wheel Path: Manholes or valves shall not be designed or constructed in the Wheel Path of the travel lane or at any location within a bike lane.
3. Location: Manhole, water valve or other utility access covers and lids shall not be located in the flowline of curbs or crosspans. Manholes and water valve covers shall be located more than 4 feet away from the curb or crosspan.

C. Trees and Large Shrubs Prohibited Over or Near Utilities

1. Buried Utilities: Trees, berms or large shrubs shall not be placed over buried utilities. Additional horizontal clearances from the trunk of any tree or shrub to any buried utility may be required by the Town Engineer.
2. Overhead Utilities: Trees should not be planted under overhead power lines when mature growth of the tree would come within 10 feet of the power lines.

D. Use of PVC Sleeves by Franchised and Private Utilities

1. It is the intent of these standards to reduce the amount of open cuts in the roadway. Therefore, franchised and private utility companies shall install all utilities within a non-corrosive sleeve equivalent to Schedule 40 PVC or other sleeves encased in concrete, slurry or flow-fill material, across all public streets to accommodate future repairs without street cuts.
2. Exceptions: Steel gas line street crossings will not require sleeves.
3. Depth: Sleeves shall be installed at a minimum depth of 36 inches from the top of the pipe to the top of pavement or 24 inches from the top of pipe to the top of subgrade, whichever is greater.
4. Locations: Sleeves shall be located within 15 feet of the parallel gutter flowline of the existing street and shall be coordinated with other utilities. All sleeve locations shall be marked appropriately in the field either by marking the concrete curb or providing

Town of Mead Design Standards and Construction Specifications

permanent stakes. Sleeves shall be separated for existing buried utilities in accordance with the utility owner requirements. Ten feet of separation is typically preferred.

5. **Extra Sleeves:** Extra PVC sleeves may be required on Collector or Arterial intersections for future traffic signalization or future utilities.

E. Mailboxes

1. Mailbox clusters must be installed a minimum of 2 feet from back of walk and not cause any sight obstruction. Mailboxes must not pose a fixed object hazard for vehicles and pedestrians.

F. Poles

1. **Location:** Poles, signs, and any other above ground streetscape (except regulatory signs) should be located within 5 feet of the right-of-way line or 10 feet from the travel lane (flowline), whichever is most restrictive.
2. **Clearance:** Light poles shall be placed no closer to the roadway than 2 feet behind a vertical curb line and no closer than 2 feet to any sidewalk.
3. **Pole Requirements:** The Town Engineer may require breakaway poles on public right-of-way where speed limit is 40 m.p.h. or higher. Refer to **CDOT Roadway Design Manual, Section 1002.6, Specifications.**
4. **Engineer Approval:** All poles within the public right-of-way must be accepted by the Town Engineer prior to the permit application for installation.

Town of Mead Design Standards and Construction Specifications

CHAPTER 800 LANDSCAPING, PARKS AND TRAILS

801 Regulated Areas and Development Process

801.1 General

- A. All arterial right-of-way, designated greenways, HWY 66 Scenic Entry Corridor, common open space or other areas owned by the Town, including detention pond areas, shall comply with these specifications, the approved plans and the terms and provisions in applicable agreement(s).
 - 1. Areas owned and not maintained by the Town shall conform to these Standards and Specifications, however, certain exceptions may be made on a case-by-case basis through approval by the Town.
 - 2. Trees designated for saving or protection in a site plan, construction plan, or a tree preservation plan approved by the Town, regardless of their location in publicly dedicated land or private property, shall be protected per the applicable criteria.
- B. Arterial rights-of-way, designated greenways, the HWY 66 Scenic Entry Corridor, park sites, and other areas owned by the Town, and private common open space and other privately maintained development areas shall also conform to the Town Municipal Code and the Town of Mead Comprehensive Plan.
- C. Consideration is to be given to provide for uniformity and proper alignment of concrete paths and associated landscaping within the regulated areas. Intersections, concrete path alignment and landscaping shall provide for safety and maintenance considerations.
- D. Any deviation in layout of the irrigation system, concrete path, or landscaping from the approved construction plans shall be reviewed and approved by the Town staff prior to installation. If modifications are extensive, plan re-submittal and approval will be required. For minor modifications, per Town determination, correction on as-built drawings may be sufficient. Determination on modification type shall be determined by Town staff.
- E. Landscape plans shall be included as part of the overall construction plans for the phase of construction associated per applicable agreement and/or phasing plan.
- F. Additional plan design criteria and plan information as relevant shall be included per each subsection of these Standards and Specifications.
- G. The Town will consider variances to Town Standards in an effort to reduce water consumption in arterial rights-of-way. The Public Works Department recommends reducing turf area by use of low water native turf and/or increasing the size of shrub beds or using sub-surface irrigation in turf areas. Subsurface irrigation is only advised in areas without extensive buried utilities.
 - 1. Untreated (raw) water sources for irrigation systems will be used when available.
- H. Reference current Open Space Parks and Trails Master Plan for additional information and requirements.

801.2 Plan Requirements

- A. Concept Plans. A concept plan shall be submitted for all annexations into the Town or as requested for a specific development. Plans shall include the following information regarding landscape improvements as a minimum:
 - 1. Plan delineation showing parks, designated greenways, arterial rights-of-way and HWY 66 Scenic Entry Corridor as adopted per the most recent update of the Town of Mead Area Comprehensive Plan. Town Landscape Regulations shall define requirements of each

Town of Mead Design Standards and Construction Specifications

designated area. Plan shall be consistent with requirements outlined in Landscape Regulations.

- a. Plan to be at a scale no smaller than 1"=200'.
 - b. Existing trees with general species and size defined.
 - c. Delineation of wetlands or other sensitive habitats with areas defined by a qualified ecological report. Wetlands shall be noted as to whether they are considered jurisdictional waters of the United States by US Corps of Engineers regulations.
 - d. Existing topography showing two (2) foot contour intervals.
 - e. All existing water bodies including ditches, streams, ponds, or other significant occurrences.
 - f. Notation as to areas that will be designated as common open space and their proposed widths, lengths and areas.
2. Typical cross-sections for relevant designated greenways and arterial streets expressing intended conceptual improvements.
 - a. Cross-sections to be at a scale no smaller than 1"=20'.
 - b. Width of area as proposed, shown with right-of-way line, curbing or ditch centerline and 100-year floodplain boundary line. Location of concrete path with distance from right-of-way line to be defined.
 - c. Typical landscape design concepts, including plant clustering, buffers and other features described.
 3. Notes to be placed on the plan that read as follows as relevant to the development:
 - a. Designated greenways shall be dedicated to the Town at the time of final platting and shall be constructed by the developer according to Town landscape regulations requirements in effect at the time of construction. Arterial rights-of-way shall be dedicated to the Town at the time of final platting and shall be constructed by the developer according to applicable Town requirements in effect at the time of construction. Public improvements shall be completed in accordance with the Municipal Code.
- B. Preliminary Plat/Site Plan/Development Plans - A preliminary landscape plan shall be submitted as required by the Town Land Use Code. Plans shall include all of the information from the Concept Plan and the following general information as a minimum (also see requirements under each sub-section of this chapter):
1. Scale of drawings at 1"=50' or larger. North arrows, scale, street names and other standard plan notations to be shown.
 2. Existing plant materials identified on the plans showing their location as surveyed, tree size measured at four and one half (4 ½) feet above adjacent grade, species and condition or health. Also, it should be indicated if the trees/shrubs are to remain or be removed as part of the site development.
 - a. A site visit with the Town Planner is encouraged at this time to determine tree removal or saving status.
 3. Preliminary grading concept showing berming or land forms. Contours should be shown at two-foot intervals.
 4. Preliminary landscape plan showing plant groupings, general plant type (deciduous, ornamental or coniferous trees); shrub beds; flower beds; water features; concrete paths or walkways, fences, live ground covers or mulch areas, and other unique features.

Town of Mead Design Standards and Construction Specifications

5. List of suggested plant species for each type of plant material shown on the plan.
6. Delineation of regulated areas per Landscape Regulations including designated greenways, park sites, arterial rights-of-way, buffer areas, and common open space and HWY 66 scenic entry corridor. Each area to be identified in terms of total length (excluding road crossings), width (minimum, maximum and typical), and square footage of each type area (primary greenway, arterial ROW, etc.).
7. Details or cross sections of each regulated area with a typical landscape treatment described. Scale of detail or section to be 1"=20' scale or larger.
8. Plan notes that include the following (also see specific notes per each sub-section of this chapter):
 - a. A design intent statement that clarifies in general terms the proposed landscape treatment.
 - b. A maintenance obligation statement that clarifies for each individual area, the responsible entity for on-going maintenance. Include clarification for arterial rights-of-way, designated greenways, on-site improvements (common open space), detention ponds and HWY 66 scenic entry corridor.
 - c. A development obligation statement that clarifies the responsibility of the developer to install landscaping and irrigation according to the most current Landscape Regulations and Standards and Specifications in effect at the time of construction.
 - d. A statement, as relevant, that clarifies the obligation of the developer to prune any existing trees within the project limits, if they are to remain, according to Town Standards and under the direction of the Town Engineer.
 - e. A statement describing landscape and irrigation tap sizes and locations.
- C. Construction Plans and/or Final Site Plans - A final plan shall be submitted as required by the Town Land Use Code. Plans shall include all of the information required for construction plans and the following information as a minimum (also see requirements under each sub-section of this chapter):
 1. Scale of drawings at 1"=20' or larger. North arrows, scale, street names and other standard plan notations to be shown.
 - a. Only areas owned by the Town need have plans at this scale. Common open space or other non-regulated areas can vary from this scale requirement provided sufficient detail and clarity can be illustrated at the different scale.
 2. Final grading concept showing berming or land forms. Existing and proposed contours are to be shown at a one (1) foot contour interval. Illustrate floodplain boundary definition showing 100-year floodplain boundary and a line representing 10% of 100-year floodplain for relevant areas.
 3. Final landscape plan showing individual plant layout at 2/3 mature size, specific plant species for each plant as identified by a key that relates to a full landscape schedule showing key, quantity per species, botanical name, common name, size and condition purchased (e.g., balled & burlapped/B&B, and mature height and spread etc.). Separate landscape schedule to be provided for each regulated area: common open space areas, arterial right-of-way, designated greenway, etc. Also show and include general dimensions for all water features with specific notation as to type; concrete paths or walkways, fences, and other unique features.

Town of Mead Design Standards and Construction Specifications

4. All existing and proposed utilities and their associated easements, graphically shown in their correct alignment and labeled as existing or proposed; underground or overhead, and with dimensions describing the width of the easements.
 5. A chart showing the following for each separate regulated area:
 - a. Total length, width (minimum, maximum and typical), square footage, and acreage of each area (designated greenway, arterial right of way, common open space, etc).
 - b. Total number of required trees and shrubs for each area, per current Landscape Regulations.
 - c. Proposed number of trees and shrubs for each area.
 - d. Square footage of shrub beds for each area.
 - e. Square footage of each different turf type for each area.
 - f. Length of concrete path for each area.
 - g. Square footage of any buildings located in each area (as applicable).
 6. Plan notes that include the following (also see specific note under each sub-section of this chapter).
 - a. A statement that indicates if potable water is to be used as a source for irrigation systems and, if so, the tap and backflow prevention device size and location.
 - b. Location of landscape material shall be altered to provide adequate clearance from the final location of the electric distribution facilities to the satisfaction of appropriate utility owner.
- D. Public Improvement/Common Open Space Plans - Shall be submitted as required by the Town Land Use Code in the same plan set as other public improvements. However, landscaping and irrigation designs for common open space areas are to be shown on separate sheets and with separate calculations from Town owned areas. Generally, construction plans shall be required for all public improvement plan submittals. Plans shall include all information required for Final Plans and include the following information as a minimum:
1. Scale of drawings at 1"=20' or larger. North arrows, scale, street names and other standard plan notations to be shown. As these plans will be used for construction as-built drawings, clear drafting notations and professional quality mapping will be required. All plans including multi-sheet sets shall include original key clarifying where each sheet lies in overall development.
 2. Final irrigation plan for public areas, common open space and detention ponds showing all equipment, layout, pipe sizing, sleeves, equipment legend and notes to clearly indicate components and construction. Tap location, meter pit assembly, controller, electrical service, valves and other locations as relevant shall be clearly indicated.
 - a. Irrigation plans shall be required at a scale of 1"=20' or larger. Variances to this requirement may be made for long linear areas that will be irrigated with large rotor zones. Specific approval by staff is required before plans are submitted
 - b. A chart listing the number of zones and the number of heads per each zone shall be included on all irrigation plans. Chart to be included for publicly owned and/or maintained areas and a separate chart for common open space areas.
 - c. Areas with temporary irrigation systems should be noted on the plans, as necessary. Sufficient information should be provided on the plans in order for the Town to determine that temporary irrigation is appropriate, including proposed methods and frequency of watering.

Town of Mead Design Standards and Construction Specifications

- d. The following plan notes are required on the irrigation plans for all common open space:

All mainline and lateral piping shall be Class 200 PVC.

 - i. The number of stations on the controllers shall include two extra stations for possible future use. Controller box shall be weather tight and vandal resistant with locking exterior disconnect.
 - ii. Check valves are required in all heads.
 - iii. Polyethylene Drip Pipe shall be weather and UV resistant, NSF approved and SDR pressure rated. Blue stripe or White stripe drip pipe is preferred. Soaker hose is not permitted.
 - iv. All irrigation taps and electric services are to have an address and building permit before installation.
 - v. All piping shall be buried a minimum of eighteen (18) inches.
 - vi. All piping shall be sleeved where located under paved surfaces. Electric wiring shall be sleeved separately from piping. Pipe sleeve sizes shall be two (2) sizes larger than the diameter of the pipe being sleeved and wire sleeves shall be a minimum of two (2) inches in diameter. All sleeves shall be marked with a "V" chiseled into the concrete curb or other paved surface it crosses under.
 - vii. Three (3) spare electrical wires shall be extended to each end of the mainline. The wires shall be looped in each valve box (eighteen (18) inch minimum loop) for possible future use.
 - viii. Head-to-head coverage is to be provided to all seeded and sodded areas.
 - ix. Drip irrigation shall be provided for all trees and shrubs located in shrub beds and in all native seeded areas (even those areas approved for temporary irrigation for native seed). Trees located in irrigated turf areas shall not receive drip. Drain valves shall be included at the end of each drip lateral pipe.
3. Plan notes that include the following (see specific sub-sections of this chapter for additional note requirements):
 - a. It is the responsibility of the developer and their Contractors to build the project according to approved plans and Town details and in accordance with current Town Standards and Specifications. Field changes to these plans are to be approved by the Town staff prior to any work. Field conditions that conflict with or jeopardize the longevity of the proposed improvements shall be brought to the attention of the Town staff for resolution. Failure to bring such matters to the Town's attention or to obtain approval of remedial measures will in no way relieve the Contractor of their obligation to resolve the matter to the satisfaction of the Town staff.
 - b. It shall be the Contractor's responsibility to schedule a Pre-Construction meeting with the Town Engineer and inspectors prior to any work commencement for publicly owned and HOA owned common open space landscaped areas. Clarification will be given at this meeting on inspector contacts. Failure to schedule this meeting or perform necessary field inspections during the course of construction shall in no way relieve the Contractor of any obligations, performance standards or construction specifications as outlined in the Town of Mead Standards and Specifications. Any work that proceeds without the approved Town inspections shall be corrected at no cost to the Town.
 - c. It shall be the responsibility of the developer/contractor to build the project in a time frame necessary to obtain Conditional Acceptance and Final Acceptance during the growing season.

Town of Mead Design Standards and Construction Specifications

- d. It is the responsibility of the Contractor to have a copy of the most current Town Standards and Specifications on site at all times. All improvements within the publicly owned and commonly-owned areas shall be installed per these standards and details. The standards shall be available to the Contractor at all site meetings/inspections. Any work that proceeds within designated greenways, common open space, HWY 66 scenic entry corridor or right-of-way that does not adhere to current Standards and Specifications and/or without the approved Town inspections shall be corrected at no cost to the Town.
- e. Landscape and irrigation improvements shall not be installed prior to all utility construction.
- f. A statement that clarifies mulch type, depth and type of permeable weed barrier underlayment.
- g. A statement that clarifies fence type, height, and materials. If applicable, include a note that clearly states that the fence and/ or signage is to be maintained by the homeowner's association, property owner or individual homeowner, as relevant to the project.
- h. For publicly owned and common open space areas including detention ponds, the following designer certification:

I certify this irrigation plan to be designed per current Town of Mead Standards and Specifications including the approved materials list, and that it was made under my supervision in accordance with Uniform Plumbing Code and Electric Code.

Design Company Name / Phone number Designer Signature /Title

Date

Notary
- i. An itemized cost estimate and an estimated completion date per phase for Town public improvements and common open space areas for landscaping, irrigation and associated concrete path. The estimate shall be itemized by area with the specific sizes for each area or quantity for each type of work provided.

801.3 Acceptance Process

- A. Conditional and final acceptance shall be conducted in accordance with Section 202 of these Standards and Specifications.
 - 1. Generally, between the months of November and April, Town inspectors will not be available to inspect the landscape portions of Development projects. If all other Town Divisions and Departments are able to approve Conditional Acceptance for other areas during the dormant season, a Partial Acceptance may be granted for weather dependent improvements. All landscape improvements shall be warrantied for a full two years after Conditional Acceptance. In the event that the developer and contractor is not able to obtain a full Conditional Acceptance from the Town for outstanding items prior to June 1, then a delay of the Final Acceptance for all public improvements may be required.
 - 2. Upon obtaining Conditional Acceptance, warranty and maintenance period by developer continues. (This section does not apply to Town capital improvement projects unless specifically stated in their bid documents.)
 - a. Maintain area in optimal condition for duration of period between Conditional Acceptance and Final Acceptance (two-year minimum).

Town of Mead Design Standards and Construction Specifications

- b. Make periodic adjustments to irrigation system to achieve most desirable application of water. Reduce watering as appropriate. Provide all necessary maintenance including mowing and fertilizing turf areas, wrapping/unwrapping trees (at beginning and end of dormant season), securing stakes and guys, restoring mulch areas, removing trash and debris, sweeping and removing snow or ice from walks, pruning broken limbs and replacing dead plant materials, weed control, erosion control, and repairing other damage as needed
- c. Maintenance shall insure optimal health and vigor of plant materials as needed to maintain specifications. Developer is responsible for all winterization or activation of irrigation system and other adjustments until Final Acceptance. Icing of walks due to irrigation water and/or seasonal conditions shall be immediately addressed by developer. Maximum allowable snow removal response time is twenty-four (24) hours.
- d. Final acceptance process in accordance with Section 202. A 15-day project work-through will take place where Town personnel, Homeowners Association, or the developer will be on-site to operate and inspect the irrigation system and landscaped areas. Schedule an irrigation operator's training session with Town personnel at the beginning of this project work-through period.
- e. The Town's Land Use Code and construction plans define responsibility of on-going maintenance.
 - i. The Town may provide a hard copy of irrigation as-built drawings to the party responsible for on-going maintenance after final acceptance and will retain a digital copy.
- f. At the Town's discretion, an extended warranty may be accepted for portions of a project that do not fully meet Town Standards and Specifications at the time of inspection, in order to facilitate Final Acceptance. Collateral for extended warranty periods in the form of an irrevocable letter of credit or cash deposit shall be required.
- g. Common Open Space Final Acceptance (including detention ponds). Landscape and irrigation improvements must be completed in order to grant Final Acceptance for a project, unless otherwise approved. At this time, the developer must provide digital (.pdf) and hard copy of landscape and irrigation as-built drawings with the following certification statements (inspection to follow receipt of as-built drawings):

Designer Certification:

I certify this irrigation system has been inspected and constructed per current Town of Mead Design Standards and Construction Specifications including approved materials list.

Design Company Name/Phone number

Designer Signature/Title

Date

Notary

Contractor Certification:

I certify this irrigation system was installed per current Town of Mead Design Standards and Construction Specifications including approved materials list, and that it was done under my supervision in accordance with Uniform Plumbing Code and Electric Code.

Construction Company Name/Phone Number

Contractor Signature/Title

Date

Town of Mead Design Standards and Construction Specifications

Notary

3. Prior to final acceptance, provide Town with tax payment certification for areas dedicated to the Town.

802 Trails, Concrete Paths, and Bridges

802.1 General Criteria

- A. Concrete paths in arterial rights-of-way, HWY 66 Scenic Entry Corridor, designated greenways, common open space, parks and other areas owned by Town, shall comply with all standards of the Town Standards and Specifications manual.
- B. Bridges may be required where crossings of a designated greenway waterway and arterial street are necessary to allow logical concrete path alignment. Bridges are to comply with this section of these Standards and Specifications.
- C. Concrete flatwork in common open space areas shall conform to these standards.
- D. All Sections as applicable shall also apply to all Town capital design and construction projects that reference these Standards. References to the “developer” in these Standards shall be considered references to the consultant or contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

802.2 Minimum Design Criteria

- A. A minimum eight (8) foot wide, minimum six (6) inch thick concrete path is to be provided along all arterial rights-of-way, HWY 66 Scenic Entry Corridor, designated greenways, and other areas as determined in cooperation with Town staff. There is to be a two (2) foot minimum clear zone adjacent to all concrete paths from any vertical object except where water or sanitary sewer maintenance access is needed. Variances from this minimum clear zone requirement may be given in those cases. A tool jointed concrete rumble strip may be used between the path and the vertical object where minimal ‘nuisance’ strips may result.
- B. Trails shall be provided within and surrounding open space areas and connecting open space areas. Trails shall be a minimum of eight (8) feet in width and shall be of concrete construction. A trail may be flanked on one (1) side by a soft surface path a minimum of four (4) feet in width. The soft surface path shall be constructed with a minimum depth of eight (8) inches of compressed gravel, crowned and compacted with edging to contain trail material.
- C. Regional trails shall be ten-foot-wide concrete surrounded by twenty (20) feet of soft surface trail. All trail locations and construction shall conform to the requirements contained within the Open Space Parks and Trails Master Plan.
- D. A ten (10) foot wide inside clear dimension is to be provided for all bridges in Town-owned areas and for all arterial street underpasses.
- E. Americans with Disabilities Act (ADA) and AASHTO standards are to be followed in the design of all concrete paths. A grade of not more than 1:20 shall be provided for all concrete paths and sidewalks.
 1. ADA guidelines allow for the following design grades for outdoor recreation trails. These requirements apply to designated greenway concrete. Please note that it is the responsibility of the developer to verify current ADA requirements and coordinate with the Town of Mead to clarify where ‘outdoor recreation trail’ standards may be applied.
 - a. 1:12 slope for no longer than two hundred (200) feet with no landings required.
 - b. 1:10 slope for no longer than thirty (30) feet with a five (5) foot landing at each end that does not exceed a 1:20 slope.

Town of Mead Design Standards and Construction Specifications

- c. 1:8 for no longer than ten (10) feet with a five (5) foot landing at each end that does not exceed a 1:20 slope.
- F. Concrete paths adjacent to slopes steeper than 4:1 shall have a six (6) foot minimum shoulder at +/- 2% slope on the downhill side of the path before the steeper slopes begin.
- G. Horizontal curves with fifty (50) foot minimum radius (fifty (50) foot minimum tangent sections between curves) is the desired guideline for all concrete paths. One hundred (100) foot radius is encouraged. An overly curvilinear concrete path is not encouraged.
 - 1. Curvilinear concrete paths may not be closer than six (6) feet from the back of curb.
- H. Vertical curves shall take into consideration the topography, drainage and ADA requirements and shall provide for safety of pedestrians and recreationalists. An overly "roller-coaster" treatment of concrete path alignment shall not be allowed.
- I. The concrete path shall be offset from the property line in such a manner as to provide the following:
 - 1. A detached concrete path.
 - 2. Width of tree lawns between concrete paths and curbs or other hard surfaces to be a minimum of eight (8) feet where canopy deciduous trees are used for ease of maintenance operations and long-term tree health. Canopy trees will not be allowed where tree lawns are less than eight (8) foot in width. Where available right-of-way width is insufficient for the required offset, variances may be allowed if landscape provisions are met, but will be restricted to ornamental or small tree canopy trees. In areas narrower than five (5) feet, depending on tree type, a root barrier may be required to prevent concrete path and/or curb heaving. See Approved Materials List – Tree Recommendations for suggested plantings.
 - 3. Optimally sized landscape areas on both sides of the concrete path within the right-of-way to allow for efficient irrigation and to eliminate nuisance strips – optimal shrub areas four (4) feet minimum and eight (8) feet preferred; optimal turf areas twelve (12) feet.
 - 4. Concrete path placement at the edge of the right-of-way where additional common open space is provided behind the right-of-way line. This layout will provide maximum separation between curbline and concrete path and also provide a visual definition of the boundary between private and public areas.
 - 5. Additional concrete flatwork is required where a detached concrete path becomes attached and where the detachment is two (2) feet or less in separation.
- J. Where greenway concrete paths intersect with local, collector or arterial streets, a stop sign shall be located at the intersection of the two traffic routes (facing the greenway route) and an intersection warning sign shall be placed one hundred (100) feet from the intersection along the greenway.
- K. Concrete path to be located out of the low flow channel and associated areas that contain 10% of the 100-year flow rate in large drainage basins, and low flow channel and associated areas that contain 5% of the 100-year flow rate in small drainage basins, as determined by the Town Public Works and Water Utilities Storm Drainage Division.
 - 1. Exceptions to this provision to be specifically requested with reason for non - compliance given.
- L. Bridge width ten (10) foot inside clear dimension between railings minimum), railing height to be 42"-54" above deck height, length and orientation if applicable. Riprap or other engineered abutment protection is required. Railings to be designed to meet AASHTO requirements.

Town of Mead Design Standards and Construction Specifications

Bridge to carry minimum uniform live load of sixty (60) pounds per square foot or one 10,000 pound vehicle load with 80% of load on rear wheels, unless Town maintenance vehicles exceeding this weight require access to this area. If jet trucks and other large vehicles require this bridge access, the specific weight of those larger vehicles will be the minimum live load requirements. Assume wind load of 0/25 psf on full height of bridge, as if enclosed. Shop drawings to be submitted for approval thirty (30) days prior to manufacture schedule.

1. Bridges to include railing to eliminate drop off areas at abutment or along approach pathways where needed. Railing to match bridge rails and accommodate turning movement of maintenance/emergency vehicles turning onto bridge.
2. Bridges in Town owned areas shall be located above 10% of the 100-year floodplain elevation unless larger flows are required by Town Engineer.
3. Each bridge shall have a safety sign attached to both ends of bridge. Signs shall not protrude into bridge or concrete path clearance zone.
4. A steel safety plate is to be mounted on the bridge deck as needed to fill gaps over one half ($\frac{1}{2}$) inch at abutment. Plate is to be mounted to bridge only and will slide over abutment with expansion movement of bridge. Plate is to run entire width of decking and extend onto abutment sufficiently to cover the gap completely. Plate edges to be beveled to lessen trip hazard or bump.
5. Site Furnishings: Site furnishings including trash containers on concrete pads and benches on concrete pads may be required for inclusion along designated greenways and common open space. Furnishings are required on a $\frac{1}{2}$ mile interval and may include other specific locations per Town staff.

802.3 Minimum Plan Information

- A. Location of concrete paths showing connections to other walkways and floodplain boundary lines delineated per these standards.
- B. Concrete path curve radii to be indicated on plans.
- C. On all plans, provide a Design Intent Statement that describes the location, width (eight (8) foot minimum), thickness (six (6) inch minimum) of the concrete path. In addition, a note should indicate compliance with the most current Town Standards and Specifications at the time of construction.

803 Grading and Fine Grading

803.1 General Criteria

- A. For Town-owned areas and common open space - soil fertility and texture tests conducted by the Colorado State University Soils Lab or other certified lab must be completed and submitted to the Town for review; recommendations in the lab reports shall be followed in all cases. Generally, this will include soil amendment and fertilizer recommendations; in some cases, all new topsoil will be required.
- B. This entire section shall also apply to all Town capital design and construction projects that reference these Standards. References to the "developer" in these Standards shall be considered references to the consultant or contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

803.2 Minimum Design Criteria

- A. Grades in all areas are to be designed to allow for proper drainage and ease of maintenance operations. Grass swales shall drain at a minimum slope of 2% (unless they are approved by the Town as part of a low impact design storm water quality system). Hard surface paths and

Town of Mead Design Standards and Construction Specifications

piping shall drain at a minimum slope of 1%. Berms and other slopes shall not exceed 4:1 for areas scheduled for irrigated and mowed turf. Berms and other slopes shall not exceed 3:1 for native grass areas (unmowed or mowed only during establishment), and for shrub beds. Retaining walls, riprap or other structures will be used to bring grades into conformance with these standards.

- B. Ditch embankments within designated greenways or common open space shall be graded to 4:1 maximum slope from a distance approximately one (1) foot above channel bottom, or as determined in the field by Town inspectors. Retaining walls, riprap or other structures will be used to bring grades into conformance with these standards. A level area should be maintained at the top of slope with a width adequate for landscaping and ditch maintenance access including concrete paths, as determined by Town and the appropriate ditch company.
- C. Grading is to be designed to contain right-of-way area nuisance water within the right-of-way. Swales or other means must be used to prevent water from draining from right-of-way areas into private lots.
- D. Grading shall take into account all desirable existing vegetation that is scheduled to remain. No grading will be allowed within the drip line of existing trees scheduled to remain. Cut or fill not exceeding six (6) inch may occur within the drip line but shall be done by hand methods. Grading will be designed to save as many mature, good quality and desirable species trees as possible, but shall include removal of all invasive or undesirable trees, shrubs, vegetation and noxious weeds (see plant list in appendix). Construction fencing and other standard protection methods shall be utilized to protect existing trees.
- E. Grading adjacent to concrete paths shall include a six (6) foot minimum shoulder at +/- 2% slope on the downhill side of the path where slopes are steeper than 4:1.
- F. Wetlands and other sensitive areas shall be protected from erosion and damage. Silt fencing shall be utilized to control damage to sensitive areas including waterways, and wetlands.
- G. Grading operations shall isolate, save and utilize all existing topsoil on the site.
- H. All grading shall adequately allow for a six (6) foot wide mowing deck, especially at tops and sides of berms, along sides and bottoms of swales, etc. Where areas are graded steeper than 4:1 adjacent to the concrete path, a six (6) foot wide shoulder with a 10:1 maximum slope shall be required.
- I. Grading shall provide a one (1) foot minimum width flat buffer area with a +/-2% slope at the toe of slopes with shrub beds steeper than 4:1 and where adjacent to a concrete path, sidewalk or curb. Grades in private common areas, including detention ponds, shall not exceed the maximums noted in this section. Walls or other structures may be used where necessary to bring grades into conformance with these standards.
- J. Detention ponds shall have corners of ponds at a slope of no greater than 4:1. The pond bottom shall drain at a minimum 2% slope over grass areas and 1% over concrete trickle channels. A concrete slab near the outlet shall be installed and sized appropriately to accommodate siltation. Storm drainage inlets shall be placed in close proximity to the pond outlet to eliminate or minimize the need for a trickle channel. A trickle channel with minimum three (3) foot width, if installed, shall be constructed with a minimum slope of 1% to ensure proper drainage and shall be located to one side of the pond and limited to the extent possible to allow for multi-use functions of the pond area. Adequate maintenance equipment access shall be provided by means of a concrete path or other allowed all-weather traffic-rated surface to access storm drainage inlets/outlets etc.
 - 1. Ponds designed to retain water at all times and detain only additional storm flows shall be designed per above criteria where applicable.

Town of Mead Design Standards and Construction Specifications

- K. For detention ponds to be utilized as common open spaces, the following shall also be provided: a perimeter landscaped area, ten (10) feet in width, around the top of the pond to allow for landscaping and other amenities; benches, picnic tables, play equipment, sports courts and/or fields, and other amenities, as determined by Town, that are in scale with the size of the detention facility. All equipment shall be placed on concrete pads, per the direction of Town staff. See Approved Materials List for equipment.
- L. Where an arterial ROW is being improved prior to the construction of the ultimate curb and gutter, the developer will be responsible for anticipating the future road construction. Ultimate ROW improvements shall be designed and built to the future curblines (horizontal and vertical elevation), as determined by the Town. The space between the existing road edge and the ultimate curblines shall contain any necessary interim drainage improvements and shall be seeded. Road delineators will be required where no curb and gutter is provided, on a fifty (50) lineal foot spacing.

803.3 Minimum Plan Information

- A. Preliminary Construction Plans: Existing topography at two (2) foot contour interval for entire site including rights of way and primary greenway. Proposed topography in general graphic delineation depicting location of berms or other landforms. Additionally, a detail or section that shows the existing and proposed topography for all right-of-way areas, HWY 66 scenic entry corridor, designated greenway areas, common open space and detention ponds within the project area. Detail to show location of concrete path, landscape areas as well as proposed grades with maximum slopes indicated.
- B. Final Construction Plans and Public Improvement Plans: Existing topography at one (1) foot contour interval for entire site including rights of way, HWY 66 scenic entry corridor, common open space and designated greenway. Proposed topography that ties to existing contours so that cut and fill areas are clearly indicated. Slope arrows that indicate minimum and maximum slopes allowable. Ultimate curblines alignment and existing edge of asphalt along arterial ROWs slated for future expansion. All future alignment information is to be determined by the Town Engineer using the most current information available.
- C. Public and Common Open Space Improvement Plan notes that read as follows:
 - 1. All irrigated turf areas shall not exceed 4:1 slopes. Native grass and shrub bed areas shall not exceed 3:1 slopes.
 - 2. All existing trees scheduled to remain shall be protected by an orange construction fence four (4) feet high secured with steel t-posts at the drip line of each tree. Sufficient posts shall be used to maintain fence in erect condition at all times. No grading shall commence without construction fencing in place. Hand grading only will be allowed within the limits of construction fencing. No more than six (6) inch of cut or fill will be allowed within the drip line of any tree shown to remain on these construction plans.
 - 3. All topsoil shall be stripped from the site and saved for use on this project. No topsoil shall be removed from the site. After clearing and grubbing operations are complete, and prior to other earthwork activities, strip topsoil to maximum depth possible to recover topsoil. No subsoil shall be removed as part of this topsoil stripping operation. Stockpile topsoil in an area where grading activities can commence without interference and protect from wind or other erosion with fabric or by other approved means. Subgrade work to leave an allowance for replacement of topsoil.
 - a. In Town-owned areas and common open space (including detention ponds), replace topsoil to the depth available or twelve (12) inch minimum. Where sufficient topsoil is not available on-site, additional imported topsoil shall be utilized to allow for twelve (12)

Town of Mead Design Standards and Construction Specifications

inch minimum depth of topsoil in all landscape areas. Imported topsoil shall comply with Section of the Town Standards and Specifications.

4. Soil amendments per the Town Standards and Specifications shall be used in all landscaped areas. Soil amendment shall be applied no more than thirty (30) days before seeding. A minimum of three (3) cubic yards soil amendment per 1000 square feet of landscape area shall be incorporated into the top twelve (12) inches of topsoil by tilling. Increase amendment quantities as needed per Soils Test recommendations.

804 Irrigation

804.1 General Criteria

- A. This entire Section shall also apply to all areas to be owned by the Town and Town capital design and construction projects that reference these Standards. References to the “developer” in these Standards shall be considered references to the consultant or contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.
- B. This entire section shall also apply to common open space areas including detention ponds.
- C. Comply with the International Plumbing Code, Town Electrical Code (latest editions) and general industry standards for all areas.
- D. All arterial right-of-way, designated greenway and other private required landscaped areas shall have an automatic, clock-activated irrigation system of sufficient coverage to irrigate all plant material.
- E. Xeriscaping is required within all Town owned areas and in privately owned common areas.
 1. Xeriscaping within this section shall be defined as reducing water use in landscaped areas through: proper planning and design (zoning plant materials and recognition of micro-climates); good soil improvement (topsoil and soil amendment); limiting turf areas and using water thrifty turf types (see approved materials list); efficient irrigation (zoning irrigation to separate turf areas from shrubs, minimize overspray onto hard surfaces, use of water saving equipment (see approved materials list), and recognition of micro-climates); use of mulches (and avoidance of impermeable weed barriers); use of water thrifty plant materials (natives are encouraged); and through appropriate maintenance practices. For more information contact Xeriscape Colorado.
- F. Installation of an irrigation system within Common open space and Town owned areas shall include a separate tap (private areas separate from public areas), backflow preventer, meter, meter pit and power source for the irrigation controller which will not be subject to disconnection should the fronting property be vacated. Where raw water irrigation is available, it shall be used for irrigation with potable back-up also provided.
 1. All potable irrigation systems shall be equipped with backflow prevention devices meeting the specifications of the Public Works Department and appropriate water district.
 2. In Town owned areas, devices will be installed below ground and a cage whose design will be approved by Public Works will protect all above ground mounts. The irrigation controller will be of the pedestal-mounted variety or be wall mounted with lockable, weatherproof cabinet.
 3. In common open space areas, devices will be installed in protected location and/or in weather tight and vandal resistant controller enclosures with locking exterior disconnect.
 - a. Any deviation in taps from the approved construction plans to be approved by the Town Engineer and Water District prior to installation. Any water service line above two (2)

Town of Mead Design Standards and Construction Specifications

inch shall be coordinated with Town Engineer. All taps shall be installed by a Contractor approved by the Water District to install irrigation systems and shall be inspected by the District and the Town upon payment of the applicable fees.

- G. All irrigation taps and electric services are required to have an address and building permit before installation. The billing information will be required at the time of building permit issuance. Addresses are determined by the Building Department and building permits are obtained from the building official.
- H. Final location of irrigation controller to be coordinated and approved by the Town Public Works Department for Town owned areas or by Town inspectors for other areas. Electric source to be coordinated and approved by Town of Mead and electric provider The developer will be responsible for all applicable electric service connection costs and fees. Maintenance of the service from the electric provider will be the responsibility of the entity in charge of overall maintenance of the area.

804.2 Minimum Design Criteria

- A. For Town-owned areas, a system is to be designed to provide head-to-head coverage with matched precipitation rates. Heads shall not overspray walkways, pavements or other hard surface areas. Temporary establishment irrigation of native grass areas MAY be an allowable variance if accepted by Public Works. Principles of Xeriscape shall be utilized in the design of irrigation system. Design considerations include: shrub and perennial beds are to be zoned separately from turf areas, sloped areas to have separate zoning for heads at the higher elevations from those at the lower elevation and areas with different exposures to be zoned separately. This design criteria is encouraged for all areas.
- B. For Common Open Space areas: a system is to be designed to provide head-to-head coverage with matched precipitation rates. Heads shall not overspray walkways, pavements or other hard surface areas where possible. Temporary establishment irrigation of native grass areas MAY be an allowable variance if accepted by Planning. Principles of Xeriscape shall be utilized in the design of irrigation system. Design considerations that must be included are: shrub and perennial beds are to be zoned separately from turf areas, sloped areas to have separate zoning for heads at the higher elevations from those at the lower elevation and areas with different exposures to be zoned separately.
- C. For all areas, if the use of untreated, raw water for irrigation is found to be appropriate by the Town, such use may be required. The developer shall install an approved pump in an approved secure above- ground pump enclosure. Pump system to include filtration equipment with self-flushing screens. Typical "dirty-water" equipment shall be required for these systems, including purple valve boxes scrubber valves, pipes and heads. At all times of use, a conspicuous notice shall be posted warning that untreated ditch is being used for irrigation. Sign message to be provided by Town.
- D. For Town-owned areas, the water from the Town tap shall not irrigate areas outside of Town-owned areas.
- E. For all areas, check valves-in-head required.
- F. For all areas, only materials, sizes and other requirements listed in this section and on Town of Mead Approved Materials List shall be specified for use, per type of area noted. Obtain available design pressure and flow from the appropriate water service provider. For Town-owned areas, design system shall not exceed available pressure at time of Town of Mead Planning Area final build-out of area. Where available pressure exceeds 85 psi, design the

Town of Mead Design Standards and Construction Specifications

system to 85 psi and include provision for pressure regulator installation to reduce actual pressure to 85 psi if necessary.

- G. Remote control valves shall be located to minimize lateral piping and sleeving under walkways and hard surface areas. For all areas, isolation valves shall be placed at both sides of each road crossing, at the upstream end of each leg in the mainline and at other areas as needed to minimize disruption to overall system in the event of system failure.
- H. For all areas, no cross-connections between potable water and untreated raw water shall be permitted.
- I. For all areas, lateral piping shall be sized based on flow demands (gpm's): velocities shall not exceed five and one half (5.5) feet per second in any Class 200 piping. Copper pipe velocities shall not exceed seven (7) feet per second.
- J. For all areas, backflow prevention devices are required for all irrigation systems and shall meet Public Works and Water District specifications.

804.3 Minimum Plan Information

- A. The final plan shall include all information required in these Standards and Specifications as well as the following notes:
 - 1. All Areas: A plan note that shows separate tap sizing calculations for each area served by each separate tap. The calculation shall be based on total ultimate use from the tap including all phases or off-site areas served from the tap even if future build-out is several years out.
 - a. The tap sizing calculation shall use the following formula: Total square feet of irrigated area from that tap (including future build-out if applicable) divided by eight (8). Result times 7.48 = gallons per cubic feet per week. Take gallons per cubic feet per week and divide by five (5) days per week, divide that answer by seven (7) hours per day, and divide that answer by sixty (60) to = gallons per minute. Tap size should then be the same as the smallest copper pipe (Type K) that will not exceed seven (7) feet per second. The number of days per week and hours per day are somewhat flexible, but those given above should be the typical. (If the areas include temporary irrigation of dryland turf, call Parks and Forestry for adjustments to this formula).
 - 2. A note shall read, 'A Inch tap will serve the (Name of area),.
- B. All Areas: The construction plans should separate Town owned areas from Common Open Space areas and include final irrigation plan information including piping, heads, valves, tap, controller and other miscellaneous equipment layout. Provide gpm, valve size, and valve number for each remote-control zone valve. Provide pipe sizes for each section of mainline and lateral. Provide a separate irrigation schedule for Town owned vs. Common open space areas that shows a key for each piece of equipment shown on the plan and describes the manufacturer, model number or other designation.
- C. Construction plans shall include the following notes:
 - 1. All Areas: Minimum design pressure.
 - 2. All Areas: These plans are diagrammatic and may require field adjustments.
 - 3. All Areas: It shall be the Contractor's responsibility to install the irrigation system in accordance with these plans and the most current Town Standards and Specifications. Field changes to these plans are to be approved by the Town inspector prior to work.

Town of Mead Design Standards and Construction Specifications

4. All Areas: All heads shall include a check valve. All valves shall have three extra wires looped per detail, and extended to the farthest wire drop or valve of each mainline branch.
Town Owned Areas: All rotor heads shall include a stainless-steel riser.
5. Town Owned Areas: Pipe including mainline shall be located within a two (2) foot offset from walks or curbs and to maximize tree planting zones. Field adjustment to this standard must be approved by the Town inspector prior to work.
6. All Areas: It is the responsibility of the Contractor to have a copy of the most current Town Standards and Specifications on site at all times. All improvements shall be installed per these Standards and Specifications. The Standards and Specifications shall be available to the Contractor at all site meetings/inspections. Any work that proceeds within these regulated areas that does not adhere to current Standards and Specifications and/or without the approved inspection of the Town shall be corrected at no cost to the Town.
7. All Areas: All sleeves will be marked with a "V" chiseled in concrete path, curb or other paved surface at all crossing points directly over the sleeve location.

805 Seeding

805.1 General Criteria

- A. Seeding shall be done in accordance with the professional standards of the industry for all landscape areas.
- B. Seeding is allowed in designated greenways where approved by Town, on all areas of detention ponds that are not within the five-year flood area, and in some temporary dry land applications. No seeding is allowed at the bottom of detention ponds within the five-year flood area . Seeding is allowed in private common open space areas. No seeding is allowed along arterial rights-of-way. Seeding within Town Parks and facilities is allowed on a project specific basis. All proposed seeded areas are to be specifically approved by Town staff.
- C. All dry land-seeded areas must have a temporary irrigation system for establishment purposes.
- D. Drought-tolerant grasses are encouraged in all areas and required in Town owned areas. Dry land grasses may be permitted in required landscape areas if deemed appropriate by Town staff. These grasses shall be maintained free of weeds and debris and shall not present a fire hazard. The use of several species is encouraged (required in Town-owned areas).
- E. All Sections (as applicable) shall apply to all Town capital projects that reference these Standards. References to the "developer" in these Standards shall be considered references to the contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

805.2 Minimum Design Criteria

- A. Seed mix: Shall be approved by Town staff based on the activity to take place, planned irrigation method and maintenance to be performed in the area being seeded. In all cases, a drought tolerant seed mix is encouraged and shall be required in all Town owned areas with a seed mix that does not contain more than 10% bluegrass.
 1. For pre-approved Native Grass Mixes, see the Approved Materials List
 2. For pre-approved turf grass mixes, see the Approved Materials List.
- B. Turf grass seed mix shall be used between the property line and the concrete path in designated greenways and on detention pond side slopes. Native grass mix may be used between the concrete path and ditch or drainage area.

Town of Mead Design Standards and Construction Specifications

- C. In areas where seed is installed along a road without curb and gutter, traffic delineators with reflectors shall be required at fifty (50) feet intervals set five (5) feet off the edge of asphalt. Posts to be installed to break away in direction of on-coming traffic. The post shall be located near irrigation heads (on the road side of the heads) to protect and shall not obstruct the irrigation system.
- D. A sign shall be supplied by the developer in all permanent native seeded areas after seeding, per these standards. Signs shall be located at all entrance points into the Greenway.
- E. Where a fence abuts an irrigated turf area a twenty-four (24) inch wide, six (6) inch thick mow band is required along the fence. The mow band may be three (3) inch cobble over weed fabric with a steel-edged border or an approved equal.

806 Sodding

806.1 General Criteria

- A. All sod is to be installed according to current industry standards for all landscape areas.
- B. All Sections (as applicable) shall also apply to all Town capital design and construction projects that reference these Standards. References to the “developer” in these Standards shall be considered references to the consultant or contractor. In the event of any conflict between these Standards and the project specifications, the more stringent of the two shall apply.

806.2 Minimum Design Criteria

- A. Sod Mix: Turf mix for all areas shall be approved by Town staff based on the activity to take place, planned irrigation method and maintenance to be performed in the area being sodded. In all cases a drought tolerant mix shall be encouraged. In Town-owned areas a drought tolerant mix shall be required using a mix that does not contain more than 10% bluegrass.
 - 1. For pre-approved Sod Mixes, see the Approved Materials List.
- B. Sodded Areas: Sod is required for landscaped areas on arterial rights of way and in all areas of detention ponds that are within the five-year flood areas. Other areas may require use of sod as determined by the Town staff.
- C. Sodded areas should be designed to minimize narrow, hard to maintain strips of turf.
- D. Where a fence abuts an irrigated turf area to be maintained by the Town, a twenty-four (24) inches wide, six (6) inches thick mow band is required along the fence. The mow band may be three (3) inch cobble over weed fabric with a steel-edged border or an approved equal.

807 CONSTRUCTION SPECIFICATIONS

807.1 General

- A. Landscape and Irrigation Construction shall be completed in accordance with the Construction Specifications included in Appendix A.

Town of Mead Design Standards and Construction Specifications

808 LANDSCAPE AND IRRIGATION DETAILS

A. The following is a list of standard details for Landscape and Irrigation that are part of the Town of Mead Standards and Specifications:

- D8.01 Shrub Planting Detail
- D8.02 Tree Planting Detail
- D8.03 Winterization Assembly
- D8.04 Remote Control Valve Assembly
- D8.05 Quick Coupler Assembly
- D8.06 Pop Up Spray Sprinkler Assembly
- D8.07 Pop Up Rotor Sprinkler Assembly
- D8.08 Master Valve Assembly
- D8.09 Valve Drain Assembly
- D8.10 Gate Valve Assembly
- D8.11 Flush Cap Assembly
- D8.12 Flow Meter Assembly
- D8.13 Drip Remote Control Valve Assembly
- D8.14 Shrub Bed Drip Detail
- D8.15 Drip to Trees in Open Turf Areas
- D8.16 Backflow Preventer Concrete Vault
- D8.17 Concrete Thrust Block
- D8.18 Flood Gate



Appendix A

Construction Specifications

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Town of Mead Design Standards and Construction Specifications

APPENDIX A – CONSTRUCTION SPECIFICATIONS

31 00 00 Earthwork Specification

31 25 00 Erosion and Sedimentation Control Specification

32 12 00 Flexible Paving Specification

32 13 00 Rigid Paving and Flatwork Specification

33 01 30.7 CIPP for Sanitary Sewerage Rehabilitation Specification

33 33 00 Sanitary Sewerage Utilities Specification

33 40 00 Storm Drainage Systems Specification

33 47 00 Landscape & Irrigation

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Town of Mead Design Standards and Construction Specifications

SECTION 31 00 00 EARTHWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Clearing, grubbing and site preparation
- B. Removal and disposal of debris
- C. Handling, storage, transportation, and disposal of excavated material
- D. Sheeting, shoring, bracing and protection work
- E. Pumping and dewatering as required or necessary
- F. Backfilling
- G. Pipe embedment
- H. Construction of fills and embankments
- I. Excavation for buildings & structures
- J. Pavement Subgrade preparation
- K. Trench Stabilization
- L. Final grading
- M. Slope Stabilization
- N. Appurtenant work

1.2 REFERENCES

- A. AASHTO – American Association of State Highway and Transportation Officials
- B. ASTM – American Society for Testing and Materials
 - 1. ASTM C33 – Concrete Aggregates
 - 2. ASTM C136 – Sieve Analysis of Fine and Coarse Aggregates
 - 3. ASTM D698 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12-Inch Drop
 - 4. ASTM D1241 – Material for Soil Aggregate Subbase, Base and Surface Courses
 - 5. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
 - 6. ASTM D4253 – Test Methods for Maximum Index Density of Soils and Unit Weight of Soils Using a Vibratory Table
 - 7. ASTM D4254 – Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density
 - 8. ASTM D4318 – Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
 - 9. ASTM D6938 – Test Method for In-Place Density and Water Content of Soil and Soil Aggregate by Nuclear Methods (Shallow Depth)
- C. ACI – American Concrete Institute
 - 1. ACI 229 – Controlled Low-Strength Materials
- D. CABO/ANSI – Council of American Building Officials/American National Standards Institute
 - A117.1 – Accessible and Useable Buildings and Facilities Standards

Town of Mead Design Standards and Construction Specifications

- E. CDOT – Colorado Department of Transportation
- F. OSHA – Occupational Safety and Health Administration
 - 1. Part 1926 – Safety and Health Regulations for Construction

1.3 SUBMITTALS

- A. Product Data: Submit on all products or materials supplied herein
- B. Test Reports: Indicate supplier, sieve analysis, optimum moisture content and density in accordance with ASTM D698 if appropriate for crushed rock or gravel, pipe embedment and material for fills and embankment.

1.4 REGULATORY REQUIREMENTS

- A. Obtain and comply with all requirements of the Town of Mead Grading Permit for all land disturbing activities and CDPHE Stormwater and/or Groundwater Discharge Permits, as required.
- B. Comply with applicable requirements of CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.
- C. Excavation work will be performed in compliance current OSHA requirements.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Protect adjacent structures and surrounding areas from damage during excavation, filling, and backfilling.
- B. Protect work from erosion or other similar types of damage until the project has been accepted. Leave protection in place for subsequent contractors' use.
- C. Do not backfill or construct fills during freezing weather. Backfill or construct fills only when temperature is 35°F and rising.
- D. Do not use frozen materials, snow, or ice in any backfill or fill area.
- E. Do not backfill or construct fill on frozen surfaces.
- F. Protect excavated material from becoming frozen.
- G. Do not backfill or construct fills or embankments during periods of heavy rainfall or precipitation when soil moisture conditions will not allow proper compaction to be achieved.
- H. Do not remove trees from outside excavation or fill areas unless authorized by the Town; protect from permanent damage by construction activities.
- I. Provide temporary bridges for roadways, walkways, driveways, etc.

1.6 QUALITY ASSURANCE

- A. All imported material to be free of hazardous and organic wastes, “clean” as defined by EPA, and approved for its intended use by the Town or a project Geotechnical Engineer.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General - Soil materials, whether from sources on or off the site must be approved by the Geotechnical Engineer as suitable for intended use and specifically for required location or purpose.
- B. Fills and Embankments
 - 1. To the maximum extent practical, use excess earth from onsite excavation for fills and embankments.

Town of Mead Design Standards and Construction Specifications

2. Fills and embankments shall be free from rocks or stones larger than 12 inches in greatest dimension and free from brush, stumps, logs, roots, debris, and organic and other deleterious materials.
 3. Fill and embankment material must be acceptable to the project's Engineer.
 4. No rocks or stones larger than six (6) inches are allowed in the upper 18 inches of fill or embankment. Where allowed, distribute rocks and stones through the fill to prevent interference with compaction.
- C. Imported Fill for Fills and Embankments
1. The Contractor is responsible for obtaining additional material for fills and embankments as necessary to meet the requirements shown on the approved drawings.
 2. Imported fill conforming to the following:
 - a. Gradation (percent finer by weight ASTM C136): 3-inch – 100% passing, No. 4 Sieve – 50-100% passing, and No. 200 Sieve – 35% passing (maximum).
 - b. Liquid Limit: 35 (maximum), Plasticity Index: 15 (maximum), Group Index: 10 (maximum).
- D. Structural Fill
1. Imported structural fill, such as a ½-inch minus, CDOT Class 7 Aggregate Road Base, shall conform to the following:
 - a. Gradation: 1" – 100% passing (percent finer by weight ASTM C136), No. 8 Sieve – 20-85% passing, and No. 200 Sieve – 15% (maximum).
 - b. Liquid Limit: 30 (maximum), Plasticity Index: 6 (maximum).
- E. Topsoil
1. Topsoil is defined as fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of rocks, stumps, stones larger than two (2) inches in any dimension, and other extraneous or toxic matter harmful to plant growth for areas to be seeded or planted.
 2. Clean topsoil free of plants and seeds will be spread to 4-inch minimum depth or as specified by approved drawings, whichever is greater, for areas of the site as detailed by the landscape plans.
- F. Grubbings
1. Grubbings are defined as the first 1 inch of surface vegetation and topsoil consisting of primarily existing grass groundcover free of roots, brush, and other objectionable material and debris.
 2. Reuse grubbing and surface topsoil containing plants and seeds in designated revegetation areas only.
- G. Pipe Embedment: Graded gravel
1. Comply with requirements for pipe embedment for public utilities.

Town of Mead Design Standards and Construction Specifications

2. 1-1/2" Washed rock

Sieve Size (Inch)	Percent Passing by Weight
2"	100
1-1/2"	95-100
1"	80-95
3/4"	30-45
1/2"	10-25
3/8"	<1

3. 3/4" – 1" Crushed rock – AASHTO 57/67

Sieve Size (Inch)	Percent Passing by Weight
1	100
3/4"	90-100
1/2"	25-60
3/8"	20-55
No. 4	0-10
No. 8	0-5
No. 200	0-2

4. Well-Graded Sand

Sieve Size	Percent Passing by Weight
3/8"	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	10-30
No. 200	2-10

5. Squeegee

Sieve Size	Percent Passing by Weight
3/8"	100
No. 4	85-100
No. 8	30-70
No. 16	5-40
No. 30	0-15
No. 50	0-10
No. 100	0-5
No. 200	<1

6. Drain Gravel

- a. Crushed rock, granular material with a maximum size of 1-1/2 inch.
- b. Minimum 50% passing No. 4 sieve, maximum 5% retained on No. 200 sieve.

H. Compacted Trench Backfill

1. Job excavated material finely divided, free of debris, organic material, and stones larger than six (6) inches in greatest dimension without masses of moist, stiff clay, or topsoil.
2. In upper 18 inches, no rock or rock excavated detritus, larger than six (6) inches except with specific approval from Geotechnical Engineer.

Town of Mead Design Standards and Construction Specifications

3. No rock greater than three (3) inches in greatest dimension within three (3) feet of top of pipe.
 4. Graded gravel: as specified or shown on the approved drawings for pipe embedment.
- I. Coarse Base Rock
1. Granular material, maximum three (3) inches, less than 10% passing 1-inch sieve.
 2. Free of trash, clay and dust.
 3. Compaction as specified by Geotechnical Engineer.
- J. Road Base
1. Will meet ASTM specification for Class II aggregate base and CDOT Class 6 gradation

Sieve Size	Percent Passing by Weight
1"	100
¾"	90-100
No. 4	35-55
No. 30	10-30
No. 200	2-9

- K. Clay for irrigation channels, cut-off walls or clay for use as a barrier material in utility trenches
1. USCS Classification: CL, CH or OH
 - a. Percent passing No. 200 Sieve: 30% or greater by weight
 - b. Plasticity Index: 15 or greater
 - c. Maximum Permeability: 1×10^{-5} cm/sec
 - d. Maximum Particle Size: ¾-inch
 - e. Minimum Clay Liner Thickness: two (2) feet at side slopes and end of wing walls or as specified in plans and details.
 - f. Maximum horizontal loose lift thickness: 12-inches or less

2.2 ACCESSORIES

- A. Controlled Low Strength Material (Flow Fill)
1. Comply with Utility Service Provider's specifications and ACI 229 for the use of flowable fill within the right-of-way or for public utility trench backfill.
 2. Product will be a lean, sand-cement slurry, "flowable fill" or similar material with a 28-day unconfined compressive strength between 50 and 200 psi.
- B. Non-woven geotextile fabric
1. Needle-punched nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Product must be inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids. Product must meet AASHTO M288-06 Class 3 for elongation > 50%.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Field verify the location of all underground utilities, pipelines and structures prior to excavation.

3.2 PERFORMANCE — GENERAL

- A. Perform work in a safe and proper manner with appropriate precautions against hazard.

Town of Mead Design Standards and Construction Specifications

- B. Provide adequate working space and clearances for work performed within excavations and for installation and removal of utilities.
- C. Contain all construction activity on the designated site and within the limits of work. Cost of restoration offsite will be the responsibility of the Contractor.
- D. Maintain service to pipelines and utilities indicated on approved drawings during construction.

3.3 PREPARATION

A. Clearing and Grubbing

- 1. Clear all site areas within the limits of work of grasses, roots, brush, and other objectionable material and debris.
- 2. Strip subgrade for fills and embankments of surface vegetation, sod, tree stumps and organic topsoil. Strip and stockpile all on-site material meeting the topsoil definition for all areas receiving grading where shown on approved drawings.
- 3. Remove all waste materials from site and dispose. Stockpile all acceptable grubblings for reuse in revegetation areas.
- 4. Remove and dispose of tree stumps and roots over three (3) inches in diameter to a minimum depth of 18 inches below the natural surface or five (5) feet below finished surface level, whichever is lower.
- 5. Remove debris including all demolished trees, underbrush, stumps, roots and other combustible materials from site and dispose of off-site. On-site burning is not permitted.
- 6. Backfill all excavated depression include grub holes with approved material.

B. Preservation of Trees

- 1. Do not remove trees outside fill or excavated areas, except as authorized by the Town.
- 2. Protect trees and their roots within the drip line that are to remain from permanent damage by construction operations.
- 3. Trim standing trees in conflict with construction operations as directed by the Town.

C. Topsoil Stripping

- 1. Strip onsite material meeting the topsoil definition to minimum depth of six (6) inches from areas to receive grading as shown on approved drawings.
- 2. At the completion of work in each area, place and grade topsoil to maintain gradient as indicated and required. Roughen surface as required for erosion control.

D. Waste and Debris

- 1. Stockpile all acceptable grubbing for reuse in native revegetation areas.
- 2. Remove and dispose of all waste materials and debris from clearing, grubbing, stripping and demolition off site.

E. Stockpiles

- 1. Segregate materials suitable for the following:
 - a. Topsoil
 - b. Embankments and fills
 - c. Backfill
 - d. Spoils and waste only
- 2. No excavation will be deposited or stockpiled at any time so as to endanger stability of banks or structures, health of trees and shrubs to be protected, or portions of the work, either by direct pressure or indirectly by overloading banks contiguous to the operation.

Town of Mead Design Standards and Construction Specifications

3. Stockpile soil materials away from edge of excavations.
4. Do not obstruct or prevent access to roads, driveways, ditches, natural drainage channels, and utility control devices.

3.4 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

- A. Excavation and backfill operations will be performed in such a manner to prevent cave-ins of excavations or the undermining, damage or disturbing of existing utilities and structures or of new work.
- B. Backfill will be placed and compacted so as to prevent future settlement or damage to existing utilities and structures and new work.
- C. Any excavations improperly backfilled or where settlement occurs will be reopened to the depth required then refilled with approved materials and compacted, and the surface restored to the required grade and condition.
- D. Any damage due to excavation, backfilling, or settlement of the backfill, or injury to persons or damage to property occurring as a result of such damage will be the responsibility of the Contractor. All costs to repair such damage, in a manner satisfactory to the Town, will be borne by the Contractor.

3.5 DEWATERING

- A. General
 1. Perform all dewatering activities in accordance with all federal, state, and Town standards regarding site drainage, dewatering, and erosion and sediment control including permitting requirements.
 2. Dewatering requires a Colorado Department of Public Health and Environment dewatering permit. Contractor must obtain dewatering permit and comply with discharge requirements therein, including water treatment prior to discharge, if necessary.
- B. Design
 1. Contractor will be responsible for the accuracy of the approved drawings, design data, and operational records required.
 2. Contractor will be solely responsible for the design, installation, operation, maintenance, and any failure of any component of the system.
- C. Damages
 1. Contractor will be responsible for and will repair any damage to work in place, or other contractor's equipment, utilities, residences, highways, roads, railroads, private and municipal well systems, adjacent structures, natural resources, habitat, existing wells, and the excavation including, damage to the bottom due to heave and including but not limited to, removal and pumping out of the excavated area that may result from Contractor's negligence, inadequate or improper design and operation of the dewatering system, and any mechanical or electrical failure of the dewatering system.
 2. Remove sub grade materials rendered unsuitable by excessive wetting and replace with approved backfill material at no additional cost to the Town.
- D. Maintaining Excavation in Dewatered Condition
 1. Dewatering will be a continuous operation. Interruptions due to power outages, or any other reason will not be permitted.
 2. Continuously maintain excavation in a dry condition with positive dewatering methods during preparation of subgrade, installation of pipe, and construction of structures until the critical period of construction and/or backfill is completed to prevent damage of subgrade

Town of Mead Design Standards and Construction Specifications

support, piping, structure, side slopes, or adjacent facilities from flotation or other hydrostatic pressure imbalance.

3. Provide standby equipment on site, installed, wired, and available for immediate operation if required to maintain dewatering on a continuous basis in the event any part of the system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, perform such work as may be required to restore damaged structures and foundation soils at no additional cost to Town.
 4. System maintenance will include supervision by personnel skilled in the operation, maintenance, and replacement of system components, and any other work required to maintain excavation in dewatered condition.
- E. System Removal
1. Remove dewatering equipment from the site, including related temporary electrical service.
 2. Wells will be removed or cut off a minimum of three (3) feet below final ground surface, capped, and abandoned in accordance with regulations by agencies having jurisdiction.

3.6 SHEETING, SHORING AND BRACING

- A. All sheeting, shoring and bracing shall be in accordance with OSHA and IBC requirements.
- B. Prevent undermining and damage to all structures, buildings, underground facilities, pavements and slabs.
- C. Contractor will be responsible for obtaining all required permits or easements for encroachments into the public right-of-way and for coordinating any encroachments onto adjacent properties.
- D. If sheet pile cut off walls are required, submit design calculations stamped by a Colorado licensed Professional Engineer.
- E. Contractor will be solely responsible for proper design, installation, operation, maintenance, and any failure of any system component.
- F. Provide proper and substantial sheeting, shoring, and bracing, in accordance with OSHA Standards as required, to prevent caving or sliding, to protect workmen and the work, and to protect existing structures and facilities.
- G. Design, furnish, build, maintain and subsequently remove, to extent required a system of temporary supports for cut and cover, open cut, temporary bypass road, or trench excavations, including bracing, dewatering, and all associated items to support the sides and ends of excavations where excavation slopes may endanger in-place or proposed improvements, extend beyond construction right-of-ways or as otherwise specified or indicated in the approved drawings.
1. Design and build sheeting, shoring, and bracing to withstand all loads that might be caused by earth movement or pressure.
 2. Design and build sheeting, shoring and bracing to be rigid, and to maintain shape and position under all circumstances.
- H. Design excavation support system and components for the following to allow safe and expeditious construction of permanent structures without movement/settlement of the ground and to prevent damage to or movement of adjacent buildings, structures, other improvements and underground facilities:
1. To support lateral earth pressures.
 2. Loads from utilities, traffic, construction, buildings and surcharge loads.
- I. Provide sheeting, shoring and bracing equipment and materials onsite prior to start of excavation in each section, making adjustments as required, to meet unexpected conditions.

Town of Mead Design Standards and Construction Specifications

- J. Contractor will make his own assessment of existing conditions including adjacent property, the possible effects of his proposed temporary works and construction methods, and will select and design support systems, methods, and details as will assure safety to the public, adjacent property, and the completed work.
- K. Space and arrange sheeting and bracing as required to exclude adjacent material and according to the stability of excavation slopes.
- L. Do not pull trench sheeting before backfilling.
- M. Do not brace sheeting left in place against the pipe, but support it in a manner that precludes concentrated loads or horizontal thrusts on pipe.
- N. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment is completed.

3.7 TRENCH STABILIZATION

- A. Thoroughly compact and consolidate subgrades for concrete structures, precast structures, and utility trench bottoms so they remain firm, dense and intact during required construction activities.
- B. Remove all mud and unstable soil during excavation.
- C. Reinforce subgrades with crushed rock or gravel if they become unstable during construction activities.
- D. Finished elevation of stabilized subgrades are to be at or below subgrade elevations indicated on approved drawings.
- E. Allow no more than ½ inch depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon.

3.8 PAVEMENT OVEREXCAVATION AND SUBGRADE PREPARATION

- A. Excavate subgrade for asphalt pavement areas per the lines, grades, and dimensions indicated on approved drawings within a tolerance of plus or minus 0.10 foot. Excavate subgrade for concrete pavement areas per the lines, grades, and dimensions indicated on approved drawings within a tolerance of plus or minus 0.05 foot.
- B. Overexcavate and scarify existing soil as required under pavement areas, slabs, curbs and walks to meet the moisture and compaction specifications herein to depth shown on approved drawings or as specified by a project Geotechnical Engineer.
- C. Extend subgrade preparation a minimum of one foot beyond proposed pavement, slabs, curbs and walks.
- D. Proof roll at a maximum of 24 hours prior to paving to locate any soft spots that exhibit instability and deflection beyond subgrade tolerances listed above. The vehicle must have a loaded GVW of 50,000 pounds with a loaded single axle weight of at least 18,000 pounds and a tire pressure of 90 psi. Areas that are observed to have soft spots in the subgrade, where deflection is not uniform or is excessive as determined by the Geotechnical Engineer, will be ripped, scarified, dried or wetted as necessary and recompacted to the requirements for density and moisture. After recompaction, these areas will be proof rolled again and all failures again corrected.
- E. If the Contractor fails to place the sub base, base course, or initial pavement course within 24 hours or the condition of the subgrade changes due to weather or other conditions, proof rolling and correction will be performed again.

3.9 FILLS AND EMBANKMENTS

- A. Using suitable approved materials, shape, trim, and finish cut slopes to conform with contours and elevations indicated on approved drawings.

Town of Mead Design Standards and Construction Specifications

- B. Place fill in horizontal layers at maximum uncompacted depth per compaction specifications herein.
- C. Do not place fill on frozen surface. Do not place snow, ice or frozen materials in fill.
- D. Level and roll subgrade so surface materials will be compact and bond with the first layer of fill or embankment.
- E. Plow and scarify subgrade to a minimum depth of six (6) inches until uniform and free of large clods.
- F. Spread and level material deposited in piles and windrows before compacting.
- G. Thoroughly compact each layer by rolling or other means acceptable to a project Geotechnical Engineer to meet the moisture and compaction specifications herein.
- H. Alter compaction methods if material fails to meet specified densities.
- I. Where a trench passes through a fill or embankment, place and compact fill or embankment to 12 inches above the top of the pipe before excavating the trench.
- J. Add water and harrow, disc, blade, or otherwise work each layer to obtain the uniform moisture content and adequate compaction.

3.10 COMPACTION

- A. Place backfill and fill materials in layers not more than eight (8) inches in loose depth for material compacted by heavy compaction equipment, and not more than four (4) inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure as described herein.
- C. Comply with a project Geotechnical Engineer's additional requirements for site development material, subexcavation, compaction and related earthwork operations.
- D. Percentage of Maximum Dry Density Requirements: Moisture treat and compact soil to not less than the following percentages of maximum dry density and to within the specified moisture content range of optimum moisture content according to ASTM D698 as follows:

Public Surface Improvement	Compaction %	Moisture Content
Paved Areas	98%	-2 to +2
Trenches Under Paved Areas	98%	-2 to +2
Utility Trenches	95%	-2 to +2
Lawns or Unpaved Areas	90%	-2 to +2

- E. Do not deposit or compact tamped or otherwise mechanically compacted backfill if frozen or if in water.
- F. Take particular care to compact backfill which will be beneath slabs, pipes, drives, roads, parking areas, curb, gutters, or other surface construction.

3.11 BORROW OR SPOIL AREA

- A. The location, size, shape, depth, drainage, and surfacing of borrow or spoil pits will be approved by the Town.
- B. Make all areas regular in shape with graded and surfaced side and bottom slopes when completed.
- C. Cut side slopes not steeper than 1:1 and uniform for the entire length of any one side.

Town of Mead Design Standards and Construction Specifications

- D. Final grade disturbed areas of borrow to uniform slope (maximum slope = 4:1, minimum slope = 50:1).
- E. Use material free of debris and deleterious material.
- F. Contractor is responsible for compliance with Colorado Discharge Permit System and local erosion control permitting requirements for any and all onsite and offsite, disturbed spoil and borrow areas. Upon completion of spoil and/or borrow operations, clean up spoil and/or borrow areas in a neat and reasonable manner to the satisfaction of the offsite property owner and the Town.

3.12 BLASTING

- A. Blasting or other use of explosives is not permitted without the Town's approval.

3.13 TRENCH EXCAVATION

- A. Establish alignment and grade or elevation from offset stakes provided by the Contractor's surveyor.
- B. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the approved drawings.
- C. Comply with pipe specification sections regarding vertical and horizontal alignment and maximum joint deflection.
- D. Measure pipe cover depth vertically from top of pipe to finished ground or surface elevation.
- E. Do not open more trench in advance of pipe laying than is necessary to expedite the work; not more than 100 feet.
- F. Total length of open trench will be limited to 200 feet unless otherwise approved by the Town Engineer.
- G. Except where tunneling or boring is indicated on the approved drawings, specified, required by jurisdictional agency or permitted by Engineer, excavate trenches by open cut from the surface.
- H. Limiting trench widths
 - 1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing and embedment.
 - 2. If needed to reduce earth loads to prevent sliding, cut banks back on slopes which extend not lower than one (1) foot above the top of the pipe.
 - 3. Stipulated minimum clearances are minimum clear distances, not minimum average distances.
 - 4. Maximum trench width from six inches above the top of pipe to trench bottom is the pipe outside diameter plus 24 inches.
 - 5. Limiting trench widths and permissible clearances from 6 inches above top of pipe to trench bottom for installed pressure and non-pressure piping.

Pipe Size (inch)	Minimum Trench Width	Maximum Trench Width
3	1' 6"	2' 6"
4	1' 6"	2' 6"
6	1' 6"	2' 6"
8	1' 8"	2' 8"
10	2' 0"	3' 0"
12	2' 0"	3' 0"
16	2' 8"	3' 8"
18	3' 0"	4' 0"

Town of Mead Design Standards and Construction Specifications

Pipe Size (inch)	Minimum Trench Width	Maximum Trench Width
24	3' 6"	4' 6"
36	4' 6"	5' 0"

- I. If the width of the lower portion of the trench exceeds the maximum permitted, provide special pipe embedment, or concrete encasement as required by loading conditions.
- J. No excessive trench widths will be allowed to avoid the use of sheeting or shoring and bracing.
- K. Trench Side Walls
 - 1. Will be sloped, shored, sheeted, braced, or otherwise supported by means of sufficient strength to protect workmen in accordance with applicable rules and regulations established for construction by the federal, state, and local ordinances and regulations.
 - 2. Sheet and brace where necessary and as specified herein.
 - 3. Excavate without undercutting.
- L. Trench Bottom
 - 1. Will be thoroughly protected and maintained when suitable natural materials are encountered.
 - 2. Will be thoroughly compacted and in approved condition prior to placing gravel bedding, if required.
 - 3. Where in earth, trench bottoms for 6 inches and smaller pipe may be excavated below pipe subgrade and granular embedment provided or the trench may be graded to provide uniform and continuous support between bell holes or end joints of the installed pipe at the Contractor's option
 - 4. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined.
 - 5. PVC pipe will not be laid directly on trench bottom
- M. Mechanical excavation
 - 1. Do not use where its operation would damage buildings, culverts, or other existing property, structures, or utilities above or below ground; hand excavate only in such areas.
 - 2. Use mechanical excavation equipment of a type and design which can be operated to provide the following:
 - a. Rough trench bottom to a controlled elevation.
 - b. Uniform trench widths and vertical sidewalls from one (1) foot above the top of the installed pipe to the bottom of the trench.
 - c. Trench alignment that pipe can be accurately laid to specified alignment and that pipe is centered in the trench with adequate clearance between pipe and trench sidewalls.
 - 3. Do not undercut trench sidewalls.
 - 4. Recompact trench bottom disturbed by bucket teeth prior to placement of embedment material.
- N. Except as otherwise required, excavate trenches below the underside of pipes as indicated in the approved drawings to provide for installation of granular embedment pipe foundation material.
- O. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined.
- P. Cuts in existing surface construction

Town of Mead Design Standards and Construction Specifications

1. No larger than necessary to provide adequate working space.
2. Breakout grooves shall be cut perpendicular to the surface of the pavement and shall be sawed full-depth to form a neat breakout line in the pavement. Alternately to full depth saw cuts, breakout grooves sawed to a minimum of 1½ inches will only be allowed with approval from the Town Engineer.
3. Remove pavement and base pavement to provide shoulder not less than six (6) feet wide between cut edge and top edge of trench.
4. Do not undercut trenches, resulting in bottom trench width greater than top widths.
5. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation. Make pavement cuts in patterns that will minimize the extents of pavement grooves beyond the edges of pavement to be removed.
6. Remove pavement for connections to existing lines or structures only to the extent required for the installation.
7. Removal and replacement of sidewalks or other concrete pavements shall be to the nearest existing joint not damaged by the construction.
8. Street and alley pavement removals:
 - a. Shall have no horizontal dimension less than three (3) feet.
 - b. Shall not leave any existing portion of pavement in place less than five (5) feet as measured to the nearest joint or edge of pavement.
 - c. Concrete curb and gutter that is parallel to the utility trench and of at least 12 inches in width may remain, provided that the curb and gutter is not damaged by the construction activity.
9. Replace the pavements between saw cuts to match original surface construction, or current pavement thickness standards, whichever is greater

3.14 PIPE EMBEDMENT

- A. Embed pipes above and below the bottom of pipe as indicated on the approved drawings and as specified herein.
- B. Granular embedment
 1. Spread and surface grade granular embedment to provide continuous and uniform support beneath pipe at all points between pipe joints.
 - a. Level bottom layer at proper grade to receive and uniformly support pipe barrel throughout length.
 - b. Barrel of pipe will have a bearing for its full length.
 2. Form depressions under each joint to permit the proper jointing. No part of joint will be in contact with trench when pipe is placed in position. After grading, aligning, and placing pipe in final position, deposit and compact sufficient embedment under and around each side of the pipe to hold the pipe in proper position and alignment during subsequent operations.
 3. Place and compact embedment material uniformly and simultaneously on both sides of pipe to prevent displacement.
 4. Complete embedment promptly after jointing operations and approval to proceed by Town Engineer.
 5. Compact granular embedment by slicing with shovel or vibrating.
 - a. Maximum uncompacted thickness of layers: six (6) inches

Town of Mead Design Standards and Construction Specifications

6. Compacted embedment will be compacted to 90 percent maximum density per ASTM D1557.
 - a. Maximum uncompacted depth thickness of horizontal layers: 8 inches
- C. Ground Water Barriers and Cut-off Walls
 1. To impede passage of water through bedding material, construct ground water barriers.
 - a. Horizontally extending one (1) foot minimum past either side of the full trench width and approximately two (2) feet of minimum thickness along the length of the utility pipe.
 - b. Vertically, extending one (1) foot minimum from the bottom of granular bedding material and one (1) foot minimum above the top of granular bedding material.
 2. Spacing:
 - a. Approximately 10 feet downstream of each manhole for sanitary sewers and storm drains.
 - b. Every 400 feet on water lines and force main.
 - c. Place a groundwater barrier 20 feet downstream of the edge of all drainage ways, streams and water courses.
 3. Minimum Compaction: 95% proctor
 4. Moisture Content: -1% to 2% Optimum Moisture Content
- D. Arch and concrete encasement
 1. Include in locations indicated on approved drawings or where over-width trench conditions need correction as approved by Town Engineer.
 2. Install and form as indicated on approved drawings.
 3. Concrete will have a 28-day minimum 4,000 psi compressive strength.
- E. Do not backfill until tests and inspections have been made and backfilling is authorized by Town Engineer. Use care in backfilling to avoid damage or displacement of pipe systems.

3.15 TRENCH BACKFILL

- A. Backfilling will be conducted in a continuous manner to prevent damage to the pipe and its coating and kept as close to the pipe laying operation as possible.
- B. Compacted backfill
 1. Compact the backfill to full depth of trench above embedment at all locations.
 2. Beneath pavements, surfacing, driveways, curbs, gutters, walks or other surface construction or structures.
 3. In street or highway shoulders.
 4. In established sodded areas.
 5. Beneath fills and embankments.
- C. Where the trench for one pipe passes beneath the trench of another pipe, compact the backfill for the lower trench to the bottom of the upper trench.
- D. Site excavated materials
 1. Place job excavated materials in eight (8) inches maximum uncompacted thickness, uniform layers.
 2. Increased layer thickness may be permitted for incohesive material if Contractor demonstrates to Town Engineer's satisfaction that specified compacted density will be achieved.

Town of Mead Design Standards and Construction Specifications

3. Use methods and equipment appropriate to the material to be compacted to prevent transmission of damaging shocks to pipe.
 4. Thoroughly compact each layer to meet the moisture and compaction specifications herein.
- E. Graded gravel
1. Deposit graded gravel in uniform layers of eight (8) inches maximum uncompacted thickness.
 2. Compact with suitable vibrating roller or platform vibrator to not less than 70 percent relative density per ASTM D4253/D4254.
- F. Uncompacted backfill
1. Compaction of backfill above pipe embedment, in locations other than those specified, is required to prevent future settlement.
 2. May be placed by any method acceptable to Town Engineer which will not impose excessive concentrated or unbalanced loads, shock, or impact on, and will not result in displacement of installed pipe.
 3. Until compacted depth over conduit exceeds three (3) feet, do not drop fill material over five (5) feet. Distance may be increased two (2) feet for each additional 1 foot of cover.
- G. Finish the top portion of backfill with at least four (4) inches of topsoil or as specified by landscaping specifications, whichever is greater, corresponding to, or better than, the underlying adjoining turf areas.
- H. Trench backfill within the public right-of-way shall conform to Town of Mead street and utility standards.
- I. Trench backfills through unimproved areas should be restored to previous conditions and left 3" above adjacent grades to allow for settlement. Seed all disturbed areas according to erosion control and landscape specifications.
- J. Protection of trench backfill
1. Where trenches are constructed in ditches or other water courses, protect backfill from erosion.
 2. Install ditch checks where the ditch grade exceeds one (1) percent.
 - a. Minimum depth: two (2) feet below the original ditch or water course bottom for the full bottom width
 - b. Minimum width: 18 inches minimum into the side slopes
 - c. Minimum thickness: 12 inches

3.16 DRAINAGE MAINTENANCE

- A. Do not backfill trenches across roadways, drives, walks or other trafficways adjacent to drainage ditches or water courses prior to backfilling the trench on the upstream side of the trafficway to prevent impounding water after pipe is laid.
- B. Backfill so that water does not accumulate in unfilled or partially filled trenches.
- C. Remove materials deposited in roadway ditches or other water courses crossed by the trench line immediately after backfilling is completed and restore ditches and water courses to original section, grade, and contours.
- D. Do not obstruct surface drainage any longer than necessary.
- E. Provide and maintain temporary bridges and other structures across unfilled trenches as required to maintain traffic.

Town of Mead Design Standards and Construction Specifications

- F. Provide adequate storm flow conveyance through the site at all times during construction to avoid flooding of any buildings or adjacent property. Provide overland drainage routing when storm sewer inlets are not fully functioning due to erosion and sediment control measures.

3.17 FINAL GRADING

- A. After completion of all other outside work, and after backfilling is completed and settled, bring to grade at the indicated elevations, slopes and contours and all areas being graded on site.
- B. Graders and other power equipment may be used for final grading and slope dressing if the result is uniform and equivalent to hand work.
- C. Grade all surfaces for effective drainage and provide a two (2) percent minimum slope except as otherwise shown on the approved drawings.
- D. Provide a smooth transition between adjacent existing grades and new grades.
- E. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- F. Slope grades to direct water away from buildings and prevent ponds from forming where not intended.
- G. Finish subgrades at lawns and unpaved areas to required elevations within a tolerance of plus or minus one (1) inch.
- H. Finish grades will be no more than 0.1 foot above or below those indicated on approved drawings.
- I. Finish all ditches, swales and gutters to drain readily.
- J. Coordinate final subgrade depth with finish landscape treatment and required topsoil depths.

3.18 SLOPE AND CHANNEL STABILIZATION

- A. Cover channel banks, slopes, bottom and thalweg (water flowline at lowest point in channel) with erosion control fabric mat where grade is steeper than 4H to 1V and where indicated on the approved drawings.
- B. Lay fabric smoothly on surface and bury top end of each section in 6-inch deep excavated topsoil trench. Provide 6-inch overlap minimum of adjacent rolls. Backfill trench, rake smooth, and level with adjacent soil.
- C. Secure outside edges and overlaps at 48-inch intervals with 4-inch to 6-inch U-shaped type pins or wooden stakes depending on ground condition.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges a minimum of six (6) inches.
- F. Maintain integrity of erosion control fabric.
- G. Prior to laying fabric, seed disturbed areas under provisions of related seeding and landscaping specification sections or as specified on approved drawings.

3.19 SETTLEMENT

- A. Warranty for settlement of all fills, embankments, and backfills is stipulated in the General Conditions from final completion of Contract under which work is performed.
- B. Repair or replace settlements of earthwork within 30 days after notice by the Town.

3.20 FIELD QUALITY CONTROL

- A. Fills and Embankment Testing
 - 1. Provide two moisture-density relationship tests, ASTM D698, on each type of fill material.

Town of Mead Design Standards and Construction Specifications

2. Provide one in-place compaction test for each 5,000 square feet and at every 1.5 feet of vertical lift of material placed.
 3. Provide additional in-place compaction tests at the discretion of the Town.
- B. Pipe Embedment and Backfill Testing
1. Provide two moisture-density relationship tests, ASTM D698, or two relative density tests, ASTM D4253/D4254, as appropriate for each type of embedment on backfill material proposed, except granular embedment material.
 2. Provide one in-place compaction test every 200 lineal feet of trench in the compacted embedment zone and at every 1.5 feet of vertical lift of backfill materials, per ASTM D6938.
 3. Provide one in-place compaction test near top of trench for trench depth of two (2) feet or less, per ASTM D6938.
 4. Provide additional in-place compaction tests at the discretion of the Town.
- C. Pavement and Structural Subgrade Testing
1. At a minimum, provide two moisture-density relationship tests, ASTM D698, or two relative density tests, ASTM D4253/D4254, as appropriate and adequate for each type of backfill material proposed.
 2. Perform tests for each footing, concrete site feature, and drainage structure subgrade. Perform tests at every 100 linear feet of subgrade of foundation walls, retaining walls, and every 150 feet for curbing, pans, drainage features, walks, etc. (or portions thereof). Perform tests every 2,000 square feet required of building slab area, exterior slabs and pavement/flatwork areas (with no less than three (3) tests). Test at subgrade and at every vertical lift of backfill materials placed.
 3. Additional in-place compaction tests at the discretion of the Town.

END OF SECTION 31 00 00

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Town of Mead Design Standards and Construction Specifications

SECTION 31 25 00 EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Minimum requirements for soil erosion and sedimentation control on all project sites where soil will be disturbed.
- B. Temporary measures needed to control erosion and water pollution. These temporary measures will include, but are not limited to, berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, and other erosion control devices or methods. These temporary measures shall be installed at the locations where needed to control erosion and water pollution during the construction of the project and during site restoration, and as directed by Town Engineer/Inspector, and as shown on the approved drawings.
- C. The erosion control plan, if presented in the approved drawings, serves as a minimum for the requirements of erosion control during construction.
- D. Contractor has the ultimate responsibility for providing adequate erosion control and water quality throughout the duration of the project. Therefore, if the provided plan is not working sufficiently to protect the project areas, then Contractor shall provide additional measures as required to obtain the required protection.

1.2 REFERENCES

- A. CDOT – Colorado Department of Transportation
- B. MHFD – Mile High Flood District
- C. UDFCD – Urban Drainage and Flood Control District
- D. CDPHE – Colorado Department of Public Health and Environment

1.3 SUBMITTALS

- A. Submit the following information
 - 1. Erosion Control Plan
 - 2. Construction schedule for Erosion Control per Scheduling paragraph below
 - 3. Sequencing Plan per Scheduling paragraph below
 - 4. All applicable permits for Grading and Erosion Control
- B. Product data: Submit on all products or materials supplied herein.

1.4 REGULATORY REQUIREMENTS

- A. 40 Codified Federal Regulations Part 122: EPA Administered Permit Programs: The National Pollutant Discharge Elimination System (NPDES)
- B. USEPA Summary Guidance Document 833-R-92-001: Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices
- C. Obtain and comply with all requirements of the Town issued Grading/Construction permits and CDPHE Stormwater and/or Groundwater Discharge Permits, as required.
- D. 401 Construction Dewatering Industrial Wastewater Permit (Construction Dewatering Permit 401):
 - 1. Contractor shall apply for and obtain a Construction Dewatering Permit 401 from the Colorado Department of Public Health and Environment.
 - 2. All costs for this permit shall be the responsibility of Contractor.

Town of Mead Design Standards and Construction Specifications

3. This permit requires that specific actions be performed at designated times.
 4. Contractor is legally obligated to comply with all terms and conditions of the permit including testing for effluent limitations.
 5. Contractor shall allow the Colorado Department of Public Health and Environment or other representatives to enter the site to test for compliance with the permit.
 6. Non-compliance with the permit can result in stoppage of all work.
- E. In the event of conflict between these requirements and erosion and pollution control laws, rules, or regulations of other Federal, State, or Weld County, the more restrictive laws, rules, or regulations shall apply.

1.5 SCHEDULING

A. Sequencing Plan

1. Contractor shall submit a sequencing plan for approval for erosion control in conformance with Contractor's overall Construction Plan for approval by the Town.
2. Changes to the Erosion Control Sequencing Plan may be considered by the Town only if presented in writing by the Contractor.

B. Temporary Erosion Control

1. Provide temporary erosion control when so indicated in the Contract Documents, or when directed by the Town. Contractor shall prepare construction schedules for accomplishing temporary erosion control work including all maintenance procedures.
2. These schedules shall be applicable to clearing and grubbing, grading, structural work, construction, etc.

C. Contractor shall submit for acceptance the proposed method of erosion control on haul roads and borrow pits, and a plan for disposal of waste material.

D. Contractor shall be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the accepted schedule. Temporary erosion control measures shall then be used to correct conditions that develop during construction.

E. Work shall not be started until the erosion control schedules and methods of operations have been accepted.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials shall be submitted for approval prior to installation.

B. Natural or biodegradable materials shall be reasonably clean, free of deleterious materials, and certified weed free. Materials may include, but are not limited to, hay bales, straw, fiber mats, fiber netting, wood cellulose, fiber fabric, gravel.

C. Grass Seed:

1. Temporary grass cover (if required) shall be a quick growing species, suitable to the area, which will provide temporary cover, and not compete with the grasses sown for permanent cover.
2. In accordance with Section 33 47 00 of the **Town of Mead Design Standards and Construction Specifications** prior to installation
3. All grass seed shall be approved by the Town prior to installation

D. Fertilizer and soil conditioners shall be approved by the Town and in accordance with Section 33 47 00 of the **Town of Mead Design Standards and Construction Specifications** prior to installation.

Town of Mead Design Standards and Construction Specifications

- E. Silt Fence Fabric: woven polypropylene
 - 1. Mirafi 100X, "Envirofence," or accepted substitution
- F. Temporary Slope Stabilization Mat (short term):
 - 1. Biodegradable
 - 2. Longevity of 12 months.
- G. Temporary Slope Stabilization Mat (extended term):
 - 1. Biodegradable
 - 2. Longevity of 24 months.
 - 3. North American Green, or accepted substitution

PART 3 EXECUTION

3.1 GENERAL

- A. All temporary and permanent erosion and sediment control practices will be maintained and repaired as needed to ensure continued performance of their intended function.
- B. The Town Engineer/Inspector will monitor Contractor's erosion control methods. If the overall function and intent of erosion control is not being met, the Town will require Contractor to provide additional measures as required to obtain the desired results.
- C. The erosion control features installed by Contractor shall be adequately maintained by Contractor until the project is accepted.

3.2 WORKING IN OR CROSSING WATERCOURSES AND WETLANDS:

- 1. Construction vehicles shall be kept out of watercourses to the maximum extent possible.
- 2. Where in-channel work is necessary, precautions shall be taken to stabilize the work area during construction to minimize erosion.
 - a. The channel, including bed and banks, shall always be restabilized immediately after in-channel work is completed.
- 3. Where a live (wet) watercourse must be crossed by construction vehicles during construction, a Temporary Stream Crossing shall be provided for this purpose.

3.3 PROTECTION OF ADJACENT PROPERTIES

- A. Properties adjacent to the site of a land disturbance shall be protected from sediment deposition.
- B. In addition to the erosion control measures that may be required on the approved drawings, perimeter controls may be required if damage to adjacent properties is likely, and may include, but is not limited to:
 - 1. Vegetated buffer strip around the lower perimeter of the land disturbance.
 - a. Vegetated buffer strips may be used only where runoff in sheet flow is expected and should be at least twenty (20) feet in width.
 - 2. Sediment barriers such as straw bales, erosion logs, and silt fences.
 - 3. Sediment basins and porous landscape detention ponds.
 - 4. Combination of above measures.

3.4 CONSTRUCTION

- A. Stabilization of Disturbed Areas:

Town of Mead Design Standards and Construction Specifications

1. Temporary sediment control measures shall be established within five (5) days from time of exposure or disturbance.
 2. Permanent erosion protection measures shall be established within five (5) days after final grading of areas.
- B. Stabilization of Sediment and Erosion Control Measures:
1. Sediment barriers, perimeter dikes, and other measures intended to either trap sediment or prevent runoff from flowing over disturbed areas shall be constructed as a first step in grading and be made functional before land disturbance takes place.
 2. Earthen structures such as dams, dikes, and diversions shall be stabilized within five (5) days of installation.
 3. Stormwater outlets shall also be stabilized prior to any upstream land disturbing activities.
- C. Stabilization of Waterways and Outlets:
1. All onsite stormwater conveyance channels used by Contractor for temporary erosion control purposes shall be designed and constructed with adequate capacity and protection to prevent erosion during storm and runoff events.
 2. Stabilization adequate to prevent erosion shall also be provided at the outlets of all pipes and channels.
- D. Storm Sewer Inlet Protection: All storm sewer inlets which are made operable during construction or which drain stormwater runoff from a construction site shall be protected from sediment deposition by the use of filters.
- E. Construction Access Routes:
1. Wherever construction vehicles enter or leave a construction site, a Stabilized Construction Entrance is required.
 2. Where sediment is transported onto a public road surface, the roads shall be cleaned thoroughly at the end of each day.
 3. Sediment shall be removed from roads by shoveling or sweeping and be transported to a sediment controlled disposal area.
 4. Street washing shall be allowed only after sediment is removed in the manner described above.

3.5 DISPOSITION OF TEMPORARY MEASURES

- A. All temporary erosion and sediment control measures shall be disposed of within thirty (30) days after final site stabilization is achieved or after the temporary measures are no longer needed as determined by the Town.
- B. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.
- C. Contractor will be responsible for maintaining temporary erosion control measures until such time as work has been accepted by the Town and as specified in the Grading Permit.

END OF SECTION 31 25 00

Town of Mead Design Standards and Construction Specifications

SECTION 32 12 00 FLEXIBLE PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Full depth and/or composite hot bituminous pavement (asphalt) over prepared subgrade.
- B. Overlay, patch and/or pavement rehabilitation applications for streets, parking lots and other miscellaneous asphalt pavement.

1.2 REFERENCES

- A. AASHTO T 230: Standard Method of Test of Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C29 – Unit Weight and Voids in Aggregate
 - 2. ASTM C88 – Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - 3. ASTM C117 - Materials Finer than No. 200 Sieve in Mineral Aggregates by Washing
 - 4. ASTM C128 – Specific Gravity Test and Absorption of Fine Aggregate
 - 5. ASTM C131 – Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - 6. ASTM C136 – Sieve or Screen Analysis of Fine and Coarse Aggregates
 - 7. ASTM D70 – Specific Gravity of Semi-Solid Bituminous Materials
 - 8. ASTM D2726 – Bulk Specific Gravity of Compacted Bituminous Mixtures
 - 9. ASTM D2041 – Theoretical Maximum Specific Gravity of Bituminous Paving Mixtures
 - 10. ASTM D4462 – Viscosity of Asphalts (Bitumens)
 - 11. ASTM D2172 – Quantities Extraction of Bitumens from Bituminous Paving Mixtures
 - 12. ASTM D2419 – Sand Equivalent Value of Soils and Fine Aggregate
 - 13. ASTM D290 – Bituminous Mixing Plant Inspection
 - 14. ASTM D6373 – Performance Graded Asphalt Binder
 - 15. ASTM D692 – Course Aggregate for Bituminous Paving
 - 16. ASTM D1073 – Fine Aggregate for Bituminous Paving Mixtures
 - 17. ASTM D1241 – Materials for Soil-Aggregate Subbase, Base and Surface Courses
 - 18. ASTM D2026 – Cutback Asphalt (Slow-Curing Type)
 - 19. ASTM D2027 – Cutback Asphalt (Medium-Curing Type)
 - 20. ASTM D2028 – Cutback Asphalt (Rapid-Curing Type)
 - 21. ASTM D2950 – Density of Bituminous Concrete in Place by Nuclear Methods
- C. Surface Preparation Standards (SSPC)
 - 1. SP-2: Superior Performing Asphalt Pavement System (Superpave) Level 1 Mix Design
- D. Colorado Department of Transportation
- E. Colorado Asphalt Pavement Association

Town of Mead Design Standards and Construction Specifications

1.3 SUBMITTALS

- A. Record of Work: Maintain record of time and date of placement, temperature, and weather conditions. Retain until completion and furnish a final copy to Town of Mead.
- B. Proposed Design Job Mix Formula for each mixture required by the work: the mixture design shall be determined using AASHTO T-312 or Colorado Procedure CP-L 5115 for the Superpave Method of Mixture Design.
- C. Test Reports: Proposed Design Job Mix testing shall be performed in a materials laboratory under the direct supervision of, and shall be stamped and signed by, a Professional Engineer licensed in the State of Colorado practicing in this field. In addition, the General Contractor shall submit as part of the Proposed Design Job Mix, documents to verify the following:
 1. Source of materials
 2. Gradation, specific gravity, source and description of individual aggregates and the final blend
 3. Aggregate physical properties
 4. Source and Grade of the Performance Graded Binder (PG Binder)
 5. Proposed Design Job Mix - aggregate and additive blending, final gradation shown on 0.45 power graph, optimum asphalt content
 6. Required mixing and compaction temperatures
 7. Mixture properties determined at a minimum of four asphalt contents and interpolated at optimum and graphs showing mixture properties versus asphalt content.
 8. Sampling and testing of asphalt concrete mixtures for quality control during paving operations
 - a. Uncompacted asphalt concrete mix
 - i. Asphalt cement content: ASTM D2172 (AASHTO T164)
 - ii. Maximum Specific Gravity: ASTM D2041 (AASHTO T209)
 - b. Compacted asphalt concrete mix
 - i. Bulk density: ASTM D1188 (AASHTO T166)
 - c. Perform at least one test for each day's paving, but not less than one test per each 4,000 sf of each lift.

1.4 QUALITY ASSURANCE

- A. Materials and installation shall conform to applicable portions of Colorado Department of Transportation (CDOT) and Town of Mead construction specifications, standards and details.

1.5 REGULATORY REQUIREMENTS

- A. For work on public streets or rights-of-way, conform to the requirements of **Town of Mead Design Standards and Construction Specifications** and details.
- B. Comply with applicable requirements of CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Transport mixture from mix plant in trucks with tight, clean, smooth, non-sticking compartments. Thinly coat hauling compartments with lime-water mixture, paraffin oil or other approved release agent to prevent sticking. Petroleum distillates such as kerosene or fuel oil are not approved release agents. Elevate and drain compartment of excess solution before loading mix.
- B. Cover loads to protect from weather and prevent loss of heat.

Town of Mead Design Standards and Construction Specifications

- C. Provide insulated truck beds during temperature below 50 degrees F on long distance deliveries.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place asphalt when underlying surface is muddy, frozen or wet.
- B. Place material only when weather conditions permit pavement to be properly placed and compacted.

The hot mix asphalt will be placed only when both the air and surface temperatures are equal to or exceed the temperatures specified in the table below:

CDOT Table 401-3: Placement Temperature Limitations in F

Compacted Layer Thickness (Inches)	Minimum Air and Surface Temp. (Degrees F and rising)	
	Top Layer	Other Layers
1½ or less	60	50
>1½ to 3	50	40
3 to 4	45	35

- C. Air temperature shall be taken in the shade. Surface is defined as the existing base on which the new pavement is to be placed.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Pavement shall be asphalt of the plant hot mix type. Materials and construction shall comply with Section 403 and 702 of the CDOT Standards and Specifications for Road and Bridge Construction.
- B. Tack Coat:
 1. SS-1 or CSS-1h
 2. AASHTO M208 or M140
- C. Asphaltic Cement
 1. Superpave Performance Graded (PG) binder of PG64-22 or PG58-28 Table 702-1 of CDOT standard section 702
 2. Will not be acidic modified or alkaline modified
 3. Will not contain any used oils that have not been refined
 4. Modifiers will not be carcinogenic
- D. Aggregate for Asphaltic Concrete
 1. Sound, angular crushed stone, crushed gravel, or crushed slag: ASTM D692
 2. Sand, stone, or slag screening: ASTM D1073
 3. Percent wear: ASTM C131, less than 45 for aggregates retained in #10 sieve
- E. Base Course Aggregates for Asphaltic Concrete
 1. Uncrushed gravel may be used in mixture if it meets design criteria specified.
 2. Provide uniform quality combined aggregates with a minimum sand equivalent value of 40.

Town of Mead Design Standards and Construction Specifications

3. Provide aggregate in gradations for courses to comply with Class S and SX, Colorado Department of Transportation, ASTM C136
 4. A maximum of 20% Reclaimed Asphalt Pavement (RAP) will be allowed in (non-polymer or non-rubberized) mixes, provided that all the requirements for hot bituminous pavement are met.
- F. Surface Course Aggregates for Asphaltic Concrete
1. Provide natural sand, unless sand prepared from stone, slag, or gravel or combinations are required to suit local conditions.
 2. Provide uniform quality combined aggregate with a minimum sand equivalent value of 50.
 3. Provide aggregate in gradations for courses to comply with Class S or SX, Colorado Department of Transportation, ASTM C136. Wearing surface course shall be Grading S or SX for residential roadway classification and Grading S for collectors, arterials, and all industrial/commercial roadways.
- G. Hydrated Lime for Aggregate:
1. May be added at the rate of 1% by dry weight of the aggregate and shall be included in the amount of material passing the No. 200 sieve. Hydrated lime for aggregate pretreatment will conform to ASTM C207, Type N. Residue retained on a No. 200 sieve will not exceed 10% when determined in accordance with ASTM C110. Drying of the residue in an atmosphere free from carbon dioxide will not be required.
- H. Weed Control:
1. First application: "Roundup," or accepted substitute.
 2. Second application: Casoron "W-50" or "G-10" with colored marker dye, manufactured by Pacific Coast Borax Company or an accepted substitute of non-flammable type.

2.2 ACCESSORIES

A. Traffic Control Devices

1. Signs.
 - a. Sign faces, posts and bases shall be in conformance with the following materials specifications. All nonstandard sign faces, posts and bases must be approved by the Town. Private property or nonstandard signs will be maintained by the property owner. Contact the Town for additional details and submit shop drawings for approval prior to fabrication. All signs shall conform to current M.U.T.C.D. Standards and Colorado Supplements.
2. Sign Posts.
 - a. For large signs greater than 12" W x 18" H and for multiple signs of any size mounted on the same post: sign posts shall be two (2) inch by two (2) inch galvanized telespar tube.
 - b. For regular single signs 12" W x 18" H or smaller: sign posts shall be one and one-half (1-1/2) inch by one and one-half (1-1/2) inch galvanized telespar tube.
 - c. Galvanized telespar tube shall have 0.120-inch wall thickness, and three-eighths (3/8) inch holes drilled on one (1) inch centers, on all sides over full length. Tube shall be minimum of ten (10) feet in length.
3. Sign Post Anchor Bases (Stubs): All sign post anchor bases shall be twist resistant square galvanized telespar tube post with thickness and hole pattern the same as sign posts. Use 2-1/4" by 2-1/4" anchor for large posts and 1-3/4" by 1-3/4" anchor for regular posts. Bases shall be embedded a minimum of 36" below finished grade and shall extend 3" above finished grade.

Town of Mead Design Standards and Construction Specifications

4. Signs Post Anchor Bases with concrete footing: Sign, post, base and compacted soil shall be rigid and able to withstand wind loads. Where predominantly clay soils are present which will not properly compact at sign base, install a 6" diameter by 36" deep concrete footing around signs post anchor base for all signs in landscaped areas.
 5. All signs and posts shall be mounted and secured with municipal-approved vandal-proof type TL-3896 drive rivets with washers, or accepted substitute.
 6. All posts shall be mounted and secured with break-away capability, per M.U.T.C.D.
- B. Pavement Marking: Specified pavement marking materials shall be used at locations as identified below.
1. Striping shall be white, blue, yellow and red color epoxy meeting requirements of CDOT Standard Specification 713. Verify colors and extent of epoxy prior to application. Unless noted on plans, evident at existing striping or instructed, provide white in color for traffic striping, parking stalls, and other control markings on parking zone pavement, yellow in color for traffic control markings or restricted parking or where indicated, blue in color for accessible parking stalls, and red in color for curbs where no parking is indicated. Reflectorized paint required for traffic stripes and control markings on public road or street pavements.
 2. 3M Stamark 5730 preformed plastic marking material or an accepted substitute shall be used for crosswalks, stop bars, symbols (i.e. turn arrows) and striping for separation of turn and through lanes in right-of-way.

2.3 MIXES/SOURCE QUALITY CONTROL

- A. Determine full depth design mix based upon aggregates furnished.
1. Test mix shall be provided by independent laboratory at Contractor's expense.
 2. Submit mix designs for review and acceptance by Town Engineer
- B. Submit mix design giving unit weight and to meet following requirements prior to placement of asphalt:

Property	S (75)	SX (75)
Air Voids in Mix %, (N Design)	3.5-4.5	3.5-4.5
Initial Gyration	7	7
Design Gyration	75	75
Hveem Stability	28 minutes	28 minutes
Voids Filled w/ Asphalt (%)	65 - 80	65 - 80

Town of Mead Design Standards and Construction Specifications

- C. Establish a single percentage passing each sieve size, a single percent of asphalt and a mix temperature. Maintain job mixes within following ranges of design mix:

Property	Allowable Range with Respect to Design Mix
Aggregate Sieve Size: ¾-inch and larger	± 6%
Aggregate Sieve Size: #4 - #8	± 5%
Aggregate Sieve Size: #30	± 4%
Aggregate Sieve Size: #200	± 2%
Asphalt Content Tolerance	± 0.3%
Discharge Mix Temperature Tolerance	± 20° F

PART 3 EXECUTION

3.1 EXAMINATION

- A. Establish and maintain required lines and elevations. Provide grade and location stakes under this section as required for asphaltic concrete paving work.
- B. Operate heavy, rubber-tired front loader or fully loaded water truck over subgrade of paved areas. Where soft spots occur, remove loose materials and replace with Class 5 or 6 road base aggregate complying with CDOT standards compacted to level of subgrade.

3.2 PREPARATION

- A. Prepare subgrade under provisions of Section 31 00 00 Earthwork
- B. Loose and Foreign Material
1. Remove loose and foreign material from compacted subgrade surface immediately before application of paving. Clean surface with mechanical sweeper, blowers, or hand brooms, until surfaces are free from dust.
- C. Weed Control
1. If weeds or vegetation exist at or on the subgrade, apply "Round-up" at rates following manufacturer's instructions. Apply "Round-up" three days prior to removal of vegetation, subgrade preparation and application of Casoron as described below to allow "Round-up" to kill all vegetation. Remove all living and dead weeds, root balls, tree/shrub roots, vegetation, and/or any organic matter from on or in the subgrade per applicable earthwork specifications prior to subgrade preparation and paving at all areas to be paved.
 2. After all fine grading, checking, shaping, and compacting of the subgrade has been completed, and just prior to placing asphalt or aggregate base course, all subgrade soil in the area to receive asphalt pavement shall be thoroughly treated with Casoron soil sterilant (in addition to "Round-up" and regardless of presence of existing weeds or vegetation). Casoron shall be thoroughly sprinkled to distribute the chemical through the first two or three inches of the subgrade. For all areas to be paved, apply Casoron weed control at a minimum rate per 100 square yards of 2.4 pounds for G-10 or 4.0 pounds for 50w at rates and methods recommended by manufacturer within one day of paving.
 3. The Contractor shall provide all necessary protection to prevent injury to animal, fish, or plant life and property occasioned by the application of the soil sterilant. Apply on a calm, wind-free day. The Contractor will be held responsible for all application of soil sterilant or the storage of same. Protect existing and new trees and shrubs beyond the limit of paving from damage due to weed killer or soil sterilant overspray or root contact. Extra caution is required to prevent over-application of products in areas to be paved under tree canopies. Trees and shrubs damaged or killed by weed killer or sterilant application shall be replaced by the contractor at contractor's expense.
 4. Do not apply within 20 feet of trees or shrubs.

Town of Mead Design Standards and Construction Specifications

D. Tack Coat

1. Apply in similar manner as prime coat, except as modified.
2. Dilute material with equal parts of water and apply to contact surfaces of previously constructed asphaltic concrete or Portland cement concrete and surfaces.
3. Apply at rate of 0.05 to 0.15 gallons per square yard of surface using a mechanical distributor (for main line paving).
4. Apply tack coat by brush to contact surfaces of curbs, gutters, catch basins, and other structures projecting into or abutting asphaltic concrete pavement.
5. Allow surfaces to dry until material is at condition of tackiness to receive pavement.

3.3 COLD MILLING

- A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
 1. Mill to minimum depth of 1 ½-inches, or as indicated on the plans.
 2. Mill to a uniform finished surface free of gouges, grooves, and ridges of more than ¼ inch depth.
 3. Control rate of milling to prevent tearing of existing asphalt course.
 4. Repair or replace curbs, manholes, and other construction damaged during cold milling.
 5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
 6. Transport milled hot-mix asphalt to asphalt recycling facility. Town may request that material be stockpiled at Town facility.
 7. Keep milled pavement surface free of loose material and dust.

3.4 RING/FRAME ADJUSTMENTS

- A. Set ring/frames of subsurface structures to final grade as a part of this work.
- B. Placing Ring/Frames
 1. Surround ring/frames set to elevation with a ring of compacted asphalt or concrete base prior to paving.
 2. Place asphalt concrete mixture up to 1-inch below top of ring/frame, slope to grade, and compact by hand tamping.
- C. Adjust frames to proper position to meet paving.
- D. If permanent covers are not in place, provide temporary covers over openings until completion of rolling operations.
- E. Set ring/frames to grade, flush with surface of adjacent pavement.

3.5 PREPARING THE MIXTURE

- A. Comply with ASTM D995 for material storage, control, and mixing and for plant equipment and operation.
- B. Stockpile
 1. Keep each component of the various sized combined aggregates in separate stockpiles.
 2. Maintain stockpiles so that separate aggregate sizes will not be intermixed and to prevent segregation.

Town of Mead Design Standards and Construction Specifications

C. Heating

1. Heat the asphalt cement at the mixing plant to viscosity at which it can be uniformly distributed throughout mixture.
2. Use lowest possible temperature to suit the temperature viscosity characteristics of asphalt.
3. Do not exceed 350 degrees F.

D. Aggregate

1. Heat-dry aggregates to acceptable moisture content.
2. Deliver to mixer at recommended temperature to suit the penetration grade and viscosity characteristics of asphalt cement, ambient temperature, and workability of mixture.
3. Accurately weigh or measure dry aggregates and weigh or meter asphalt cement to comply with job-mix formula requirements.

- E. Mix aggregate and asphalt cement to achieve 90-95 percent coated particles for base mixtures and 85-90 percent coated particles for surface mixture, per ASTM D2489.

3.6 EQUIPMENT

A. Bituminous Pavers:

1. Pavers shall be self-propelled, spread material without tearing surfaces, be equipped with an activated screed assembly, be heated if necessary, control pavement edges to true lines without use of stationary forms and capable of spreading and finishing the asphalt plant mix material in widths applicable to the typical sections and thicknesses for the work.
2. Pavers used for roadway shoulders, recreational paths and similar construction will be capable of spreading and finishing the courses of asphalt plant mix material in widths shown in the contract documents.
3. Pavers will be equipped with automatic screed controls with sensors capable of sensing grade from an outside reference line, and maintaining the screed at the specified longitudinal grade and transverse slope. The sensor will be constructed to operate from either or both sides of the paver and will be capable of working with the following devices:
 - a. Ski-type device at least 30 feet in length
 - b. Short ski or short shoe
 - c. At least 5,000 feet of control line and stakes
4. The controls will be capable of maintaining the screed at the specified transverse slope within plus or minus 0.1 percent.
5. Manual operation will be permitted:
 - a. For constructing irregularly shaped or minor areas
 - b. If the automatic controls fail or malfunction the equipment may be operated manually for the remainder of the normal working day, provided specified results are obtained. However, if specified surface tolerances cannot be achieved, paving operations will be suspended until satisfactory correction, repairs of equipment or replacements are made.
6. Placement of hot mix asphalt on a waterproofed bridge deck shall be accomplished with equipment that will not damage the membrane or other protective covering.

B. Rolling Equipment

1. Steel-wheel roller: Self-propelled, contact pressure of 250 to 350 psi per inch of width of roller wheel, equipped with adjustable scrapers and means for keeping wheel wet to prevent mix from sticking.

Town of Mead Design Standards and Construction Specifications

- 2. Pneumatic-tired rollers: Self-propelled, contact pressure under each tire of 85 to 110 psi, wheels spaced so that one pass will accomplish one complete coverage equal to rolling width of machine, oscillating wheels. Remove and replace immediately tires picking up fines.
- C. Hand Tools: Provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools as required.

3.7 PLACING THE MIX

- A. Place asphalt concrete mixture on prepared surface, spread and strike-off using paving machine.
- B. Complete placement over full width of section on each day's run.
- C. Spread mixture at minimum temperature specified by CDOT Table 401-5 for the specific binder used in the asphalt mix:
 - 1. PG 64-22: 320 F minimum mix discharge temperature, 235 F minimum delivered mix temperature
 - 2. PG 58-28: 275 F minimum mix discharge temperature, 235 F minimum delivered mix temperature
 - 3. The maximum mix discharge temperature shall not exceed the minimum discharge temperature by more than 30 F.
 - 4. Delivered mix temperature shall be measured behind the paver screed.
 - 5. Hot asphalt mixture shall be produced at the lowest temperature with the specified temperature range:
 - a. A workable mix that provides for uniform coating of aggregates, in accordance with AASHTO T195.
 - b. Allowing the required compaction to be achieved.
- D. Inaccessible and small areas may be placed by hand.
- E. Conform to the grade, cross section, finish thickness, and density indicated.
- F. Lift Thickness
 - 1. Place in multiple lifts. Place asphalt in lifts such that each compacted lift thickness is no less than 2.0" thick and no greater than 3.0" thick. Top lift to be 2" thick.
 - 2. Typical Lift Thickness Sequencing:

Final Asphalt Section Required (inches)	No. of Lifts	Thickness of each Lift from bottom to top lift (inches)
2"	1	2
3"	1	3
4"	2	2-2
5"	2	3-2
6"	3	2-2-2
7"	3	3-2-2
8"	3	3-3-2
9"	4	3-2-2-2
10"	4	3-3-2-2
>10	Review with Town Engineer	

Town of Mead Design Standards and Construction Specifications

G. Paver Placing

1. Unless otherwise directed, place pavers along centerline of areas in crowned section and at high side on one-way slope and in direction of traffic flow.
2. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips.
3. Complete base courses before placing surface courses.
4. Place mixture in as continuous an operation as practicable.

H. Hand Placing

1. Spread, tamp, and finish mixing using hand tools in areas where machine spreading is not possible as acceptable to Town Engineer.
2. Place mixture at a rate that will insure handling and compaction before mixture becomes cooler than acceptable working temperature.

I. Joints

1. Construct transverse joint at right angles to centerline when operations are suspended long enough for mixture to chill.
2. Construct joints to have same texture, density, and smoothness as adjacent sections of asphalt concrete course.
3. Clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
4. Offset transverse joints in succeeding courses not less than 24 inches.
5. Cut back edge of existing pavement or previously placed course to expose an even, vertical surface for full course thickness.
6. Offset longitudinal joints in succeeding courses not less than 6 inches.
7. When the edges of longitudinal joints are irregular, honeycombed or inadequately compacted, cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.
8. Wearing course constructed in even number of strips; place 1 longitudinal joint on centerline of road.
9. Wearing course constructed in odd number of strips; place the centerline of 1 strip on centerline of road.
10. Joints shall not be placed in traffic wheel paths.

- J. Gutter: Finish surface high adjacent to concrete gutter so when compacted surface is slightly higher than edge of curb and flashing.

3.8 COMPACTING THE MIX

- A. All paving will be compacted to 94 +/- 2% of Maximum Theoretical (RICE) density, CP-51 or AASHTO T209: Maximum Specific Gravity of Bituminous Paving Mixtures, as determined by ASTM D 2950. RICE values will be used in calculating Relative Compaction according to CP-44 or AASHTO T166.
- B. Provide pneumatic and steel-wheel type rollers to obtain the required pavement density, surface texture and rideability.
- C. Begin rolling operations when the mixture will bear weight of roller without excessive displacement and complete as quickly as possible after placement occurs.

Town of Mead Design Standards and Construction Specifications

- D. Compaction operations will be continuous until the required density is achieved or the density requirements are not met and the mix temperature falls below 185° F or there is obvious surface distress or breakage. Minimum compaction temperatures may be adjusted according to the asphalt binder supplier recommendations. Adjusted minimum compaction temperatures must be shown on the approved mix design or on the asphalt binder supplier documentation kept on file at the jobsite.
- E. Do not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.
- F. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- G. Start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. Roll to slightly different lengths on alternate roller runs.
- H. Do not roll centers of sections first under any circumstances.
- I. Breakdown Rolling
 - 1. Accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and outside edge.
 - 2. Operate rollers as close as possible to paver without causing pavement displacement.
 - 3. Check crown, grade, and smoothness after breakdown rolling.
 - 4. Repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- J. Second Rolling
 - 1. Follow breakdown rolling as soon as possible, while mixture is hot and in condition for compaction.
 - 2. Continue second rolling until mixture has been thoroughly compacted.
- K. Finish Rolling
 - 1. Perform finish rolling while mixture is still warm enough for removal of roller marks by combination of steel and pneumatic rollers.
 - 2. Continue rolling until roller marks are eliminated and course has attained specified density, and required surface texture and surface tolerances.
 - 3. After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. Erect barricades to protect paving from traffic until mixture has cooled and attained its maximum degree of hardness.
- L. Patching
 - 1. Remove and replace defective areas.
 - 2. Cut-out and fill with fresh, hot asphaltic concrete.
 - 3. Remove deficient areas for full depth of course.
 - 4. Saw cut sides perpendicular and parallel to direction of traffic with edges vertical.
 - 5. Apply tack coat to exposed surfaces before placing new asphaltic concrete mixture.
 - 6. Compact by rolling to specified surface density and smoothness.

3.9 JOINING TO EXISTING WORK

- A. Saw cut sides vertically and apply tack coat to exposed asphalt surfaces before placing new pavement. Meet existing thickness of surface and base courses, but not less than specified for new work.

Town of Mead Design Standards and Construction Specifications

- B. All joints shall be compacted to 94.0% +/- 3.0% of RICE, taken fully on each side of joint, every 200 lineal feet. RICE values shall be used in calculating Relative Compaction according to AASHTO T166.

3.10 FIELD QUALITY CONTROL

- A. The Contractor will engage a certified testing agency to perform field testing to determine compliance of in-place asphaltic concrete paving materials and compaction.
- B. It is the Contractor's responsibility to initiate, coordinate and accommodate all required tests and inspections.
- C. Testing Agency will test in-place pavement for density and thickness.
- D. Asphalt density testing:
 - 1. Every one-hundred fifty (150) lineal feet per driving lane
 - 2. Every 2,000 square feet of parking lot
 - 3. Densities shall be between ninety-four percent (94%) and ninety-six percent (96%) of the RICE unit weight
- E. Contractor to verify final surfaces are of uniform texture, conforming to required grades and cross sections.
- F. The Contractor will core the pavement as required by the testing agency for field density tests in accordance with AASHTO T 230, Method B, or for field calibration of nuclear density equipment in accordance with ASTM D 2950.
 - 1. Minimum testing frequency shall be 1/500 lane feet per lift (min. of 1 per street) or as directed by the Town or testing agency.
 - 2. Testing agency will take not less than 4-inch diameter pavement specimens.
 - 3. At the testing agency's discretion, cores may be required at the beginning of placement of each pavement layer or change of mixture materials or gradation.
 - 4. Untested areas during placement will require cores to be taken to verify compaction.
 - 5. Contractor to repair holes from test specimens.
- G. For each completed course or from locations directed by the testing agency, and at a minimum, a representative asphalt pavement sample shall be taken from the first one thousand (1,000) tons, and all mix properties shall be verified. The percent voids filled with asphalt cement, Hveem stability, and Lottman shall be verified at a minimum of every ten thousand (10,000) tons. Asphalt testing shall comply with ASTM D1559. Two copies of all test reports shall be submitted directly to the Town Engineer.
- H. Acceptable density of in-place course materials is between 92 and 96 percent of the recorded laboratory RICE unit weight. Immediately re-compact asphaltic concrete not conforming to acceptable density. Remove and replace all sections not in conformance density requirements.
- I. Thickness: Variations from approved drawings
 - 1. Base course: 1/4-inch +
 - 2. Remove and replace paving less than minimum thickness
- J. Grade Tolerance: ±0.1 feet
- K. Surface Smoothness
 - 1. Test using a 10-foot straight edge applied parallel to direction of drainage.
 - 2. Advance straight edge five feet, maximum 1/4-inch per foot from nearest point of contact.
 - 3. Do not permit pockets or depressions where water may pool.

Town of Mead Design Standards and Construction Specifications

4. Remove and replace areas, deficient in smoothness. Overlay corrections may be permitted only if acceptable to the Town.
- L. Inspection: The work of this section is subject to the inspection and approval of the Town. The following inspections are required:
 1. Protection of adjacent property
 2. Staking and establishment of elevations
 3. Establishment and compaction of subgrade
 4. Placement and compaction of bituminous base course and wearing surface
 5. Final inspection
 6. Obtain approval of each element of work listed above in sequence of its completion before proceeding with the next item

3.11 CLEANING

- A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of the Town.

3.12 PROTECTION OF FINISHED WORK

- A. After final rolling, do not permit vehicular traffic on asphalt concrete pavement until it has cooled and hardened, and in no case sooner than 6 hours.
- B. Provide barricades and warning devices as required to protect pavement and the general public.

3.13 WARRANTY

- A. Provide installer's 2-year written warranty endorsed by the contractor warranting the pavement from creeping, shoring, cracking, softening, settling, ponding and other defects due to improper placing or defective materials. Replace defective materials upon notification by the Town in accordance with the requirements of the original work.

3.14 SCHEDULE OF MIX PLACEMENT:

- A. Refer to approved drawings for asphalt thickness and subgrade requirements.

END OF SECTION 32 12 00

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Town of Mead Design Standards and Construction Specifications

SECTION 32 13 00 RIGID PAVING AND FLATWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Forming, jointing, placing and curing of concrete pavements, curbs, gutters, cross pans, islands and sidewalks.

1.2 REFERENCES

- A. AASHTO M171 – Sheet Materials for Curing Concrete
- B. ACI – American Concrete Institute
 - 1. ACI 214 – Recommended Practice for Evaluating Compression Test Results of Field Concrete
 - 2. ACI 301 – Specifications for Structural Concrete for buildings
 - 3. ACI 304 – Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
 - 4. ACI 305/305R – Hot Weather Concreting
 - 5. ACI 306/306R – Cold Weather Concreting
 - 6. ACI 308 – Standard Practice for Curing Concrete
- C. ASTM
 - 1. ASTM A1064 – Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed for Concrete
 - 2. ASTM A615 – Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 3. ASTM C31 – Making and Curing Concrete Test Specimens in the Field
 - 4. ASTM C33 – Concrete Aggregates
 - 5. ASTM C39 – Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 6. ASTM C94 – Ready Mix Concrete
 - 7. ASTM C143 – Test Method of Slump of Hydraulic Cement Concrete
 - 8. ASTM C150 – Portland Cement
 - 9. ASTM C260 – Air-Entraining Admixtures for Concrete
 - 10. ASTM C309/AASHTO M148 – Liquid Membrane-Forming Compounds for Curing Concrete
 - 11. ASTM C494 – Chemical Admixtures for Concrete
 - 12. ASTM C618 – Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
 - 13. ASTM C1116 – Fiber Reinforced Concrete
 - 14. ASTM D994 – Preformed Expansion Joint Filler for Concrete (Bituminous Type)
 - 15. ASTM D6690 – Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
 - 16. ASTM C979 – Pigments for Integrally Colored Concrete
 - 17. ASTM D1751 – Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction

Town of Mead Design Standards and Construction Specifications

- 18. ASTM D1752 – Preformed Sponge Rubber Cork Expansion and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction
- D. CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.
- E. Colorado Department of Transportation (CDOT)
- F. Town of Mead Design Standards and Construction Specifications

1.3 SUBMITTALS

- A. Product Data: Provide sufficient information on mix design and products specified to verify compliance with specifications. Provide data on joint filler admixtures and curing compounds.
 - 1. Existing data on proposed design mixes, certified and complete
 - 2. Submit reports of field quality control testing

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301: Conform materials and installation to applicable portions of Colorado Department of Transportation, and the Town of Mead.

1.5 REGULATORY REQUIREMENTS

- A. For work on public streets or rights-of-way conform to the requirements of **Town of Mead Design Standards and Construction Specifications** and details for the construction of curbs, gutters, sidewalks, driveways, Street Paving, and other public right-of-way Improvements.
- B. Comply with applicable requirements of CABO/ANSI A117.1 for accessibility requirements related to walks, ramps, parking areas, drives, curb ramps, etc.
- C. Obtain cementitious materials and aggregate from same source for all work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Reinforcing steel: Store on supports which will keep materials from contact with the ground and cover.
- B. Rubber and plastic materials: Store in a cool place. Do not expose to direct sunlight.
- C. Prepare a delivery ticket for each load of ready-mixed concrete.
- D. Contractor shall submit tickets for all concrete delivered to site which document the following:
 - 1. Quantity delivered
 - 2. Actual quantity of each material in batch
 - 3. Outdoor temp in the shade
 - 4. Time at which cement was added
 - 5. Numerical sequence of the delivery
 - 6. Quantity of water that can be added in the field based on mix design
 - 7. Free moisture in fine and coarse aggregate in percent by weight
 - 8. Temperature of batch

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.
- B. Protect concrete from rapid loss of moisture during hot weather placement.

Town of Mead Design Standards and Construction Specifications

PART 2

2.1 MATERIALS

A. Form Materials

1. Plywood: PS 1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete Grade B or better
2. Fiberboard: FS LL-B-810, Type IX, tempered, waterproof, screen back, concrete form hardboard
3. Capable of supporting loads imposed by construction equipment, straight and free from warp. Clean and strong enough to resist pressure of concrete when placed and retain horizontal and vertical alignment. Coat forms with a non-staining form release agent that will not discolor or deface the surface of the concrete.
4. Joint filler: ASTM D1751 or D1752 type; 3/4-inch thick unless indicated otherwise

B. Reinforcement

1. Where reinforcement is specified herein or indicated on the approved drawings:
 - a. Bars: ASTM A615, Grade 60
 - b. Reinforcing Welded Wire Fabric (WWF): ASTM A1064, steel, 16 gage minimum
 - c. Furnish in flat sheets
 - d. Dowels: ASTM A615; 40 ksi yield, Grade 60, plain steel, unfinished finish
 - e. Fibrous reinforcement: Collated, fibrillated, polypropylene fibers, tensile strength 70,000 psi
 - i. ASTM C1116
 - ii. Use 1.5 lbs. Per cubic yard minimum
 - iii. Fibermesh or accepted substitution

C. Weed Control: First application, "Roundup." Second application, Casoron "W-50" or "G-10" with colored marker dye, manufactured by Pacific Coast Borax Company or an accepted substitute of non-flammable type.

D. Detectable Warning Plates

1. Detectable warning plates shall consist of cast iron domes and be prefabricated by the manufacturer as a pattern on embeddable cast iron surface plates and meet AASHTO M 333-16 requirements. The final surface shall meet the requirements given in R305 of the PROWAG.
2. DWS provide a cue to pedestrians with visual impairments and are required to contrast visually with the surrounding surface (light on dark or dark on light). The domes and their underlying surface shall contrast visually with adjacent gutter, street or highway, or pedestrian access route surface, either light-on-dark or dark-on light, per R305.1.3 of the PROWAG.
3. The truncated dome pattern of the DWS should be aligned so that the rows of domes are parallel to the direction of pedestrian travel.
4. Prior to installation of the plates, concrete shall be installed and consolidated as a base for the plates. The concrete shall be placed to a thickness that will allow the base surface of the plates to be at the same elevation as the adjacent concrete.

2.2 ACCESSORIES

- #### A. Curing Compound: ASTM C309, AASHTO M-148, white pigmented liquid membrane

Town of Mead Design Standards and Construction Specifications

- B. Joint Sealers: Polyurethane base, elastomeric, self-leveling, chemical cure, handling 50% joint movement; Sikaflex-2C-SL or accepted substitutions
- C. Sheet Materials: AASHTO M171, 4 millimeters
- D. Expansion Joint Material: 0.5-inch thick, ASTM D1751, asphalt impregnated fiber board, glass fiber or sponge, or closed cell polyethylene foam; Texmastic "vinylex 3600," Sonneborn "Sonoflex F," or accepted substitutions

2.3 CONCRETE MIX

- A. Comply with ASTM C94
- B. Maximum Coarse Aggregate Size: 1-inch
- C. Portland Cement: ASTM C150, Type II; 555 pounds minimum per cubic yard of concrete
- D. Water/Cementitious Material (Cement and Fly Ash) Ratio: Less than or equal to 0.45
- E. Slump: 4-inch maximum
 - 1. May be increased to 4.5 inches for hand work, acceptable to Town.
 - 2. As low as possible consistent with proper handling and thorough compaction.
- F. Volumetric Air Content: 5 – 8% by volume (per CDOT Table 601-1)
 - 1. Vary air content with maximum size aggregate, ASTM C94, Table 3.
- G. Strength: Compressive strength as determined by ASTM C39, 4,500 psi minimum at 28 days
- H. Consistency: Uniform slump, suitable for the placement conditions with aggregate floating uniformly throughout the concrete mass, flowing sluggishly when vibrated or spaded.
- I. Adjust mix as required to meet specifications.
- J. Approved fly ash may be substituted for ASTM C150 cement up to a maximum of 25 percent Class C or Class F by weight of the cementitious material content. Fly ash for concrete shall conform to the requirements of ASTM C618 with the following exceptions:
 - 1. The loss on ignition shall not exceed 3.0 percent
 - 2. The CaO in Class F fly ash shall not exceed 18 percent
- K. Admixtures: Content, batching method, and time of introduction in accordance with the manufacturer's recommendations for compliance with this specification.
- L. Include a water reducing admixture.
- M. Calcium chloride content shall not exceed 0.05% of the cement content by weight.
- N. Fiber reinforcement required for all concrete flatwork, including curb and gutter, sidewalk, and pavement. Add fiber reinforcement to mix at plant prior to delivery to jobsite.

2.4 SOURCE QUALITY CONTROL AND TESTS

- A. Submit proposed mix design to Town of Mead for review and approval prior to commencement of work.
- B. Tests on cement and aggregates will be performed to ensure conformance with specified requirements.
- C. Test samples in accordance with ACI 301.

Town of Mead Design Standards and Construction Specifications

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that the compacted subgrade is acceptable and ready to support paving and imposed loads.
- B. Verify that the gradients and elevations of base are correct.
- C. Check completed formwork for grade and alignment to the following tolerances:
 - 1. Top of forms not more than 1/8-inch in 10 feet
 - 2. Vertical face on longitudinal axis, not more than 1/4-inch in 10 feet

3.2 PREPARATION

- A. Subgrade
 - 1. Prepare subgrade in accordance with Section 31 00 00 – Earthwork.
 - 2. Moisten subgrade to depth of 6 inches at optimal moisture not more than 12 hours prior to placement to minimize absorption of water from fresh concrete.
 - 3. Check for soft spots by proof-rolling or other means prior to setting forms. Remove soft yielding material and replace. Compact to specifications under provisions of Section 31 00 00 – Earthwork.
 - 4. Check crown and/or elevation of subgrade to assure specified thickness. Compact to specification additional material used to bring to correct elevation. Remove excess material where subgrade is too high.
 - 5. Clean subgrade of all loose materials before placement of concrete. Do not disturb area inside forms after fine grading is complete.
- B. Weed Control
 - 1. If weeds or vegetation exist at or on the subgrade, apply “Round-up” at rates following manufacturer’s instructions. Apply “Round-up” three days prior to removal of vegetation, subgrade preparation and application of Casoron as described below to allow “Round-up” to kill all vegetation. Remove all living and dead weeds, root balls, tree/shrub roots, vegetation, and/or any organic matter from on or in the subgrade per applicable earthwork specifications prior to subgrade preparation and paving at all areas to be paved.
 - 2. After all fine grading, checking, shaping, and compacting of the subgrade has been completed, and just prior to placing asphalt or aggregate base course, all subgrade soil in the area to receive asphalt pavement shall be thoroughly treated with Casoron soil sterilant (in addition to “Round-up” and regardless of presence of existing weeds or vegetation). Casoron shall be thoroughly sprinkled to distribute the chemical through the first two or three inches of the subgrade. For all areas to be paved, apply Casoron weed control at a minimum rate per 100 square yards of 2.4 pounds for G-10 or 4.0 pounds for 50w at rates and methods recommended by manufacturer within one day of paving.
 - 3. The Contractor shall provide all necessary protection to prevent injury to animal, fish, or plant life and property occasioned by the application of the soil sterilant. Apply on a calm, wind-free day. The Contractor will be held responsible for all application of soil sterilant or the storage of same. Protect existing and new trees and shrubs beyond the limit of paving from damage due to weed killer or soil sterilant overspray or root contact. Extra caution is required to prevent over-application of products in areas to be paved under tree canopies. Trees and shrubs damaged or killed by weed killer or sterilant application shall be replaced by the contractor at contractor’s expense.
 - 4. Do not apply within 20 feet of trees or shrubs.

Town of Mead Design Standards and Construction Specifications

C. Frame Adjustment

1. Coat surfaces of manhole and catch basin frames with oil or approved board breaker to prevent bond with concrete pavement for concrete collars.
2. Set frames of structures in full grout bed to provide bearing. Set to final grade.
3. Form construction joints and blockouts as indicated on approved drawings.

3.3 PERFORMANCE AND INSTALLATION

A. Transporting mixed concrete

1. Transporting of mixed concrete shall conform to ACI 305R.
2. Do not exceed manufacturer's guaranteed capacity of truck agitators. Maintain the mixed concrete in a thoroughly mixed and uniform mass during handling.
3. Do not incorporate additional mixing water into the concrete during hauling or after arrival at the delivery point, unless ordered by the Town. If additional water is to be incorporated into the concrete, revolve the drum not less than 30 revolutions at mixing speed after the water is added and before placing concrete.
4. Furnish a water measuring device in good working condition, mounted on each transit mix truck, for measuring the water added to the mix on the site by the Town.
5. Provide delivery ticket and comply with delivery requirements of this Section.

B. Forming

1. Place and secure forms to correct location, dimension, profile, and gradient.
2. Install sufficient quantity of forms to allow continuous progress of work so that forms can remain in place at least 24 hours after concrete placement.
3. Join neatly and mechanically tamp to assure firm placement. Assemble formwork to permit easy stripping and dismantling without damaging concrete.
4. Oil forms prior to concrete placement.
5. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.
6. Set dowels, expansion joints, preformed construction joints and header boards as specified or indicated on the approved drawings.
7. Low roll or mountable curbs may be formed without the use of face form by using a straight edge and template to form curb face.
8. Backfill behind forms as required to prevent water from entering subgrade.

C. Reinforcement

1. Add fiber reinforcement to mix at plant prior to delivery to jobsite.
2. Place reinforcement at mid-height of slabs-on-grade or as shown on the approved drawings
 - a. Install in as long lengths as possible. Lap adjoining pieces at least one full mesh and lace with wire.
 - b. Support with metal chairs. Brick or stone is unacceptable.
3. Hold all tie and marginal dowels in proper position by sufficient supports or pins.
4. Mechanically install dowels or place on supports if center longitudinal joint is sawed in lieu of placing plastic strip.
5. Interrupt reinforcement at expansion joints.

Town of Mead Design Standards and Construction Specifications

6. Place dowels to achieve pavement and curb alignment as detailed.
7. Provide doweled joints at interruptions of concrete with one end of dowel set in capped sleeve to allow longitudinal movement.
8. Grease dowels on one side of joints with caps on greased end.

D. Placing concrete

1. Place concrete in accordance with ACI 301.
2. Lightly moisten subgrade or base course immediately before placing concrete.
3. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
4. Deposit concrete near final position. Minimize segregation and damage to subgrade.
5. Place concrete continuously over the full width of the panel and between predetermined construction joints. Spread mechanically to prevent segregation and separation of materials.
6. Consolidate concrete with vibrators and spade next to forms to remove air spaces or honeycombs.
7. Do not place concrete in forms that has begun to set.
8. Do not place more concrete in one day than can be finished before dark the same day.
9. Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.
10. Walks: Construct sidewalks with a minimum thickness of 6-inches per Town of Mead standard details. Tool edges to rounded profile and finish as specified or as shown on the approved drawings. Pitch walks 1/4-inch per foot for cross drainage unless otherwise indicated.

E. Cold Weather Concreting

1. Conform to ACI 306/306R, except as modified herein.
2. Minimum concrete temperature at the time of mixing will conform to the following table:

Outdoor Temperature at Placement, as measured in the shade	Minimum Concrete Temperature at Mixing
Below 30°F	70°F
Between 30°F & 45°F	60°F
Above 45°F	45°F

3. Do not place heated concrete which is warmer than 80 degrees F
4. If freezing temp are expected during curing, maintain the concrete temp at or above 50 degrees F for 5 days or 70 degrees F for 3 days with forms in place.
5. Do not allow concrete to cool suddenly.

F. Hot Weather Concreting

1. Conform to ACI 305/305R, except as modified herein.

Town of Mead Design Standards and Construction Specifications

2. At air temperature of 90 degrees F and above keep concrete as cool as possible during placement and curing. Fog sprayers or special wetting agents may be required for protection.
 3. Do not allow concrete temperature to exceed 70 degrees F at placement.
 4. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
 5. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs per sq ft per hr as determined from ACI 305, Fig 2.1.4.
- G. Joints
1. Provide concrete joints per CDOT Standard Details.
 2. Sidewalk and pavement
 - a. Contraction joints: At intervals not to exceed 10 feet and 1 1/2 inches deep, tooled or sawcut.
 - b. Expansion joints: 1/2-inch premolded joints where sidewalks end at curb returns, against fixed objects, at points of sharp radius, and between sidewalk and driveway slabs. Place expansion joint at minimum of every 200 feet.
 - c. Construction joints: At all separate pours, and around all appurtenances such as manholes, utility poles, and other penetrations extending into and through sidewalks. Place backer rod and polyurethane sealant for entire joint length.
 3. Curb and Gutter
 - a. Contraction joints: At intervals not to exceed 10 feet made by insertion of 1/8-inch template at right angles to curb and 1 1/2-inch deep.
 - b. Expansion joints: At curb returns, against fixed objects, at points of sharp radius, between adjacent sidewalk and curb at all curb returns, between sidewalk and all driveway slabs, and along straight lengths every 200 linear feet. Install expansion joint filler between concrete sidewalks and any fixed structure. Extend expansion joint material for full depth of concrete, except stop 1/2-inch below finish surface.
 - c. Construction joints: At all separate pours, place backer rod and polyurethane sealant for entire joint length.
 4. Place expansion joint filler between paving components and buildings or other appurtenances when temperatures are above 50 degrees F. Clean all dust, debris and water from joint. Recess top of filler 1/2-inch for sealant placement.
 5. Provide keyed joints as indicated in approved drawings
- H. Finishing
1. Run straight-edge over forms with sawing motion to fill all holes and depressions.
 2. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.
 3. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and re-float repaired areas to provide a continuous smooth finish.
 4. Finish surfaces with a wooden or magnesium float. Plastering of surfaces is not permitted.
 5. Immediately after float finishing, slightly roughen the concrete surface by brooming in the direction perpendicular to the main traffic route. Use fine hair fiber-bristle broom unless otherwise directed. Coordinate the required final finish with the Town before application.

Town of Mead Design Standards and Construction Specifications

6. On inclined slab surfaces and steps, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.
 7. Edge all outside edges of the slab and all joints with a 0.25-inch radius edging tool.
 8. Work edges of gutters, back top edge of curb, and formed joints with an edging tool, and round to 0.5-inch radius, unless otherwise indicated. Eliminate tool marks on concrete surface.
 9. Brush with soft bristle brush to remove trowel marks and leave a uniform appearance just before concrete takes initial set.
 10. Direction of Texturing:
 - a. Curb and Gutter: At right angles to the curb line
 - b. Sidewalk: At right angles to centerline of sidewalk
 11. Place curing compound on exposed concrete surfaces immediately after finishing. Apply under pressure at the rate of one gallon to not more than 135 square feet by mechanical sprayers in accordance with manufacturer's instructions acceptable to Town.
 12. Finishing aid shall be submitted to Town Engineer for approval. Water is not allowed as a finishing aid
- I. Joint sealing
1. Seal joints and clean concrete prior to opening to traffic.
 2. Seal all expansion joints.
 3. Separate concrete from other structures with 3/4-inch thick joint filler.
 4. Place joint filler in concrete pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
 5. Extend joint filler from bottom of pavement to within 1/4-inch of finished surface.
- J. Curing and protection
1. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
 2. Have plastic sheeting, straw, burlap and/or canvas materials available at all times to protect fresh uncured surfaces from adverse weather conditions.
 3. Do not permit pedestrian traffic over sidewalks for 7 days minimum after finishing. Do not permit vehicular traffic over pavement for 14 days minimum after finishing or until 75 percent design strength of concrete has been achieved.

3.4 FIELD QUALITY CONTROL

- A. It is the Contractor's responsibility to initiate, coordinate and accommodate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Contractor will be responsible for coordinating the testing requirement with testing agency and provide testing agency sufficient advance notification to schedule tests.
- B. Tolerances
1. Maximum Variation of Surface Grade: 1/4-inch in 10 ft
 2. Maximum Variation from True Alignment: 3/8-inch in 10 ft
- C. Take cylinders and perform slump and air entrainment tests as required in accordance with ACI 301. Unit weight and mix temperature will also be taken.
- D. The first three loads will be tested for slump and air content. If any one test fails to meet requirements, that load will be rejected and tests will continue on each load until three

Town of Mead Design Standards and Construction Specifications

consecutive loads meet requirements. Thereafter, five concrete test cylinders will be taken for every 75 cubic yards or less cubic yards of concrete placed each day.

- E. One additional test cylinder will be taken during cold weather and cured on site under same conditions as concrete it represents.
- F. One slump and air entrainment test will be taken for each set of test cylinders taken.
- G. Cylinders will be tested as follows: 2 at 7 days, 2 at 28 days and one at a later date should the test at 28 days fail or as directed by the Town Engineer.
- H. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.
- I. Thickness of fresh concrete may be checked by Town Engineer at random. Coring will be conducted in accordance with Town of Mead requirements. Where average thickness of concrete is deficient in thickness by more than 0.20-inch, but not more than 1.0-inch, payment to Contractor will be adjusted based on amount indicated in schedule of values for Portland cement concrete paving as specified in the contract documents and/or the documented material costs of the concrete in question.
- J. Failure of Test Cylinders or Coring Results: Town may order removal and replacement of concrete as required upon failure of 28-day tests or if thickness of pavement is less than 95% of specified thickness.

3.5 SCHEDULE OF CONCRETE

- A. Concrete thicknesses and subgrade preparation shall be per approved drawings and applicable Town of Mead standard detail drawings.

3.6 SCHEDULE OF CONCRETE REINFORCEMENT

- A. Fiber reinforcement required for all concrete flatwork, including curb and gutter, sidewalk and pavement.
- B. Rebar reinforcement required for all cross pans as noted in Town of Mead standard drawings.

END OF SECTION 32 13 00

SECTION 33 01 30.7 CURED IN PLACE PIPE LINING FOR REHABILITATION OF SANITARY SEWERAGE MAINS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Minimum requirements for the rehabilitation of sanitary sewer pipelines by the installation of Cured-In-Place Pipe (CIPP) within the existing, deteriorated pipe as shown on approved drawings. The work for rehabilitation of sanitary sewer pipelines shall include the cleaning and flushing of existing sanitary sewers prior to installation of CIPP.
- B. The rehabilitation of sanitary sewer pipelines shall be done by the installation of a resin-impregnated flexible tube which, when cured, shall be continuous and tight-fitting throughout the entire length of the original pipe. The CIPP shall extend the full length of the original pipe and provide a structurally sound, jointless and water-tight new pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor. Ground water will be present in the existing sanitary sewer. Service connections shall be reestablished after the CIPP is cured.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. D256 – Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
 - 2. D638 – Standard Test Method for Tensile Properties of Plastics
 - 3. D790 – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - 4. D1248 – Standard Specification of Polyethylene Plastics Molding and Extrusion Materials
 - 5. D1693 – Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
 - 6. D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 - 7. D2122 – Determining Dimensions of Thermoplastic Pipe and Fittings
 - 8. D2657 – Standard Practice for Heat-Joining Polyolefin Pipe and Fittings
 - 9. D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
 - 10. D2990 – Tensile, Compressive, and Flexural Creep and Creep Rupture of Plastics
 - 11. D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
 - 12. D5260 - Standard Classification for Chemical Resistance of Poly(Vinyl Chloride) (PVC) Homopolymer and Copolymer Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
 - 13. D5813 - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems
 - 14. F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
 - 15. F1533 - Standard Specification for Deformed Polyethylene (PE) Liner

Town of Mead Design Standards and Construction Specifications

16. F1606 - Standard Practice for Rehabilitation of Existing Sewers and Conduits with Deformed Polyethylene (PE) Liner
17. F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)
18. F1867 - Standard Practice for Installation of Folded/Formed Poly(Vinyl Chloride) (PVC) Pipe Type A for Existing Sewer and Conduit Rehabilitation
19. F1871 - Standard Specification for Folded/Formed Poly(Vinyl Chloride) Pipe Type A for Existing Sewer and Conduit Rehabilitation
20. F2019 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)

1.3 SUBMITTALS

- A. Shop Drawings and Product Data
 1. Manufacturer
 2. Sufficient data to verify compliance with the specifications and to illustrate construction and assembly of the products.
 3. Detailed specifications and data describing materials used.
 4. Indicate liner dimensions for each pipe size to be relined.
 5. Complete description of proposed wet-out procedures.
- B. Manufacturer's Installation Instructions
 1. Submit detailed description of liner placement and curing procedures for piping.
 2. Include description of procedures for sealing liner material at manholes and reestablishing service connections.
 3. Submit manufacturer's requirements for receiving, handling, and storage of materials.
- C. Manufacturer's Field Start-up Report
 1. Indicate personnel present and actual test procedures that were performed by manufacturer's representative.
 2. Manufacturer to submit field verification of proper assembly.
- D. Contractor's procedures and materials for service renewal
- E. Digital Video Discs (DVDs):
 1. Submit video recordings of piping sections
 2. Show cured liner and reestablished service connections after relining Work is complete.

1.4 COORDINATION

- A. Coordinate Work of this Section with users connected to the system.
- B. Notify home owners and businesses at least 48 hours in advance of expected disruption of sanitary service.
- C. Limit disruption of service to individual properties to one-time occurrence for maximum of eight hours.
- D. Do not disrupt customer service between hours of 5:00 P.M. and 8:00 A.M.
- E. Provide and maintain temporary facilities, including piping and pumps, to meet Town requirements.

Town of Mead Design Standards and Construction Specifications

1.5 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of piping mains and services that include CIPP liner. Indicate pipe inverts and top of pipe elevations.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum five years' documented experience in installation of liner materials and licensed or certified by manufacturer.

1.7 DELIVERY STORAGE AND HANDLING

- A. The Contractor shall be responsible for the delivery, storage, and handling of products. No products shall be shipped to the job site without the approval of the Town Engineer.
- B. Keep products safe from damage. Promptly remove damaged products from the job site. Replace damaged products with undamaged products. Protect material from moisture.
- C. Store hydrophilic end seal gaskets inside, in a dry, humidity controlled environment. The end seal will swell when exposed to moisture, either direct or indirect.

1.8 EXISTING CONDITIONS

- A. Verify field measurements prior to fabrications.
- B. Indicate field measurements on Shop Drawings.

1.9 WARRANTY

- A. Material Warranty
 - 1. All CIPP liners shall be certified by the manufacturer for specified material properties for the repair. The manufacturer shall warranty the liner to be free from defects in raw materials for ten years from the date of installation. During the warranty period, any defects which affect the integrity, strength or water tightness of the installed pipe shall be repaired at the contractor's expense.
- B. Installation Warranty
 - 1. The Installer shall guarantee the CIPP liner against defects in installation and workmanship for the period of two (2) years commencing with the date of substantial completion of the CIPP system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. CIPP Liner
- B. Layne, Inc
- C. Insituform Technologies, Inc.
- D. LMK Technologies, LLC
- E. Or accepted substitution approved by Town Engineer

2.2 DESIGN CONSIDERATIONS

- A. CIPP shall be designed in accordance with ASTM F1216 and D5813.
- B. CIPP design for the main sheet shall assume no bonding to the original pipe.

Town of Mead Design Standards and Construction Specifications

- C. The resin saturated main sheet must place the resin in full contact with the host pipe. The cured liner must provide coating on the interior of the lateral piping for an improved flow rate.
- D. The liner must be smooth and have an average roughness coefficient “n” factor of 0.013 or lower.

2.3 GENERAL

- A. The CIPP liner shall be constructed of materials and methods that provide a jointless and continuous structurally sound liner able to withstand all imposed static, and dynamic loads on a long-term basis.
- B. Design lining material to have sufficient structural strength to support dead loads, live loads, and groundwater load imposed, assuming existing pipe cannot share loading or contribute to structural integrity of liner.
- C. Field measurements of the existing pipe diameters, ovality and length shall be taken.
- D. Pipe liner shall be capable of installation with water in the carrier pipe and surrounding groundwater.
- E. The flexible tube shall be fabricated to a size that when installed will neatly fit (minimum 99.75%) the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so that the final cured product is snug against the wall of the host pipe.
- F. The minimum length shall be that deemed necessary by the Contractor to effectively span the distance from the inlet to the outlet of the respective manholes unless otherwise shown or specified. The Contractor shall verify the lengths in the field before impregnation.

2.4 CURED-IN-PLACE-LINER (CIPP)

- A. Unless otherwise specified, the Contractor shall furnish a general purpose, unsaturated, polyester or thermosetting vinyl ester resin and catalyst system compatible with the reconstruction inversion process that provides cured physical strengths specified herein, and complies with ASTM D5813, F1216, F1743, and F2019.
- B. Liner material shall be manufactured with resins pre-impregnated within the liner to eliminate the possibility of air bubbles and voids. Resin shall be a corrosion-resistant polyester or vinyl ester resin and catalyst system that, when properly cured within tube composite, meets requirements of ASTM F1216, F1743, and F2019.
- C. The liner thickness shall be sized for a minimum hydrostatic load of 8.0 feet and maximum depth of earth cover as measured in the field. The hydrostatic load shall be increased to the manhole depth plus 1.0 foot for bury depths in excess of 8.0 feet.
- D. The finished pipe liner in place shall be fabricated from materials which when complete is chemically resistant to and will withstand internal exposure to domestic sewage having a pH range of 5 to 11 and temperature of 150°F.
- E. Minimum Design Criteria:
 - 1. Minimum flexural strength: 4,500 PSI
 - 2. Initial Modulus of Elasticity: 250,000 PSI
 - 3. Nominal CIPP Thickness: Per ASTM F1216, Minimum of 6mm

2.5 MAINLINE CONNECTION

- A. The main tube and lateral tube shall form a one-piece assembly by stitching the lateral tube to the mainsheet aperture.
- B. The connecting end of the lateral tube shall be shaped to match the aperture and curvature of the main tube.

Town of Mead Design Standards and Construction Specifications

- C. The lateral tube and main tube shall be sealed by use of a flexible UV cured adhesive/sealant applied in a factory controlled setting.
- D. The main/lateral tube assembly shall take the shape of a tee or wye with corresponding dimensions such as a curved circle or a curved elliptical opening in the pipefitting.

2.6 HYDROPHILIC GASKET SEAL

- A. The rubber joint seal shall be an extended hydrophilic rubber compounded from chloroprene (Neoprene) rubber and a hydrophilic resin, which expands on contact with water.
- B. The rubber joint seal shall be bonded with adhesive on one face to hold it in place during assembly.
- C. On contact with water, the rubber shall swell by up to 10 times its original volume if necessary and mold itself to completely fill any gaps and exert pressure evenly to ensure the seal. High compression or bolt up forces shall not be necessary to effect a complete and watertight seal.
- D. Hydrophilic rubber joint seals shall be installed at all manhole walls for all lining products.
- E. The mainline tube shall include a seamless molded flange shaped gasket attached to the main liner tube at the connection or four molded hydrophilic O-rings at the mainline termination ends.
- F. The gaskets must be a minimum of 2.5mm thick and must retain this consistent thickness under installation pressures.
- G. The hydrophilic gasket seals must be manufactured in a controlled factory environment with strict quality control and quality assurance protocols.
- H. A liquid sealant, adhesives or other fluid like materials having paste like consistency will not be accepted.

2.7 SOURCE QUALITY CONTROL

- A. Inspect extruded material for defects and physical properties according to ASTM D1785. Verify liner material is homogeneous and free of defects, cracks, holes, blisters, protrusions, foreign materials, or other deleterious faults.
- B. Marking:
 - 1. For testing purposes, mark each production lot with identical marking number.
 - 2. Mark each reel of folded PVC pipe at intervals not to exceed 5 feet with coded number identifying manufacturer, size, cell class, machine, shift, and date when liner was extruded.
- C. Chemical and Physical Testing: Test cured samples according to ASTM D5260.

PART 3 EXECUTION

3.1 PREPARATION

- A. Cleaning: Clean existing sewer pipes of debris, sedimentation, and mineral deposits with high-velocity cleaner, bucket and scraper, root saws, rolling or balling units, or other appropriate means.
- B. Bypassing Sewage:
 - 1. Set up bypassing pump system to isolate each section of piping for relining.
 - 2. Maintain bypass pumping until lining is totally formed and service connections are reestablished.
- C. The interior of the pipeline shall be carefully inspected to determine the location of any condition that shall prevent proper installation, such as roots, severe offsets, and collapsed or crushed pipe sections. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of pipelines.

Town of Mead Design Standards and Construction Specifications

3.2 ACCESS SAFETY

- A. Prior to entering access areas such as manholes, an excavation pit, performing inspection or cleaning operations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen shall be undertaken in accordance with local, state, or federal safety regulations.

3.3 SANITARY SEWER REHABILITATION PROCEDURES

- A. Pipe Rehabilitation (CIPP) for limits between manholes, or as shown.
- B. Sewer lines with no indication for either pipe rehabilitation (CIPP) or full replacement are to have no work performed on them.
- C. Where practicable, liners should be installed in continuous runs where there are two or more continuous manhole segments. This is especially desirable to connect several short manhole segments with a continuous lining.
- D. Pipe rehabilitation with cured in place thermosetting resin pipe (CIPP) methods must adhere to ASTM F1216 and F2019 for pulled in place installation.
 1. Work includes installation of continuous lengths of homogeneous resin impregnated flexible tube cured tight to existing pipe wall with UV curing, pressurized steam, or in accordance with the manufacturer's recommendations.
 2. Work includes:
 - a. Field air testing
 - b. Point repair prior to lining where necessary
- E. Contractor Responsibilities Include:
 1. Contractor to install the specified system must be responsible for complete performances of such, including, but not limited to:
 - a. Materials
 - b. Application
 - c. Quality Control
 2. Contractor will supply Town Engineer with documentation showing past installation experience and licensing prior to construction.
 3. Contractor prequalification may be required by individual product manufacturers.
 4. Contractor shall inspect all surfaces and sewers prior to construction and notify Town Engineer of any discrepancies or disparities that may interfere with proper preparation or installation.
 5. Contractor must comply with all requirements of the manufacturer.
 6. Contractor is responsible for all quality assurance testing of systems after construction.
 7. Contractor is responsible for all sewage bypass equipment and traffic control.
 8. Contractor is to verify all existing utilities prior to digging for replacement.
 9. After the liner has been installed, as directed by Town Engineer, existing services shall be temporarily reinstated to 95% of the original opening.
 - a. This shall be done without excavation in pavement areas, and in the case of non-man-entry pipes, from the interior of the pipeline by means of a 360-degree television camera and a cutting device that reestablishes the service connection.
 - b. When a remote cutting device is used and a cleanout is available, then a mini-camera down the service shall also be used to assist the operator in cutting or trimming.

Town of Mead Design Standards and Construction Specifications

- c. Restored openings should be neatly and smoothly cut and without rough edges. Care must be exercised not to damage the CIPP or the existing main or lateral pipes.
- d. Connections should not be over-cut as this could damage the pipe, break the CIPP watertight seal and/or interfere with future lining of the lateral. Any damage to the liner or lateral while reinstating services will be repaired by a hat or injection sealing method. No grouting will be allowed and no separate payment shall be made for such repair.

3.4 FINISHED CIPP

- A. It shall be a homogenous CIPP liner assembly from manhole to manhole.
- B. The CIPP shall be smooth with minimal wrinkling and shall increase flow rate.
- C. The profile of the hydrophilic molded gaskets should be visible and verifiable during post-video inspection on liners 6mm or thinner thickness.
- D. The CIPP shall be free of dry spots, lifts, and delamination.
- E. The CIPP shall include a textile taper at each end providing a smooth transition to the host mainline liner for accommodating video equipment and maintaining proper flow in the mainline.

3.5 TESTING

- A. The wall thickness shall be measured in accordance with the applicable sections of ASTM Test Method D5813 and D3567. One test shall be taken for every 500 LF of lining completed.
- B. Flexural strength and flexural modulus of elasticity shall be determined in accordance with ASTM D-790. One test shall be taken for every 500 LF of lining completed.
- C. After installation or during the curing/installation process, Contractor shall conduct a mainline integrity pressure test. The test must demonstrate CIPP mainline is watertight.
 - 1. The Contractor shall furnish all necessary equipment to conduct the test. An acceptable method is a low pressure air test, conducted as follows:
 - 2. Pressurize the test section to 4.0 psi and hold above 3.5 psi for not less than 2 minutes. Add air if necessary to keep the pressure above 3.5 psi. At the end of this 2 minute stabilization period, note the pressure (must be 3.5 psi minimum) and begin the timed period. If the pressure drops 0.5 psi in less than the time given in the table below, the section of pipe shall have failed the test.
 - 3. When the prevailing groundwater is above the sewer being tested, test pressure shall be increased 0.43 psi for each foot that the water table is above the invert of the sewer.

Sewer Diameter (Inches)	Minimum Test Time per 100 ft. (seconds)
8	72
10	90
12	108
18	144

- 4. If the time for the pressure to drop 0.5 psi is 125 percent or less of the time given in the table, the line shall immediately be re-pressurized to 3.5 psi and the test repeated.
- 5. The pressure gage used shall be supplied by the Contractor and have minimum divisions of 0.10 psi and be oil filled.

3.6 PROSECUTION OF WORK

- A. All sewer services connected to the main shall be reinstated after the sewer main has been lined or replaced due to defects. The Contractor shall note that not all sewer lines segments have been televised in their entirety due to obstructions blocking further entry, etc. These obstructions shall be cleared to allow TV viewing of the entire segment length before lining is commenced. Existing sanitary sewer segments may be broken and contribute considerable

Town of Mead Design Standards and Construction Specifications

ground water to the sewer main or contain considerable amounts of grease, roots or other debris.

3.7 FINAL ACCEPTANCE

- A. All CIPP sample testing and repairs to the installed CIPP as applicable shall be completed, before final acceptance, meeting the requirements of these specifications and documented in written form.
- B. The Contractor shall perform a detailed closed-circuit television inspection in accordance with ASTM standards, after installation of the CIPP liner and reconnection of the side sewers. The finished liner shall be continuous over the entire length of the installation and shall be free of significant visual defects, damage, deflection, holes, leaks and other defects. Unedited digital recordings of the inspection shall be provided to the Town within ten (10) working days of the liner installation.
- C. The data shall note the inspection date, manhole depths from rim to inverts, location of all reconnected side sewers, debris, defects in the liner, including but not limited to gouges, cracks, bulges, or bumps. Immediately prior to conducting the video inspection, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated, at no additional cost to the Town.
- D. Bypass pumping or plugging from the upstream manhole shall be utilized to minimize sewage from entering the line during the inspection. In the case of bellies in the line, the pipe shall be cleared of any standing water to provide continuous visibility during the inspection.

END OF SECTION 33 01 30.7

Town of Mead Design Standards and Construction Specifications

SECTION 33 33 00 SANITARY SEWERAGE UTILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Polyvinyl chloride (PVC) non-pressure pipe for gravity sanitary sewer with all jointing materials, fittings, and other appurtenances required for a complete installation
- B. Polyvinyl chloride (PVC) pressure pipe for sanitary sewer force main with all jointing materials, fittings, and other appurtenances required for a complete installation
- C. All precast manholes complete with steps, ring and cover as required

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. A48 – Standard Specification for Gray Iron Castings
 - 2. A126 – Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 - 3. A185 – Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement
 - 4. A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
 - 5. A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 6. C33 – Standard Specification for Concrete Aggregates
 - 7. C150 – Standard Specification for Portland Cement
 - 8. C443 – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 - 9. C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
 - 10. C497 – Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile
 - 11. C913 – Standard Specification for Precast Concrete Water and Wastewater Structures
 - 12. C923 – Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
 - 13. C1227 – Standard Specification for Precast Concrete Septic Tanks
 - 14. C1619 – Standard Specification for Elastomeric Seals for Joining Concrete
 - 15. C1821 – Standard Practice for Installation of Underground Circular Precast Manhole Structures
 - 16. D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
 - 17. D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
 - 18. D1330 – Standard Specification for Rubber Sheet Gaskets
 - 19. D1351 – Standard Specification for Thermoplastic Polyethylene Insulation for Electrical Wire and Cable
 - 20. D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC)

Town of Mead Design Standards and Construction Specifications

21. D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
 22. D2122 – Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
 23. D2240 – Standard Test Method for Rubber Property – Durometer Hardness
 24. D2321 – Standard Specification for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
 25. D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
 26. D2774 – Standard Specification for Underground Installation of Thermoplastic Pressure Piping
 27. D2837 – Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
 28. D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 29. D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
 30. D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
 31. D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
 32. D3261 – Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
 33. D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
 34. F412 – Standard Terminology Relating to Plastic Piping Systems
 35. F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
 36. F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
 37. F679 – Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
 38. F1055 – Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing
 39. F2164 – Standard Specification for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure
- B. American Water Works Association (AWWA):
1. C104 – Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
 2. C105 – Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems
 3. C111 – Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 4. C115 – Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Grey-Iron Threaded Flanges
 5. C150 – Standard for Thickness Design of Ductile-Iron Pipe
 6. C151 – Standard for Ductile-Iron Pipe, Centrifugally Cast

Town of Mead Design Standards and Construction Specifications

7. C504 – Standard for Rubber-Seated Butterfly Valves
 8. C512 – Standard for Air Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
 9. C600 – Standard for Installation of Ductile Iron Mains and Their Appurtenances
 10. C900 – Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 12 In. (100 mm Through 300 mm), for Water Transmission and Distribution
 11. C905 – Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm), for Water Transmission and Distribution
 12. M23 – PVC Pipe: Design and Installation
- C. Colorado Department of Transportation (CDOT)
- D. Occupational Safety and Health Administration (OSHA)
- E. National Association of Corrosion Engineers (NACE):
1. SP0169 – Control of External Corrosion on Underground or Submerged Metallic Piping Systems
 2. SP0286 – Electrical Isolation of Cathodically Protected Pipelines
- F. Plastics Pipe Institute (PPI):
1. TR-4 – HDB / HDS / SDB / PDB / MRS Ratings for Thermoplastic Piping Materials or Pipe
 2. TR-33 – Generic Butt Fusion Joining Procedure for Field Joining of Polyethylene Pipe
 3. Handbook of Polyethylene Pipe
 4. Polyethylene Piping Systems Field Manual for Municipal Water Applications
 5. Material Handling Guide

1.3 SUBMITTALS

- A. Product Data: Submit on all products or materials supplied herein.
- B. Shop Drawings: Provide piping layout and assembly drawings with fitting dimensions. Provide sufficient information to verify compliance with specifications.
- C. Shop Drawings and Product Data: Provide manufacturer's catalog information with dimensions, material and assembled weight.
1. Pipe materials
 2. Special, fitting, and coupling details
 3. Gasket materials
 4. Valves
 5. Laying and installation schedule
 6. For sewer rehabilitation work
 - a. Manufacturer
 - b. Sufficient data to verify compliance with the specifications and to illustrate construction and assembly of the products
 - c. Detailed specifications and data describing materials used
 - d. Indicate liner dimensions for each pipe size to be relined
 - e. Complete description of proposed wet-out procedures
 7. Specifications and data sheets

Town of Mead Design Standards and Construction Specifications

- 8. Affidavits of compliance for protective shop coatings and linings
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements and applicable standards. Provide prior to shipment.
- E. Test Reports: Submit reports of field exfiltration/infiltration, mandrel and lamp tests.
- F. TV Inspection Files:
 - 1. Submit videos and reports
 - 2. For rehabilitation work, show cured liner, connections to mains, and reestablished service connections after relining work is complete

1.4 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of piping mains, valves, connections, invert elevations, and any mapped or unmapped utilities.
- B. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
- C. Sewer Rehabilitation Work: Accurately record actual locations of piping mains, laterals, and services that include CIPP liner. Indicate pipe inverts and top of pipe elevations.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with the Town of Mead and CDPHE Stormwater and/or Groundwater Discharge Permit, notes on the drawings and as specified herein.
- B. Manufacturers shall be experienced in the design and manufacturing of materials specified herein for a minimum period of 5 years.
- C. All PVC pipe, regardless of diameter, shall be supplied by a single manufacturer. Fittings may be provided by another manufacturer.
- D. Perform Work in accordance with the Colorado Department of Public Health and Environment (CDPHE) and Weld County.
- E. Contractor shall conduct visual inspection before installation.
- F. Manufacturer's name and pressure rating shall be marked on piping and valves.
- G. Provide piping complete with all fittings, jointing materials, supports, joint restraint system, and necessary appurtenances for watertight, fully operational sewer lines.

1.6 REGULATORY REQUIREMENTS

- A. Conform to all municipal codes and ordinances, laws and regulations of Weld County, Town of Mead, CDPHE, the notes and details on the drawings and as specified herein, and CDPHE Stormwater Management and/or Construction Dewatering Permit.
- B. In case of apparent conflict, CDPHE requirements govern over these specifications.
- C. Contractor shall prepare, submit, pay, and otherwise obtain all necessary permits from all appropriate entities.

1.7 DELIVERY, STORAGE AND HANDLING

- A. During loading, transporting and unloading, exercise care to prevent damage to material
 - 1. Use nylon slings only
 - 2. Do not drop pipe or fittings
 - 3. Do not roll or skid against pipe already on ground
 - 4. Repair any damage done to coating or lining
 - 5. Handle per manufacturer's recommendations

Town of Mead Design Standards and Construction Specifications

6. Store rubber gaskets in cool dark location
7. Store all material on wood pallets or timbers
- B. Shop coated materials shall be handled, transported, stored and shipped in a manner that will prevent damage to the coating and lining. Coating or lining damaged in handling or other operations shall be repaired to the approval of the Town.
- C. Any damage to the pipe or the protective coating from any cause during the installation of the pipeline shall be repaired in accordance with these Specifications.
- D. Pipe
 1. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
 2. PVC pipe has reduced flexibility and impact resistance as temperatures approach and drop below freezing. Extra care should be used in handling PVC pipe during cold weather.
 3. Do not store PVC pipe uncovered in direct UV light.
 4. Pipe stored along the trench side shall be suitably supported off the ground to avoid damage to the coating.
- E. Valves
 1. Prepare valves for shipping as follows:
 - a. Ensure that valves are dry and internally protected against rust and corrosion
 - b. Protect valves against damage to threaded ends, flange faces, and weld ends
 - c. Seal valve ends to prevent entry of foreign materials into valve body
 - d. Set valves in best position for handling
 - e. Set valves closed to prevent damage
 2. Deliver and store valves and accessories in shipping containers with labeling in place.
 3. Storage: Use the following precautions for valves during storage:
 - a. Do not remove end protectors unless necessary for inspection; then reinstall for storage
 - b. Protect valves from weather by storing indoors or support valves off ground or pavement in watertight enclosures when outdoor storage is necessary
- F. Precast Concrete Structures
 1. Transport and handle precast concrete units with equipment to protect from dirt and damage.
 2. Do not place precast concrete units in position which will cause damage.
 3. Handle precast concrete structures by means of lifting inserts. Do not move from manufacturer's yard until curing is complete.

1.8 JOB CONDITIONS

- A. All work which requires the interruption of active sanitary sewer service lines must be completed as quickly as possible in order to minimize inconvenience to customers and risk to the Town.
- B. Underground Obstructions
 1. Underground Obstructions known to Engineer are shown on approved drawings
 - a. Contractor shall field locate and verify all obstructions where or not shown on the Drawings.

Town of Mead Design Standards and Construction Specifications

2. Notify each Utility Provider and request utility be field located by surface reference at least 48 hours prior to trenching or excavation.
3. Expose and verify size, location and elevation of underground utilities and other obstructions where conflicts might exist sufficiently in advance to permit changes in the event of a conflict.
 - a. Notify project's Engineer and the Town in case of a conflict.
 - b. In case of a conflict, the proposed work may be changed by Engineer and will require Town approval to modify approved drawings.
4. Maintain, protect, and support by shoring, bracing or other means existing utilities and appurtenances.

PART 2 PRODUCTS

2.1 PIPE, MANHOLES AND ACCESSORIES

- A. Comply with the **Town of Mead Design Standards and Construction Specifications** and standard details.
- B. Provide products in sizes and materials specified in approved drawings.

2.2 PVC GRAVITY SANITARY SEWER PIPE (NON-PRESSURE)

- A. The PVC piping shall be non-pressure PVC pipe for gravity sanitary sewer application of sizes indicated in the approved drawings.
- B. Pipe and fittings:
 1. ASTM D3034, T-1 wall, SDR 35, non-pressure pipe
 2. Cell classification: ASTM D1784
 3. Pipe length: 12-20 feet standard manufactured length for construction
- C. Joints: ASTM D3212 and F477 - Rubber gasket with one compression gasket ring, integral bell and spigot type
 1. Designed to hold pipe in alignment, provide flexibility, separate the ends of pipe lengths, resist applied earth pressures, and provide fluid tightness
 2. Rubber rings: ASTM F477

2.3 SOURCE QUALITY CONTROL

- A. Identification Marks: Clearly and permanently marked at not greater than 5-foot intervals with pipe diameter, PVC cell classification (if applicable), manufacturer, plant, shift, ASTM, date designations and service designation.
- B. Testing per ASTM D3034
 1. Test products not manufactured in the U.S. at an acceptable laboratory in the U.S.

2.4 PIPE ACCESSORIES

- A. Underground Type Plastic Line Marker
 1. Manufacturer's standard permanent, continuous-printed plastic tape with metallic core, intended for direct-burial service; not less than 6-inch wide x 4 mils thick. Provide green tape with black printing reading "CAUTION SANITARY SEWAGE LINE BURIED BELOW." Provide identification markers of one of the following:
 - a. Allen Systems, Inc.
 - b. Emed Co., Inc.
 - c. Seton Name Plate Corp.

Town of Mead Design Standards and Construction Specifications

- d. Or accepted substitution
- B. Tracer Wire for Buried Pipe
 - 1. Provide tracer wire for all HDPE pipe and PVC pipe.
 - 2. All tracer wire shall be 12 AWG solid copper wire coated with 45 mil Type HMW - PE blue insulation compliant with ASTM D1351 specifically designed for direct burial in corrosive soil or water.
 - 3. UL listed
- C. Tracer Wire for Horizontal Directional Drilling
 - 1. Non-UL listed tracer wire specifically developed for Horizontal Directional Drilling application.
 - 2. 1/4-inch 304 Stainless Steel tracer wire
 - a. Performance Wire & Cable Inc.: "Tracer wire, Stranded SS /45 mil HMW-HDPE, 30 Volt, HDD direct bury use only"
 - 3. #12 AWG Solid Carbon Clad Steel Extra High Strength tracer wire
 - a. Copperhead Industries, LLC: "Direct Burial #12 AWG Solid (.0808" diameter), 21% conductivity copper-clad hard drawn high carbon steel extra high strength horizontal directional drill tracer wire, 1150# average tensile break load, 45 mil. high molecular weight-high density polyethylene jacket complying with ASTM D1248, 30 volt rating"
 - b. Pro-Line Safety Products Co.: "Pro-Trace HDD-CCS PE45"
- D. Tracer Wire Test Stations
 - 1. 4-inch with locking lid
 - 2. Manufacturers:
 - a. CP Test Services
 - b. Glenn Series "Glenn-4"
 - c. Or accepted substitution
- E. Corrosion Control
 - 1. Rust inhibitive primer:
 - a. Tnemec "Series 77H Chem-Prime"
 - b. Or accepted substitution
 - 2. Rust preventative compound:
 - a. Houghton "Rust Veto 344"
 - b. Rust-Oleum "R-9"
 - c. Or accepted substitution

2.5 AIR RELEASE AND VACUUM BREAKER COMBINATION VALVES

- A. Manufacturers:
 - 1. Val-Matic "Model 801A"
 - 2. Dezurik/APCO "Series 440 SCAV"
 - 3. Or accepted substitution
- B. Provide combination air release and vacuum breaker valves as indicated on Drawings.
 - 1. Provide single body type that functions as both an air release and a vacuum breaker valve.
 - 2. Valves shall be manufactured and tested in accordance with AWWA C512.

Town of Mead Design Standards and Construction Specifications

3. Provide a shutoff valve and transition piece from HDPE to NPT threaded connection on valve.
 - a. Ball valve: compatible with butt fusion, HDPE fitting
- C. General
 1. Usage: Recommended for service up to a pressure rating indicated by approved drawings
 2. Bodies and covers:
 - a. Gray iron meeting requirements of ASTM A126 Class B
 - b. Globe style of 1-inch valves to increase float clearance and reduce clogging
 3. Exterior coating: universal alkyd primer
 4. Valve cleanout: 2" NPT
 5. Valve drain connection: 1" NPT
 6. Inlet and Outlet:
 - a. Inlet: NPT, 2-inch on 1-inch valves
 - b. Outlet: NPT equal to valve size, 1-inch
 7. Internals:
 - a. Metal internal parts only
 - b. Float sensitive skirt provided
 - c. Float, plug, guide shafts, and bushings: Type 316 stainless steel
 - d. Resilient seats: Buna-N

2.6 ECCENTRIC PLUG VALVES

- A. Manufacturers:
 1. DeZurik
 2. Henry Pratt Company
 3. Milliken
 4. Val-Matic Valve and Manufacturing Corporation
 5. Or accepted substitution
- B. Provide plug valves as indicated on approved drawings.
- C. General
 1. Quarter-turn non-lubricated eccentric plug valves
 2. Resilient faced plug
 3. Valves with vane type seat rings are not acceptable
 4. Valve ends to match connecting piping
 - a. Buried: Mechanical joint, ANSI A21.11/AWWA C111
 - b. Flanged: 125 lb, ANSI B16.1
 - c. Screwed valve ends shall be to the NPT standard
 5. Minimum Working Pressure Rating:
 - a. 175 psi
 6. Opening motion eccentric, lifting plug away from body seat
 7. Valve alignment

Town of Mead Design Standards and Construction Specifications

- a. Valve shall be installed so that the plug is horizontal and rotates upward as the valve opens.
 - b. Valve shall be installed with seat on low pressure side of valve.
 8. Provided with fully adjustable plug position stops.
 9. Plugs shall be eccentric type with no backing ring or frame.
 10. Valve body cavity shall be smooth without protrusions or baffles.
 11. Valve body plainly marked to indicate seat end
 12. Valve packing adjustment accessible without removing actuator from valve
- D. Valve Materials
1. Plug and body: Cast iron, ASTM A126, Class B
 2. Resilient plug facing or replaceable style body seats shall be synthetic rubber, neoprene, or Buna N compound suitable for use with water and wastewater applications
 3. Seat rings shall be threaded, or welded of corrosion-resistant stainless steel (18-8), nickel, or Monel conforming to AWWA C504
 4. Sprayed or plated mating seat surfaces are not acceptable.
 5. Bearings shall be replaceable. Sleeve type and thrust bearings in the upper and lower journals shall be corrosion-resistant stainless steel or bronze.
 6. Shaft seals shall be multiple O-ring, self-adjusting U-cup or chevron type packing conforming to AWWA C504
 7. Pull-down packing is not acceptable.
 8. Shaft seals shall be field adjustable or replaceable without valve disassembly.
 9. Plug seat: Chloroprene (Neoprene)
 10. Packing: Acrylonitrile Butadiene V-Type Cup
 - a. Dual U-cup
 11. Upper thrust bearing: TFE
 12. Body seat: Welded-in overlay seat of no less than 90% nickel
 13. Upper and lower trunnion bearings: Sleeve type, 18-8 stainless steel
 14. Valves complete with epoxy coating on the interior and exterior, manufacturer's standard corrosion resistant coating shall be acceptable
- E. Testing
1. Valves shall be capable of drip-tight shut-off up to the full leak test rating.
 - a. Test and certify pressure capacity in the reverse direction.

2.7 MANHOLES

- A. Precast Concrete Units:
1. Manufacturers:
 - a. Rinker Materials
 - b. Old Castle Precast
 - c. Or accepted substitution
 2. Specification: ASTM C478
 3. Minimum wall thickness: greater of 6 inches or 1/12 of internal diameter

Town of Mead Design Standards and Construction Specifications

4. Reinforced
5. Grade rings as required
- B. Precast Units or Cast-in-place: Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi with a cement content of not less than 6 sacks per cu. yd. Openings to be precast per plan. Sawcut in field only if no other option.
- C. Manhole Steps:
 1. Steel bar, ½-inch Grade 60, drop-front type, with polypropylene coating applied by manufacturer, Type MA Industries, Inc. "PS2-PF," or,
 2. Aluminum, drop-front type with polypropylene coating applied by manufacturer, Type MA Industries Inc. "PS2-PF" or approved substitution or approved substitution

2.8 FABRICATION

- A. Vault/Manhole Sections
 1. Precast concrete dimensions as shown on plans
 2. Minimum manhole inside diameter: 48 inches
 3. Precast lid and Cones: Same or greater reinforcement and wall thickness as vault or manhole section with capability for H2O loading
 4. Vault Joints: Shiplap or tongue and groove with double mastic gaskets, each joint to set equally and tightly
 5. Manhole Joints: Keylock type with double mastic gaskets, each joint to set equally and tightly
 6. Access opening: Minimum 24 clear or as indicated
 7. Pipe connection: As indicated on Drawings
 8. Pipe knockout: As indicated on Drawings
 9. Cast-in-place base
 10. Manhole steps: 12 inches on center, vertical alignment above largest bench or open area
- B. Grating and Metal Frame: As specified on drawings

2.9 ACCESSORIES

- A. Plugs and Caps: Use pipe plugs or caps provided by the pipe manufacturer and approved by the Town Engineer/Inspector for pipe stub-outs.
- B. Cleanouts: Provide as indicated, pipe extension to grade with ferrule and countersink cleanout plug. Provide round cast-iron access frame over cleanout, with heavy duty secured scoriated cover with lifting device cast with the word "SANITARY".
- C. Reinforcement:
 1. Reinforcing Steel: ASTM A615 Grade 60
 2. Welded Wire Fabric: ASTM A185
- D. Concrete:
 1. Minimum compressive strength: 4,500 psi at 28 days
 2. Cement: ASTM C150, Portland Cement, Type II
 3. Aggregates: ASTM C33, free of deleterious substances
- E. Gaskets and Plastic Sealing Compound:

Town of Mead Design Standards and Construction Specifications

1. Mastic:
 - a. Approved sealant manufacturers:
 - i. "Rub'r-Nek", K.T. Snyder Co.
 - ii. "Kent Seal", Hamilton-Kent Manufacturing Co.
 - iii. GS #79, 44, or 4, General Sealants
 - iv. ConSeal, CS202
 - v. Or accepted substitution
 - vi. "Ram-Nek" is not acceptable
 2. Rubber: Neoprene, 40±5 hardness when measured by ASTM D2240, Type A durometer
 3. Compression Gaskets: ASTM C443
 4. Boot Connectors: ASTM C923
 - a. Flexible rubber boots shall provide a watertight seal between the pipe and concrete structure.
 - b. Z-LOK connector by A-LOK Products, Inc. or approved substitution
- F. Frames and Castings: ASTM A48 with asphalt varnish coating hot dip applied at foundry, 6 mils thick Class 30b
- G. Manhole Rings and Covers
 1. Cast iron, heavy duty traffic type, ASTM A48, Class 35B. Grind bearing surfaces to ensure flat, true surfaces
 2. Covers to seat at all points on ring
 3. Lids
 - a. All sanitary sewer lids shall be forged with the following: "Town of Mead Sanitary Sewer". Sewer manhole lids must be Denver Pick slot style model #1156 manufactured by Deeter Foundry or A-1480 by D&L Foundry.
 - b. Rings and covers shall be cast-iron. Manhole rings and covers shall be twenty-six (26) inch diameter manholes.
 - c. Surface patterns in the lids shall be drivable and per detail. Checker patterns or other textured patterns are not allowed.
 4. Provide type as indicated on the drawings
- H. Manhole Height Adjustment: Use precast concrete grade rings
- I. Rock Subbase: 1-1/2 -inch minus, well-graded gravel over compacted subgrade
- J. Water: Clean and free of deleterious substances

2.10 GROUT MANUFACTURERS

- A. Non-Shrink, Non-Metallic Grout
 1. Master Builders: Masterflow 928
 2. Burke: Non-Ferrous Non-Shrink
 3. M.R. Meadows: Sealtight 588
 4. Sonneborn: Sonogrout G.P.
 5. Tamms: Tammsgrout 621
 6. Sika: SikaGrout 212
 7. Or accepted substitution

Town of Mead Design Standards and Construction Specifications

- B. Epoxy Grout
 - 1. Burke: BurkEpoxy Anchoring Grout
 - 2. L&M Inc.: EpogROUT
 - 3. Sika: Sikadur 42, Grout Pack
 - 4. Or accepted substitution

2.11 SOIL MATERIALS

- A. Furnish pipe bedding and cover as specified in Section 31 00 00 – Earthwork

2.12 TAP SADDLE MANUFACTURERS

- A. Fernco, Inc., Flexible Tab Saddle
- B. T-FLEX, Sewer Saddle
- C. Indiana Seal, Flexible Service Saddle
- D. Or accepted substitution

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine pipe and fittings and do not use individual sections containing cracks, dents, abrasions, and other defects

3.2 INSTALLATION OF PVC GRAVITY SANITARY SEWER PIPE (NON-PRESSURE)

- A. Trenching, Pipe Embedment, Backfill, and Compaction: See Section 31 00 00 - Earthwork
- B. Install pipe in accordance with ASTM D2321 as modified herein or on the drawings.
- C. Cutting
 - 1. Cut and bevel ends in accordance with manufacturer's standard recommendations.
 - 2. Machine cut ends smooth and square to proper dimensions.
 - 3. Do not cut with a cold chisel, iron pipe cutter, flame or any other method that may fracture the pipe or leave ragged, uneven edges.
 - 4. Remove burrs and wipe off all dust and dirt from jointing surfaces.
- D. Pipe Laying
 - 1. Inspect pipe and accessories for cracks and other defects before lowering into trench.
 - 2. Replace any defective, damaged or unsound pipe.
 - 3. Remove all dirt and foreign material from the inside of pipe before laying.
 - 4. Check bedding for firmness and uniformity of surface immediately before laying each section of pipe.
 - 5. Carefully lower pipe, fittings, valves, and accessories into the trench with derricks, ropes, and other suitable equipment to prevent damage.
 - 6. Do not dump or drop pipe or accessories into trench.
 - 7. Lay to lines and grades indicated on drawings or as specified.
 - a. Lay piping beginning at a low point of system, true to line and grade with unbroken continuity of invert.
 - b. Closely joint to form a smooth flow line.
 - c. Place bell end or groove ends of piping facing upstream.

Town of Mead Design Standards and Construction Specifications

- d. Maximum length of pipe that can be used without exceeding the allowable deflection at a coupling shall be determined.
 8. Utilize implements, tools, and facilities as recommended by the manufacturer.
 9. Keep pipe clean during and after laying.
 10. Close all open ends with watertight expandable type sewer plugs or test plugs.
 11. Remove and relay any pipe which has floated.
 12. Do not lay pipe when:
 - a. There is water in the trench
 - b. Trench conditions are unsuitable
 - c. Weather conditions are unsuitable
 13. Use acceptable adaptors at manhole and structure connections to provide a watertight seal.
 14. Protect from lateral displacement by placing and compacting bedding material under provisions of Section 31 00 00 – Earthwork.
- E. Jointing
1. Assemble in accordance with the manufacturer's instructions.
 2. Wipe clean pipe ends, gasket and gasket groove before inserting gasket.
 3. Apply lubricant furnished by the pipe manufacturer to the gasket and the outside of the spigot end.
 4. Insert the spigot end to the reference mark.
- F. Fittings
1. Install utilizing standard methods.
 2. Lower into trench with rope or other means to prevent damage.
 3. Attach rope around the exterior.
 4. Do not attach rope through the interior.
 5. Carefully connect to pipe or other facility.
 6. Check joint to insure a sound and proper joint.
- G. Water Line and Sanitary Sewer Crossings
1. Whenever possible lay water mains over sanitary sewers to provide vertical separation of at least 18-inches between invert of water main and crown of sewer.
 2. If above separation cannot be met, provide one continuous length of watertight sewer pipe 20 feet long centered on water main with joints between different pipes encased in 6-inch minimum of concrete and extending 6-inches either side of joint or encase sewer pipe in 6-inches of concrete completely around pipe, for not less than 10 feet either side of water main.
 3. Water Mains Passing Under Sewers: If vertical separation less than 18-inches provide structural support for sewer.

3.3 MANHOLE PREPARATION

- A. Verify items provided by other section of Work are properly sized and located.
- B. Verify that built-in items are in proper location, ready for roughing into Work.
- C. Verify excavation for manholes is correct

Town of Mead Design Standards and Construction Specifications

- D. Excavation, Backfill, Subgrade Compaction: Refer to Section 31 00 00 – Earthwork for requirements
- E. Rock Subbase
 - 1. Remove water and place to a 6-inch minimum depth.
 - 2. Vibrate for compaction.
 - 3. Level top to accept precast sections with uniform bearing all around.
 - 4. If material below vault is unsuitable, excavate as directed by the project's Engineer or Geotechnical Engineer and backfill to grade with 1-1/2 inch minus rock and compact.

3.4 PLACING MANHOLE

- A. Place manhole sections plumb and level. If not level, remove and re-level the grade.
- B. Clean ends of sections and place double mastic gasket.
- C. Set cover rings and covers level without tipping, to correct elevations or set cover rings and covers with slight tip to match cross slope of finished surface.
- D. Completed manholes shall be rigid and watertight.
- E. Coordinate with other sections of work to provide correct size, shape, and location.
- F. For cast-in-place:
 - 1. Place base pad, trowel top surface level to accept manhole section with uniform bearing all around
 - 2. Place sufficient non-shrink grout on base to ensure watertight fit between first manhole section and base of place first manhole section directly in wet concrete

3.5 PREFORMED GASKETS

- A. Remove and replace manhole sections which have chipped or cracked joints.
- B. Thoroughly clean section joints.
- C. Install gasket type in conformance with precast structure manufacturer's recommendation.
- D. Install gasket in conformance with manufacturer's recommendations.
- E. Only use primer furnished by gasket manufacturer.

3.6 MANHOLE INVERT

- A. Place concrete in bottom of manhole and form smooth transition. Trowel smooth and brush for non-skid finish. Slope bench ½-inch per foot for drainage to invert.
- B. Invert shape to conform to radius of pipe it connects.
- C. Remove all rough sections or sharp edges which tend to obstruct flow or cause material to snag. Remove all grout droplets from invert.
- D. Construct in conformance with standard drawings.

3.7 MANHOLE RINGS AND COVERS

- A. Place rings in bed of non-shrink grout on top of manholes.
- B. Ensure no infiltration will enter manhole at this location.
- C. Carry non-shrink grout over flange of ring.
- D. Set top of ring flush with all surfaces subject to foot and vehicular traffic or as required by approved drawings.
- E. Set manhole ring and cover 1/4-inch to 1/2-inch below roadway surface.

Town of Mead Design Standards and Construction Specifications

- F. Use precast grade rings for height adjustment of manhole ring and cover.

3.8 CONNECTION TO EXISTING MANHOLES

- A. Maintain flow at all times.
- B. Prior approval of proposed method for maintaining flow must be obtained from the Town.
- C. Cover area around new pipe with non-shrink grout and or waterstop gasket to ensure a watertight structure.
- D. Make connection during low flow periods.
- E. The contractor shall core drill the existing manhole as necessary to insert a "Kor-N-Seal or approved gasket and new sewer pipe.
- F. The existing concrete foundation bench shall be ground to the cross-section of the new pipe in order to form a smooth, continuous invert similar to what would be formed in a new concrete base. Portland cement grout shall be used as necessary to smoothly finish the new invert.

3.9 NEW MANHOLE CONNECTIONS TO ACTIVE SEWER LINES

- A. When connecting to an active line, the connecting manhole shall be poured in place, Class "B" 4,500 psi concrete with a minimum thickness of eight inches (8) below the flow line of the pipe and four inches (4) above the crown is required.
- B. Manhole inverts shall be formed to the full diameter of the pipe to insure full and unobstructed flow. Each pipe must extend no more than four (4) inches into the manhole wall to a formed concrete invert.
- C. Pre-cast bases may be used when specifically authorized by the Town. Pipes extended through manholes and cut to form an invert are not acceptable without prior written permission from the Town.

3.10 FIELD QUALITY CONTROL – GENERAL TESTING REQUIREMENTS

- A. Testing shall be accomplished through a combination of visual inspections, deflection tests, low-pressure air tests, and leakage test methods.
- B. Sanitary sewer pipe and appurtenances shall be cleaned and tested after backfill operations have been completed and acceptable compaction test results have been submitted to the Town Engineer. All testing shall be completed and approved by the Town prior to placement of permanent resurfacing.
- C. All testing shall be witnessed by the Town Engineer. The Contractor shall provide a minimum of 48 hours' notice to Town Engineer prior to testing. Tests performed in the absence of the Town's representative shall be considered invalid and shall be repeated at the Contractor's expense.
- D. The Contractor shall provide the Town a final report of all testing completed.
- E. New sanitary sewer installations shall be televised and as-built shots taken to verify design slope requirements by the Contractor after backfill operations have been completed. The results of the inspection and video shall be submitted to the Town Engineer for approval. Digital video files to be provided with reach noted, footage, inverts, and manhole number at each end, and pipe size and type. Water line installation may not begin until acceptable televised testing video and as-built shots have been submitted and reviewed by the Town.
- F. The Contractor shall have sewers jet washed on new installation prior to the initial television inspection. Debris resulting from the cleaning shall be removed before entering the Town's existing sewer, by either some type of plug or elbow to catch debris. Material shall be removed from the site and disposed of by the Contractor. If on the initial television inspection, the cleaning is unsatisfactory and prevents the television inspection from being completed, the Contractor shall reclean the sewer and shall be responsible for costs incurred by a second television inspection.

Town of Mead Design Standards and Construction Specifications

- G. Any damages to the pipe caused by cleaning or testing operations shall be repaired or replaced by the Contractor at their own expense. Should the pipe fail to meet the requirements of the low-pressure air test or infiltration of ground water is noted, the Contractor shall determine the source or sources of the leakage and shall replace defective materials or workmanship. Replacement of defective materials or workmanship as above noted shall be the financial responsibility of the Contractor. Pipe which fails to meet these requirements shall be repaired or replaced and retested in accordance with these requirements.
- H. New sanitary sewer installations may also be televised by the Town for initial acceptance after the installation, cleaning, testing, and final lift of asphalt are complete. Inspection reports and videos shall be available for review by the Responsible Party. The Responsible Party shall be responsible for any repairs or replacement of any portions of the pipeline that are determined defective by the television inspections.
- I. Prior to the final acceptance there may be another television inspection performed by the Town. If there are any discrepancies, a punch list shall be formulated and sent to the Responsible Party. Any discrepancies must be repaired prior to final acceptance being granted.

3.11 PIPE TESTING

A. Low Pressure Air Test

1. The Contractor shall perform a low-pressure air test on each reach of sanitary sewer pipe between manholes. The low-pressure air test shall be required on the entire length of pipe installations. The test shall conform to the recommended practice and calculations established by the ASTM C-828.
2. Pipe outlets shall be plugged with suitable test plugs. Pipe may be tested without pre-wetting. If the pipeline to be tested is submerged in groundwater, the Responsible Party shall determine the groundwater elevation at the test location and provide it to the Town Engineer. The backpressure on the pipe due to groundwater shall be determined and the internal pipeline test pressure shall be established at 4.0 psi (gauge) in excess thereof. Add air slowly to the portions of the pipe being tested. After the pipe has been filled to the required pressure, allow at least two (2) minutes for the air-temperature to stabilize, adding only the amount of air necessary to maintain the test pressure. After the two (2) minute period, disconnect the air supply and allow the initial pressure to drop to 3.5 psi (gauge) in excess of the groundwater back pressure.
3. The time interval required for the sewer internal pressure to drop from 3.5 psi (gauge) to 2.5 psi (gauge) above the excess of ground water backpressure shall be measured and recorded.
4. The basis for acceptance of the air test shall be the minimum time required for the internal pressure to drop 1.0 psi (gauge). The calculations generated by ASTM C-828 shall then be used to check the adequacy of the pipe installation. The minimum allowable time in seconds shall be in accordance with the following tables. The minimum allowable pressure drop time is computed based upon an allowable leakage rate not to exceed 0.003 cfm per square foot of internal pipe surface. Sewers 15 inches in diameter and smaller shall be tested from manhole to manhole. Sewers 18 inches in diameter and larger shall be tested in lengths such that the total loss is no less than two (2) cfm when computed using an allowable rate of 0.003 cfm per square foot of internal surface.
5. Minimum allowable pressure drop times for pipe 15 inches in diameter and smaller (in seconds) per table below:

Pipe Diameter (Inches)	Length of Pipe Being Tested (Feet)			
	100'	200'	300'	400'
8"	38	76	114	152
10"	47	94	141	188

Town of Mead Design Standards and Construction Specifications

12"	56	113	170	226
15"	71	141	212	283

6. Minimum allowable pressure drop times for pipe 18 inches in diameter and larger (in seconds) per table below:

Pipe Diameter (inches)	Length of Pipe Being Tested (feet)					Maximum Testing Length (feet)
	25'	50'	75'	100'	126'	
18"	21	42	64	85	106	140
21"	25	50	74	99		120
24"	28	56	85	113		106
27"	32	64	95			94
30"	35	71	106			84
36"	42	85				70

The minimum allowable pressure drop time when using the maximum testing length is 120 seconds.

7. Sewers 36 inches in diameter shall be tested one (1) joint at a time.
8. The Responsible Party shall follow precautions necessary to perform a safe and successful test. Plugs used to isolate the line for the air test must be securely braced to avoid the unintentional release of the plug. Gauges, air piping manifolds, and control valves shall be located above ground. No one shall be permitted to enter a manhole when a plugged pipe is under pressure. Air testing apparatus shall be equipped with a pressure relief device designed to relieve the pressure when in excess of six (6) psi (gauge).

B. Exfiltration Test

1. Contractor shall perform an exfiltration test on each reach of sanitary service and sanitary sewer pipe between manholes or discharge.
 - a. Test the first reach prior to backfilling and before installing any of the remaining pipe.
2. Procedure
 - a. Block off all manhole openings except those connecting with the reach under test.
 - b. Fill the line:
 - i. Average depth: 10 feet above invert except as required by manhole depth
 - ii. Maximum depth at lower end: 25 feet above crown
 - iii. Minimum depth at upper end: 5 feet above crown
 - c. Add and measure water as required to maintain a constant level
 - i. Air pocket entrapment shall be avoided when filling the line with water. Once filled with water, the system shall be allowed to stabilize for a period of one or two hours before starting the test.
 - ii. Maximum exfiltration/infiltration: 0.039 gallons per inch of nominal diameter per hour per 100 feet of pipe.
 - iii. For the purposes of exfiltration leakage, manholes shall be considered to be concrete pipe of the same diameter as the manhole i.e. 48, 60 or 72-inch diameter.
 - iv. Maintain test for a minimum of 2 hours or as long as necessary, to locate all leaks.
3. Repair and retest any reach which exceeds the allowable exfiltration/infiltration

Town of Mead Design Standards and Construction Specifications

- a. If excessive ground water is encountered during construction of a sanitary sewer section or as requested by the Town Engineer, the infiltration test for leakage shall be used.
 - b. Maximum infiltration: 0.039 gallons per inch of nominal diameter per hour per 100 feet of pipe.
4. Repair and retest any reach which exceeds the allowable infiltration.

C. Infiltration

- 1. If excessive ground water is encountered during construction of a sanitary sewer section or as requested by the Town Engineer, the infiltration test for leakage shall be used.
- 2. Maximum infiltration: 0.039 gallons per inch of nominal diameter per hour per 100 feet of pipe.
- 3. Repair and retest any reach which exceeds the allowable infiltration

D. Pipe Deflection Test

- 1. Pipe deflection test shall be completed if video inspection shows defects or as required by the Town Engineer.
- 2. No sooner than 30 days after placement and compaction of backfill, but prior to placement of permanent surface materials, clean and mandrel each line to detect obstructions (deflections, joint offsets, lateral pipe intrusions, etc.).
- 3. Use a rigid mandrel with diameter of at least 95 percent of the pipes specified average inside diameter and a length of the mandrel circular portion at least equal to the nominal pipe diameter.
- 4. Maximum allowable deflection is 5 percent of the base internal diameter. Mandrel outside diameters in inches are as follows:

Pipe Size	Base I.D.	Mandrel O.D.
6	5.792	5.50
8	7.764	7.38
10	9.711	9.23
12	11.558	10.98

- 5. Pull the mandrel through the pipe by hand.
 - 6. Relay or replace all pipe exceeding the 5 percent deflection.
 - 7. Retest repaired sections.
 - 8. Maximum allowable deflection at end of one year correction period, 7-1/2 percent of the base internal diameter tested in the same manner. Uncover and repair sections exceeding the allowable deflection.
- E. TV Inspection shall be provided as requested by the Town. Digital video files to be provided with reach noted, footage, inverts, and manhole number at each end, and pipe size and type.
- F. All sewer lines shall be inspected visually to verify accuracy of alignment and freedom from debris and obstructions. The full diameter of the pipe should be visible when viewed between consecutive manholes. The method of test can be photography, closed circuit television or visually lamping with mirrors and lights.
- G. Lamp Test
- 1. Each section between manholes will be lamped by Contractor in the presence of the Town Engineer if requested.

Town of Mead Design Standards and Construction Specifications

2. A true circle will be required in the lamp tests to indicate a properly constructed sewer line.
3. Repair any sections not passing the lamp test at Contractor's expense.

3.12 MANHOLE TESTING

A. Test all manholes:

1. Vacuum test:
 - a. Plug all inlets and outlets in such a manner as to prevent displacement of plugs.
 - b. Install and operate vacuum tester head assembly in accordance with equipment specifications and manufacturer instructions.
 - c. Attach the vacuum pump assembly to the proper connection on the test head assembly. Ensure that vacuum inlet/outlet valve is closed.
 - d. Inflate sealing element to twice the pressure test to be used. Do not over inflate.
 - e. Start vacuum pump assembly engine and allow preset RPM to stabilize.
 - f. Open vacuum inlet/outlet valve and evacuate manhole to 5-inches Hg (mercury).
 - g. Close vacuum inlet/outlet valve, disconnect vacuum pump and monitor vacuum.
 - h. Record time for vacuum to drop from initial 5 inches Hg to 4 inches Hg.
 - i. Acceptance for manholes when the time to drop from 5 inches Hg to 4 inches Hg meets or exceeds requirements as defined below:

Maximum Allowable Vacuum Drop			
Manhole Depth - Rim to Invert	Manhole Diameter (in)		
	48"	60"	72"
	Vacuum Testing Durations (s)		
8"	20	26	33
10"	25	33	41
12"	30	39	49
14"	35	46	57
16"	40	52	67
18"	45	59	73
20"	50	65	81
22"	55	72	89
24"	59	78	97
26"	64	85	105
28"	69	91	113
30"	74	98	121

- j. Repair all manholes that fail leakage test and retest until manhole passes test.
 - k. If joint mastic or gasket is displaced during vacuum test, disassemble manhole and replace seal.
 - l. If the manhole fails the initial test, necessary repairs should be made with a non-shrink grout. Repairs and retesting shall proceed until a satisfactory test is obtained.
2. All testing shall be witnessed by the Town Engineer or Town Inspector. Contractor shall provide a minimum of 48-hour notice prior to testing.

3.13 TRACER WIRE TESTING

The Contractor shall provide test report for tracer wire continuity.

Town of Mead Design Standards and Construction Specifications

3.14 CLEANUP AND RESTORATION

- A. Restore pavements, curbs and gutters, utilities, and other improvements to condition equal to or better than before work began and to satisfaction of the Town.
- B. Deposit waste material in designated waste areas and disposal site graded and shaped.

3.15 FINAL ACCEPTANCE

- A. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, and dirt when connected.
 - 1. Wire brush, if necessary, wipe clean and keep joint contact surfaces clean until connection is complete.
- B. Provide record drawings with manhole number, inverts, and location (x, y, z) for each service connection.
- C. Provide test report for tracer wire continuity.
- D. Provide pipe and manhole tests and results.
- E. Provide video files of TV inspection on a DVD.

END OF SECTION 33 33 00

Town of Mead Design Standards and Construction Specifications

SECTION 33 40 00 STORM DRAINAGE SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Piping and concrete structures for storm sewer system, roof drainage, and culverts
- B. Riprap for channel lining, outlet protection and rock check dams

1.2 REFERENCES

- A. ACPA - American Concrete Pipe Association
- B. ASTM – American Society for Testing and Materials
 - 1. ASTM C76 - Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
 - 2. ASTM C150 - Portland Cement
 - 3. ASTM C443 - Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
 - 4. ASTM C478 – Precast Concrete Structures
 - 5. ASTM C497 - Testing Concrete Pipe, Manhole Sections, or Tile
 - 6. ASTM A48 - Gray Iron Castings
 - 7. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 8. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - 9. ASTM C33 - Concrete Aggregates
 - 10. ASTM C478 - Precast Reinforced Concrete Manhole Sections
- C. Urban Storm Drainage Criteria Manual, Mile High Flood District (MHFD)
- D. Colorado Department of Transportation (CDOT) Standard Specifications for Road and Bridge Construction

1.3 SUBMITTALS

- A. Shop Drawings: Provide drawings with pipe and structure details, design standards, reinforcement, dimensions, etc. Provide additional detailed information (including elevations, fittings, specialty materials or fabrications, etc.) for special or custom features, structures, junctions and/or pipes. Provide pipe-laying schedule.
- B. Product Data: Provide sufficient data on features, pipe, joints, gasket material, lubricant and accessories to verify compliance with specifications.
- C. Manufacturers Certificate: Certify that pipe, meets or exceeds specified requirements. Confirm all materials comply with applicable standards.
- D. Test Reports: Submit all shop and field test reports in accordance with the Town of Mead Design Standards and Specifications.
- E. Provide sufficient data to verify compliance with these specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery
 - 1. Ship rubber gaskets in cartons and store in a clean area away from grease, oil, ozone producing electric motors, heat and the direct rays of the sun.
- B. Storage

Town of Mead Design Standards and Construction Specifications

1. Store pipe, fittings and gaskets in clean locations protected from environmental conditions such as: (direct sunlight, mud. etc).
 2. Do not use pipe and fittings stored in direct sunlight for periods in excess of 18 months.
 3. Store pipe on a flat surface which provides even support for the barrel with bell ends overhanging.
 - a. Do not stack pipe higher than five (5) feet.
- C. Handling
1. Handle to ensure installation in sound undamaged condition.
 2. Use equipment, tools and methods for unloading, reloading, hauling and laying that do not damage pipe or cause an impact. Damaged pipe will be cause for rejection.
 3. Use hooks or straps with broad, well padded contact surfaces for lifting sections of pipe.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Weather limitations: Do not install piping over frozen surfaces or in standing water.

PART 2 GENERAL PRODUCTS

2.1 PIPE MATERIALS

- A. General: Provide pipes of one of the following materials, of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated
- B. Fittings: Furnish bends, ells, tees, wyes, couplings and other fittings of the same type and class of material having equal or superior physical and chemical properties as acceptable to the Engineer
- C. Reinforced Concrete Pipe: ASTM C76,
1. 12-inch RCP Class V, with modified tongue-and-groove compression gasket joints complying with ASTM C443.
 2. 15-inch RCP Class IV (Class V when specified on plans), with modified tongue-and-groove compression gasket joints complying with ASTM C443.
 3. 18-inch thru 24-inch RCP Class III (Class IV or V when specified on plans), with modified tongue-and-groove compression gasket joints complying with ASTM C443.
 4. 24-inch thru 36-inch RCP Class II (Class III, IV or V when specified on plans), with modified tongue-and-groove compression gasket joints complying with ASTM C443.
- D. PVC Sewer Pipe: ASTM D3034, Type PSM, SDR 35 with PVC, elastomeric joints complying with ASTM D3212 using elastomeric seals complying with ASTM F477.
- E. HDPE Sewer Pipe: smooth interior, corrugated exterior piping conforming to ASTM D 2412, ASTM D 3212, AASHTO specifications M252 and M 294, joints to conform to ASTM F 477.
- F. Corrugated Metal Pipe (CMP): AASHTO M218 or ASTM A444, helically or circumferentially corrugated, mill galvanized steel.
1. Furnish galvanized sheet metal, 16 gauge, 0.064-inch galvanized thickness, 0.0598-inch base metal thickness and size of conduit as indicated. Sizes indicated are minimal inside diameters.
 2. Furnish width and lap depths and corrugations conforming to AASHTO M36.
- G. Corrugated Aluminum Pipe (CAP): ASTM M197 helically or circumferentially corrugated.
1. Aluminum alloy, 16 gauge, size shown on approved drawings.

Town of Mead Design Standards and Construction Specifications

2. Furnish width and lap depths and corrugations conforming to AASHTO M196.
- H. Perforated PVC Sewer Pipe for Underdrains: ASTM D3034, Type PSM, SDR 35 with PVC, elastomeric joints complying with ASTM D3212 using elastomeric seals complying with ASTM F477.

2.2 MATERIALS

- A. Plugs and Caps: Use pipe plugs or caps provided by the pipe manufacturer and approved by the Engineer for pipe stubouts.
- B. Cleanouts: Provide as indicated, pipe extension to grade with ferrule and countersink cleanout plug. Provide round cast-iron access frame over cleanout, with heavy duty secured scoriated cover with lifting device cast with the word "STORM".
- C. Reinforcement
 1. Reinforcing Steel: ASTM A615 Grade 60
 2. Welded Wire Fabric: ASTM A185
- D. Concrete: Refer to Section 31 13 00 - Rigid Paving and Flatwork Specifications
 1. Minimum compressive strength: 5000 psi at 28 days
 2. Cement: ASTM C150, Portland Cement, Type II
 3. Aggregates: ASTM C33, free of deleterious substances
- E. Gaskets: ASTM C923
 1. Mastic: FS SS-S-210A, "RAM-NEK" or accepted substitution
 2. Rubber: Neoprene, 40+ 5 hardness when measured by ASTM D2240, Type A durometer
- F. Inlet Gratings and Manhole Rings and Covers
 1. Cast iron, heavy duty traffic type, ASTM A48, Class 35B. Grind bearing surfaces to ensure flat, true surfaces.
 2. Provide bike/pedestrian-safe grates where such traffic is anticipated.
 3. Set grate on frame such that openings maximize inlet intake.
 4. Covers to seat at all points on ring.
 5. Covers to be cast with "STORM SEWER" in 1 1/2" tall flush letters minimum in addition to the symbol of a fish with the phrase "DUMP NO WASTE, DRAINS TO WATERWAYS".
 6. Manhole covers to receive asphalt varnish coating hot dip applied at foundry, 6 mils thick.
- G. Manhole Height Adjustment: Use precast concrete grade rings.
- H. Rock Subbase: 1-½ -inch minus, well-graded gravel over compacted subgrade
- I. Water: Clean and free of deleterious substances
- J. Grout:
 1. Non-Shrink, Non-Metallic Grout: Factory premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing minimum compressive strength of 4000 psi in one day and 8000 psi in 7 days
 2. Epoxy Grout: Three Component Epoxy Resin System
 - a. Two liquid epoxy components
 - b. One inert aggregate filtered component
 - c. Each component furnished in separate package for mixing at job site

Town of Mead Design Standards and Construction Specifications

2.3 CONCRETE CATCH BASINS AND MANHOLES

A. General:

Comply with Town of Mead Standard Details and CDOT standards and specifications for public storm sewer products.

B. Precast Concrete Units for Catch Basins and Manholes:

1. Manufacturers: Carder Concrete Products, Amcor Precast, or accepted equal
2. Specification: ASTM C478 and C789, wall "B"
 - a. Minimum wall thickness: greater of six (6) inches or 1/12 of internal diameter
 - b. Reinforced
 - c. Grade rings as required
 - d. Cast steps into units.

C. Precast Units or Cast-in-place as shown. Use concrete that will attain a 28-day compressive strength of not less than 4,000 psi with a cement content of not less than 6 sacks per cu. yd. Openings to be precast per plan or sawcut in field.

D. Cast-in-place Concrete Units: As shown on the approved drawings or standard detail drawings and complying with the Colorado Department of Transportation drainage and design standards.

E. Manhole Steps: Steel bar, 1/2-inch Grade 60, drop-front type, with polypropylene coating applied by manufacturer, Type MA Industries, Inc. "PS2-PF" or equal

2.4 PVC PLASTIC INLINE DRAINS AND DRAIN BASINS

A. Manufacturer: Nyloplast America Inc. or accepted substitution.

B. Inline drains and drain basins shall be manufactured from PVC pipe stock, utilizing a thermo molding process to reform the pipe stock to the furnished configuration. The drainage pipe connection stubs shall be manufactured from PVC pipe stock and formed to provide a watertight connection with the specified pipe system. The joint tightness shall conform to ASTM D3212.

C. Surface drainage products shall meet the mechanical property requirements for fabricated fittings as described in ASTM F794, F949 and F1336.

D. Inline drain and drain basin adapters and accessories:

1. Adaptable to SDR-35 PVC piping.
2. Watertight adapters.

E. Cast iron or ductile iron frames and grates:

1. Light –traffic rated
2. Pedestrian rated
3. Hinged and locking
4. Made specifically for use with the specified inline drains and drain basins
5. Painted black
6. ASTM A-48-83 Class 30B or A536 grade 70-50-05 grade iron
7. Size indicated on the approved drawings

Town of Mead Design Standards and Construction Specifications

2.5 CONCRETE FABRICATION

A. Vault/Manhole Sections

1. Precast concrete dimensions as shown on plans
2. Minimum manhole inside diameter: 48 inches
3. Precast lid and Cones: Same or greater reinforcement and wall thickness as vault or manhole section with capability for H20 loading
4. Vault Joints: Shiplap or tongue and groove with double mastic gaskets, each joint to set equally and tightly
5. Manhole Joints: Keylock type with double mastic gaskets, each joint to set equally and tightly
6. Access opening: Minimum 24 inches clear or as indicated
7. Pipe connection: As indicated on Drawings
8. Pipe knockout: As indicated on Drawings
9. Precast concrete, monolithic base or cast-in-place base
10. Manhole steps: 12 inches on center, vertical alignment above largest bench or open area

B. Grating and Metal Frame: As specified on approved drawings

2.6 SOIL MATERIALS

A. Furnish pipe bedding and cover as specified in Section 31 00 00 – Earthwork.

B. Riprap Materials:

1. Hard, dense, durable stone, angular in shape and resistant to weathering
2. Minimum specific gravity of 2.5
3. Material may be approved by Town Engineer, if by visual inspection, the rock is determined to be sound and durable.
4. Town Engineer may require Contractor to furnish laboratory test results if the material appears to be marginal or unacceptable.
5. Tested material shall meet the following requirements for abrasion resistance or compressive strength:

Test	Test Method	Requirement
Abrasion Resistance by Los Angeles Machine	ASTM C 535	50% loss, max
Unconfined Compressive Strength of Drilled Core Specimen	AASHTO T 24	2500, min

Town of Mead Design Standards and Construction Specifications

6. Gradation:

Riprap Designation	% Smaller Than Given Size By Weight	Intermediate Rock Dimension (Inches)	Mean Particle Size, d_{50} (Inches)
Type L	70-100	15	9
	50-70	12	
	35-50	9	
	2-10	3	
Type M	70-100	21	12
	50-70	18	
	35-50	12	
	2-10	4	
Type H	70-100	30	18
	50-70	24	
	35-50	18	
	2-10	6	

7. Granular Riprap Bedding:

a. 3/4" – 1" Crushed rock – AASHTO 57/67

Sieve Size (Inch)	Percent Passing by Weight
1	100
3/4"	90-100
1/2"	25-60
3/8"	20-55
NO. 4	0-10
NO. 8	0-5
NO. 200	0-2

C. Pipe Bedding:

- a. Refer to Section 31 00 00 – Earthwork
- b. Minimum 6 inch deep, unless specified otherwise

D. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:

1. Grab Tensile Strength: 110 lbf (490 N); ASTM D 4632.
2. Tear Strength: 40 lbf (178 N); ASTM D 4533.
3. Puncture Resistance: 50 lbf (222 N); ASTM D 4833.
4. Water Flow Rate: 150 gpm per sq. ft. (100 L/s per sq. m); ASTM D 4491.
5. Apparent Opening Size: No. 50 (0.3 mm); ASTM D 4751.

PART 3 EXECUTION

3.1 PIPE PREPARATION

- A. Shape trench and place bedding as specified in Section 31 00 00 and as shown on the approved drawings.
 1. Dig bell or coupling holes.
 2. Do not support pipe on blocks or mounds of earth.

Town of Mead Design Standards and Construction Specifications

3. Provide uniform and continuous bearing and support for full length of pipe between bell holes.
 4. Minor disturbance over a maximum length of 18 inches near the middle of each length of pipe will be permissible by the withdrawal of pipe slings or other lifting tackle.
- B. Alignment and Grade
1. Except as indicated on the Drawings, lay all pipe straight and at a uniform grade.
 2. Use batter boards to determine and check pipe subgrades.
 3. Other methods of maintaining alignment and grade may be acceptable if approved by the Town Engineer.

3.2 PIPE INSTALLATION

- A. Inspect pipe and accessories for defects before lowering into trench.
- B. Replace any defective, damaged or unsound pipe.
- C. Carefully lower pipe, fittings, and accessories into the trench with derricks, ropes, and other suitable equipment to prevent damage. Do not dump or drop pipe or accessories into trench.
- D. Pipe embedment shall be as specified in Section 31 00 00 – Earthwork for pipe.
- E. Protect from lateral displacement by placing the specified pipe embedment material.
- F. Do not lay pipe in water, under unsuitable weather conditions or under unsuitable trench conditions.
- G. Joint to form true and smooth line.
- H. Remove any pipe not making a good fit.
- I. Begin pipe laying at the lowest point unless reverse laying is accepted by Engineer.
- J. Utilize implements, tools and facilities as recommended by the manufacturer and/or catch basins if required to remove debris.
- K. Keep pipe clean during and after laying.
- L. During construction, close all open ends with watertight expandable type plugs.
 1. At the end of each day's operations.
 2. Whenever pipe ends are left unattended.
 3. Deposit adequate backfill on pipe to prevent flotation.
 4. Do not use wood, burlap or other similar temporary plugs.
- M. Remove and re-lay any pipe which has floated.

3.3 PRECAST STRUCTURE PREPARATION

- A. Verify items provided by other section of Work are properly sized and located.
- B. Verify that built-in items are in proper location, ready for roughing into Work.
- C. Verify excavation for manholes is correct.
- D. Excavation and Backfill: Refer to Section 31 00 00 - Earthwork for requirements.
- E. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.
- F. Rock Subbase: Remove water, excavate, and place 1-1/2 inch washed rock 6-inch minimum depth, vibrate for compaction.

Town of Mead Design Standards and Construction Specifications

3.4 CATCH BASINS

- A. Construct catch basins to the sizes and shapes indicated, and to conform to requirements of authorities having jurisdiction.
 - 1. Rock Subbase: Remove water, excavate, and place 1-1/2 inch washed rock 6-inch minimum depth, vibrate for compaction.
 - 2. For precast units, set in place to accurate elevations on firm, solid bed, plumb and level.
 - 3. Pipe openings, elevations and alignment per plans
 - 4. Seal and grout all pipe penetrations
 - 5. Set cast iron frames and gratings to the elevations indicated.

3.5 PLACING MANHOLE SECTION OR CAST-IN PLACE BASE

- A. Rock Subbase: Remove water, excavate, and place 1-1/2 inch washed rock to a 6-inch minimum depth, and vibrate for compaction.
- B. Place base pad, trowel top surface level to accept manhole section with uniform bearing all around.
- C. Place sufficient non-shrink grout on base to ensure watertight fit between first manhole section and base or place first manhole section directly in wet concrete.
- D. Place manhole sections plumb and level, trim to correct elevations.
- E. Clean ends of sections and place double mastic gasket.
- F. Fill inside and outside of joint completely with non-shrink grout and trowel smooth.
- G. Cure non-shrink grout using approved methods.
- H. Set cover rings and covers level without tipping, to correct elevations or set cover rings and covers with slight tip to match cross slope of finished surface where directed by Town Engineer.
- I. Completed manholes shall be rigid and watertight.
- J. Coordinate with other sections of work to provide correct size, shape, and location.

3.6 PREFORMED GASKETS

- A. Remove and replace manhole sections which have chipped or cracked joints.
- B. Thoroughly clean section joints.
- C. Install gasket in conformance with manufacturer's recommendations.
- D. Only use primer furnished by gasket manufacturer.

3.7 MANHOLE INVERT

- A. Place concrete in bottom of manhole and form smooth transition. Trowel smooth and brush for non-skid finish. Slope bench ½ inch per foot for drainage to invert.
- B. Invert shape to conform to radius of pipe it connects.
- C. Remove all rough sections or sharp edges which tend to obstruct flow or cause material to snag. Remove all grout droplets from invert.
- D. Construct in conformance with standard drawings.

3.8 MANHOLE RINGS AND COVERS

- A. Place rings in bed of non-shrink grout on top of manholes.
- B. Ensure no infiltration will enter manhole at this location.
- C. Carry non-shrink grout over flange of ring.

Town of Mead Design Standards and Construction Specifications

- D. Set top of ring flush with all surfaces subject to foot and vehicular traffic.
- E. Set top of ring 6 inches above surfaces in open, unraveled, non-pedestrian areas.
- F. Use precast grade rings for height adjustment.

3.9 CONNECTION TO EXISTING MANHOLES

- A. Maintain flow at all times.
- B. Prior approval of proposed method for maintaining flow must be obtained from Engineer.
- C. Cover area around new pipe with non-shrink grout and or waterstop gasket to ensure a watertight structure.
- D. Make connection during low flow periods.

3.10 GROUT

A. PREPARATION

- 1. Non-Shrink, Non-Metallic Grout, General Use
 - a. Clean concrete surface to receive grout.
 - b. Saturate concrete with water for 24 hours prior to grouting and remove excess water just prior to placing grout.
 - c. Cold weather conditions
 - i. Warm concrete, substrate and base plate to 40 degrees F, or above; store grout in warm area.
 - ii. Follow manufacturer's recommendations for cold weather application.
 - d. Hot weather conditions
 - i. Use cold mixing water and cool base plate if possible; store grout in cool area.
 - ii. Follow manufacturer's recommendations for hot weather application.
 - e. Apply to clean, sound surface.
 - f. Apply latex bonding agent to hardened concrete, mix-in-grout, or as directed by Engineer.
- 2. Epoxy Grout: Apply only to clean, dry, sound surface.
 - a. Patch cavities in concrete including, but not limited to, tie holes, and structural and equipment support.

B. APPLICATION

- 1. Non-Shrink, Non-Metallic Grout
 - a. Mix in a mechanical mixer
 - b. Use no more water than necessary to produce flowable grout.
 - c. Provide air vents where necessary to eliminate air pockets.
 - d. Place in accordance with manufacturer's instructions.
 - e. Where exposed to view finish grout edges smooth.
 - f. Protect against rapid moisture loss by immediately covering with wet rags and polyethylene sheets or curing compound.
 - g. Wet cure grout for 7 days, minimum.
 - h. Maintain the temperature at a minimum of 40 degrees F until grout reaches 3000 psi.
 - i. After placement of grout, eliminate excessive external vibration.

Town of Mead Design Standards and Construction Specifications

2. Epoxy Grout
 - a. Mix and place in accordance with manufacturer's instructions.
 - b. Completely fill all cavities and spaces around dowels and anchors without voids.
 - c. Obtain manufacturer's technical assistance as required to insure proper placement.

3.11 RIPRAP

- A. Do not place riprap over frozen or spongy subgrade surfaces.
- B. Place riprap at pipe outlets and in channels as indicated on plans. Top of riprap to match invert of outlet pie and channels.
- C. Excavate and prepare subgrade.
- D. Place geotextile fabric per plans under all bedding. Place bedding and place riprap on bedding per plans.
- E. Material may be machine placed and then arranged as necessary by use of a Gradall with multi-prong grapple device or by hand to minimize voids. Dumping alone is not sufficient to achieve properly placed riprap.

3.12 FIELD QUALITY CONTROL

- A. Field inspection and testing including a lamp test will be performed for every section of pipe after backfill has occurred.
 1. Contractor shall furnish suitable assistance to the Town Engineer.
 2. A minimum of 75% of a true circle will be required to indicate a properly constructed line.
 3. Contractor will repair any section not passing the lamp test.
- B. Request inspection immediately after placing cover over pipe.
- C. Backfilling and testing as required per Section 31 00 00 - Earthwork.

END OF SECTION 33 40 00

Town of Mead Design Standards and Construction Specifications

SECTION 33 47 00 LANDSCAPE AND IRRIGATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Specifications for concrete paths and bridges and all associated signage, railings, lighting and root barrier
- B. Specifications for grading and fine grading, top soil, soil amendments, fertilizer
- C. Specifications for installation of irrigation improvements including taps, backflow prevention, valves, piping, sprinkler heads, control systems, pumps and signage.
- D. Minimum requirements for seeding, mulching, fertilizer and weed control during establishment of seeded areas to be owned by the Town and common open space owned by the Homeowners Association.
- E. Minimum requirements for sodded areas to be owned by the Town and common open space owned by the Homeowners Association.
- F. Materials and practices to install trees, shrubs and groundcover.

1.2 REFERENCES

- A. AASHTO – American Association of State Highway and Transportation Officials.
- B. USACE – US Army Corps of Engineers
- C. USFWS – US Fish and Wildlife Service
- D. CDPHE – Colorado Department of Health and the environment
- E. UPC – Uniform Plumbing Code
- F. NSF – NSF International (National Science Foundation)
- G. ANSI – American National Standards Institute
- H. ASTM – ASTM International (American Society for Testing and Materials)
- I. Water Provider - Little Thompson Water District or Longs Peak Water, District of Central Weld County Water District
- J. Electric Provider – United Power
- K. Electric Code as currently adopted
- L. UL – Underwriters Laboratory
- M. PE – Polyethylene cable
- N. UF - underground feeder cable; rated for in-ground and damp-area installation
- O. HOA – Homeowners Association or other entity responsible for installation and maintenance of these improvements
- P. B&B – Balled and Burlapped nursery stock

1.3 SUBMITTALS

- A. Submit on all products required for construction to verification of compliance with these Specifications.
- B. Seeding and fertilizers: certificates showing State, Federal or other inspection showing source and origin.
- C. Samples: Mulch; canvas strap or approved equal (when requested by Town).

Town of Mead Design Standards and Construction Specifications

1.4 REGULATORY REQUIREMENTS

- A. Conform to all Town codes and ordinances, laws and regulations of Weld County, Town of Mead, CDPHE, USACE, USFWS, the notes and details on the drawings, and as specified herein.
- B. In case of apparent conflict, CDPHE, USACE, USFWS requirements govern over these specifications.
- C. Contractor shall prepare, submit, pay, and otherwise obtain all necessary permits from all appropriate entities.

1.5 SCHEDULING

PART 2 PRODUCTS

2.1 GENERAL

- A. The **Town of Mead List of Approved Landscape Materials** is attached to this Section as a separate document, herein referred to as Town Approved Materials List.
 1. The **Town of Mead List of Approved Landscape Materials** is periodically updated. Please contact the Town Engineer for the most current list.

2.2 CONCRETE PATHS AND BRIDGES

- A. For specific list of materials accepted by the Town please see Town Approved Materials List.
- B. Concrete mix design: see Section 32 13 00 of these Specifications. Control joints: zip strips or saw cut (soft cut) to one quarter (1/4) the total slab thickness. Curing compound: for all exposed concrete surfaces - white pigmented sealant.
- C. Bridge steel to be CorTen self-weathering steel (preferred) or zinc enamel painted structure (color gloss black or as approved by Town). Concrete reinforced bridges are acceptable. Concrete decking is preferred, however, alternate ironwood decking also acceptable (three inch (3") minimum thickness planks). See approved materials list for pre-approved decking. Approach railing to match bridge steel and paint (if applicable). Safety plate at abutment to be 1/4" minimum textured, galvanized steel plate.
- D. Barrier Railings shall be constructed of minimum two-inch (2") round tubing with three-eighths inch (3/8") walls. All welds shall be ground smooth and railings shall be painted (color per Town approval) with zinc enamel paint. All railing design is to meet current AASHTO standards.
- E. Signage: All non-traffic regulation signs in recreational areas shall be silk-screened with 3M ink on .080" thick aluminum backing plate backing plates. No Electronically Cuttable Film (E.C. Film) shall be permitted unless approved by the Town. All signs shall have a border the same color as the sign text. All signs to include Spanish translation if possible (to be provided by Town). Sign faces to be secured using tamper resistant fasteners.
 1. Street identification sign (English only) at underpass – Street name (only) to be secured to the face of the underpass: Color: Royal blue with white letters.
 2. Bridge caution loading sign (English only) (with manufacturer's maximum bridge loading information) to be secured to the bridge by the manufacturer: Color: White with black letters
 3. Stop sign (English only) at concrete path intersections with roads (standard street sign or smaller version allowed) to be mounted on wood post: Sign Color: red with white letters.
 4. Path intersection sign to be mounted on wood post: "Warning: Intersection ahead. Aviso: Intersection a continuation." sign: Color: White Yellow with black letters.
 5. Bridge caution sign: "Caution: Slippery when wet. Precaución: Área resbaloso cuando esta mojado." Or, International graphic symbol to be secured to bridge end posts without extending into path or on separate free-standing wood post. Color: yellow with black letters.

Town of Mead Design Standards and Construction Specifications

6. Designated ID sign: Name of designated greenway (English only) to be mounted on wood post, Sign Color: White with green letters. Sign to run vertically up post.
 7. Dog waste sign: Copy and color to be provided by Town. Sign face to be mounted on wood post.
 8. Dog waste dispenser: 24" long 4" PVC (Class 200) pipe with 2 end caps – painted black. (2 ea.) 4" diameter holes cut into one side of pipe top and bottom. Dispenser to be mounted on wood post.
 9. Trail Courtesy sign – Color – Green. Copy to be provided by Town. Two sign faces are to be provided (English and Spanish). Mount to wood post with one sign face on each side.
 10. Sign Posts – 4x4" or 6x6" (size as appropriate for sign face) pressure treated wood posts stained gray (Stain Color – Sherwin Williams Grey Birch). Top edges beveled and posts free of significant checking.
- F. Lighting:
1. Vandal resistant, Lexan lens fixtures with metal guard. See approved materials list for pre-approved fixtures.
 2. Root Barrier: See approved materials list for pre-approved barriers.

2.3 FINE GRADING

- A. For specific list of materials accepted by the Town, please see Town Approved Materials List.
- B. Topsoil: a friable loam, typical of cultivated local top soils, containing at least 2% humus. It must be taken from a well-drained, arable site and shall be reasonably free of subsoil, stones, clods, sticks, roots and other objectionable extraneous matter or debris. No stones or other materials over two inches (2") in size shall be allowed. It shall contain no toxic materials. Topsoil shall have an acidity in the range of ph 5.5 to ph 8.5.
 1. Submit sample and written confirmation from supplier of material composition including the percent of organic matter, salts, and nutrient composition. Sample is to be representative.
- C. Soil Amendment: A high quality composted material containing a minimum of 30% organic matter by dry weight. The mixture shall be free from clay subsoil, stones, lumps, plants or roots, sticks, weed stolons, seeds, high sodium content and other materials harmful to plant life. The compost shall be coarsely ground with an even composition and have an acidity in the range of PH 5.5 to PH 7.0. All material shall be sufficiently composted such that no material used is recognizable. The following nutrient analysis should be provided on a dry basis: Nitrogen: 1% min; Phosphorus: 0.4%; Potassium: 1.2%; Salts: 6.5% (as received basis).
- D. Submit sample and written confirmation from supplier of material composition including: percent organic matter, sodium, nutrient composition and trademark. Sample is to be representative.
- E. Fertilizer: Triple superphosphate with a chemical analysis of (0-46-0).

2.4 IRRIGATION

- A. For a specific list of materials accepted by the Town, please see Town Approved Materials List.
- B. Taps: Contractor is responsible for supplying saddle to connect the service pipe.
- C. Backflow Prevention Device and Water Meter: Backflow devices and water meters to be purchased to meet Town and Water Provider specifications.
 1. Above ground reduced pressure backflow preventers are required for all potable systems and for all untreated raw water (non-potable) or with in-line injection system designs.
- D. Master valve: sized to match size of mainline.
- E. Copper: Type K rigid conforming to ASTM Standard B88.

Town of Mead Design Standards and Construction Specifications

F. Mainline:

1. Class 200 PVC, NSF approved.
2. Town Owned Areas: For pipe sizes larger than three-fourths of an inch (3/4-inch) use gasketed pipe.
3. Town Owned Areas: No mainline to be sized at 1-1/4 inch.
4. Use ductile iron fittings for mainline sizes larger than four (4) inches.
5. No cold weather glue permitted.

G. Laterals:

1. Class 200 PVC, NSF approved.
2. Town Owned Areas: No laterals smaller than one inch (1") or sized at 1-1/4".
3. Polyethylene Drip Pipe: weather and UV resistant material, NSF approved, SDR pressure rated pipe, only as approved for drip applications.

H. Pipe Fittings:

1. Pipe fittings shall be molded fittings manufactured of the same material as the pipe.
2. Funny Pipe (pop-up heads only): to be compatible with the elbows needed for the sprinkler heads and appropriately sized crimp-type clamps to be used.
3. PVC: Schedule 40, Type 1, PVC solvent weld with ASTM Standards D2466 and D1784. No cold weather glue permitted.
4. Copper pipe: Wrought copper or cast bronze fittings, soldered or threaded per installation details.
5. Use ductile iron fittings for mainline sizes larger than 4".

I. Sleeving:

1. Ductile Iron Pipe or Class 200 PVC under all paved surfaces. Each mainline, lateral or wire crossing of any paved area to be installed in a separate sleeve.
2. Sizes to be a minimum of two sizes larger than the pipe being sleeved. Minimum four-inch (4") diameter, or larger where appropriate, for irrigation lines.
3. Wires to be in separate sleeve from pipe, two inch (2") minimum size pipe for control wire sleeves.
4. Shall have marker tape on upper side and both ends for future locates.

J. Valves:

1. Remote Control Zone Valves (including Master Valves): Electrically operated, appropriate for the water supply (scrubber type for raw water applications), with manual bleed device and flow control stem. Shall have a slow-opening and slow-closing action for protection against surge pressure.
2. Pressure regulating function to be used as needed.
3. Drip Remote Control Valves: Same as remote control zone valves sized to match system requirements, including upstream filter, pressure regulator and y-strainer.
4. Isolation Gate Valves: Able to withstand a continuous operating pressure of 150 psi. Clear waterway equal to full diameter of pipe. Shall be opened by turning square nut to the left (wheel opening is unacceptable).
5. Manual Drain Valve: 3/4" ball valve with tee handle.

Town of Mead Design Standards and Construction Specifications

6. Quick Coupling Valves: one-inch (1") brass units with rubber cover and one-inch (1") brass key.
- K. Valve Boxes:
1. House valves in valve box with matching locking cover: One valve per box. Install in Jumbo box sizes, as specified. Also, install a waterproof tag with permanent marker with each valve number. One tag shall be attached to each valve.
- L. Control System:
1. Controller (for systems including Town owned and HOA Owned Common Open space areas): Number of stations shall include two extra stations for possible future use. Controller box shall be weather tight and vandal resistant with locking exterior disconnect.
 - a. Control System Enclosure: Weatherproof security enclosure with floor stand kit and lock kit.
 - b. One per water tap. Number of stations shall include three (3) extra stations for possible future use. System shall come pre-assembled with security enclosure.
- M. Electric Control Wiring:
1. #14 solid copper direct burial UF or PE cable, UL approved, for systems up to 2,000 feet in length. For larger systems, wire is to be #12 solid copper direct burial UF or PE cable, UL approved, or larger, per system design and manufacturer's recommendations.
 2. Five wires with consistent color scheme throughout:
 - a. Red = live White = ground Black = extra (to farthest end of mainline including each branch). Blue = extra (to farthest end of mainline including each branch) Green = extra (to farthest end of mainline including each branch)
 - b. Label each wire with waterproof tape and permanent marker at the controller and the furthest end of each wire.
 - c. Wire connectors and waterproofing sealant specific for direct burial to be used to join control wires to remote control valves.
- N. Sprinkler heads:
1. All heads shall be of the same manufacturer as specified on the plans, and marked with the manufacturer's name and model in such a way that materials can be identified without removal from the system.
 - a. Include check valve in head.
 - b. Gear driven rotor heads: with stainless riser.
- O. Drip system:
1. Spiral barb emitters. No spaghetti tubing allowed. Install tracer wire over all drip pipes, buried a minimum of six inches (6") under the soil.
- P. Thrust blocks:
1. 3000 psi concrete with #4 rebar wrapped with asphalt tar based mastic coating.
- Q. Raw Water Systems:
1. For all raw water irrigation systems, typical "dirty water" equipment shall be required, including purple valve boxes, pipes and rotor heads, scrubber valves and bubblers instead of drip emitters. Raw water systems typically include supply turn-out structure (where applicable), storage pond for 3 days storage (typical). Storage pond to be lined – submit lining material product literature for Town review and approval, and rip rap will be installed 12" minimum below the lowest water level at draw down of irrigation. All raw water systems to include provision for potable back up in the event of raw water delivery system failure.

Town of Mead Design Standards and Construction Specifications

R. Pump Systems:

1. Irrigation pump systems for raw water use to be coordinated with Town. Submit information on pump equipment for Town review and approval – using Approved Materials list for equipment as appropriate. Basic system requirements include: Pump system capable of water delivery at required volume and pressure for ultimate landscape build out (Variable Speed Pump to be used if drip irrigation is included in the design or if there is a varying depth of water storage); skid-mounted pump system (typical) with manufacturer per Town approval; pump control system with interface to irrigation controller(s); pump enclosure heating system to maintain 49 degrees minimum temperature at 0 degrees F; lighting and power (GFI) on separate breaker from pump; masonry (typical) enclosure with vandal resistant coatings and steel screen over vent openings; pump access hatch centered over pump; man door access using steel door with lock guard over door hardware; pump enclosure sized to provide adequate walking room around pump skid and controller systems.

S. Signs:

1. Raw Water in Use signs for all raw water systems.

2.5 SEEDING

A. For a specific list of materials accepted by the Town, please see Town Approved Materials List.

B. Seed:

1. Seed shall be of fresh, clean, new crop seed composed of the varieties approved by the Town with tested minimum percentages of purity and germination clearly labeled on the package. All seed shall be free of Poa annual grass and all noxious objectionable weeds with a maximum crop of 0.10% weeds.

C. Mulch:

1. For slopes 3:1 and less: Certified weed free hay for dryland seeded areas and hydromulch for irrigated turf seeded areas.
2. For slopes steeper than 3:1, and inaccessible areas: Hydromulch using wood cellulose fiber.
3. Hydraulic mulching shall not contain any substance or factor which might inhibit germination or growth of grass seed. It shall be dyed a green color to allow metering of its application.

D. Tackifier: Per approved materials (Mandatory for hydromulch).

E. Netting:

1. For slopes steeper than 3:1, use Soil Saver jute netting, or approved equal. Netting to be stapled with No. 11 gauge steel wire forged into a six inch (6") long U shape, and painted for viability in mowed areas.

F. Fertilizer:

1. Slow release type Nitrogen

G. Native grass seeded area signs:

1. A sign is to be erected in all permanent dryland seeded areas in designated pathways reading "Native dryland grass seeding is being established in this area. Prior to establishment, the grasses will be mowed approximately 4-5 times per year to help control noxious weeds. After establishment, the dryland grass will be maintained according to approved maintenance procedures and accepted industry standards, including growth heights of over twelve inches (12") and the irrigation system will be turned off. Eventually, these grasses will provide habitat for wildlife in the area and will help conserve water.

Town of Mead Design Standards and Construction Specifications

Thank you for your cooperation." The sign shall be brown with white letters with Town logo and shall be mounted on 6"x6" wood post, mounted 5'-6' above grade.

2. Breakaway Traffic Delineators: Durapost or SafeHit. In-ground mounted, white with reflectors. See Approved Materials List.

2.6 SODDING

A. For a specific list of materials accepted by the Town, please see Approved Materials List.

B. Sod:

1. Sod shall have a clay-loam base that will not break, crumble or tear during sod installation. Netted sod is acceptable. It shall have a healthy, vigorous root system that has undergone a program of regular fertilization, mowing and weed control to obtain thick turf free of objectionable weeds. It shall be free of nematodes, pests and pest larvae as inspected by the entomologist of the Colorado State Department of Agriculture.
 - a. Thickness: one inch (1") thick excluding top growth and thatch.
 - b. Thatch: Not to exceed 1/2" uncompressed.
 - c. Width: Eighteen inch (18") wide strips or forty two inch (42") wide rolls.
2. Fertilizer:
 - a. Ammonium sulfate and diammonium phosphate, with chemical analysis of N 20%, P 10%, K 5%, S 8%, Fe 3% (Urea and sulphur coated Urea only), unless soil test recommendation provides alternative rates.

2.7 TREES PLANTS AND GROUND COVER

A. Nursery Stock: All nursery stock shall conform to the American Standard for Nursery Stock (ANSI Z60.1) and the Colorado State Nursery Act.

B. Plants

1. Plants shall be first class representatives of specified species or variety, in healthy condition with normal developed branch and root systems, free of objectionable features. Must conform to: American Joint Committee on Horticulture (plant names); American Standard for Nursery Stock (ANSI Z60.1); Colorado Nursery Act.
2. Only plants grown in hardiness zones 2, 3, 4, and 5 are acceptable.
3. All material shall be free of disease, insects, eggs, larvae, and parasites of objectionable or damaging nature.
4. Inspect plants to make sure they meet minimum size requirements of the ordinance and the plans, and for proper form including strong central leader and good branching pattern on trees and number and length of canes on shrubs:
 - a. Large or small canopy deciduous trees (>30' mature height): two inch (2") caliper measured six inches (6") above ground, balled and burlapped.
 - b. Ornamental deciduous trees (<30' mature height): 1-1/2" caliper measured six inches (6") above the ground, balled and burlapped.
 - c. Evergreen trees: six feet (6') in height, balled and burlapped.
 - d. Shrubs: # 5 plastic container with deciduous shrubs approximately two feet (2') high and spreading shrubs having 18" – 24" spread.
 - e. Groundcovers, vines, perennials: #1 plastic container.

C. Backfill mix:

1. Mix shall consist of the following and be used in backfilling all plant materials:

Town of Mead Design Standards and Construction Specifications

2. One part composted soil amendment; two parts topsoil; three parts native soil from planting pits; superphosphate amendment.
 3. All materials to be thoroughly blended.
- D. Stakes and guys:
1. Shall be standard guying system unless previously approved by town.
 2. Standard guying system:
 - a. Stakes – see approved materials list.
 - b. Guys - see approved materials list.
- E. Miscellaneous: See approved materials list.
- F. Mulch: See approved materials list.
- G. Weed barrier fabric: See approved materials list.
- H. Steel edging: See approved materials list.
- I. Beaver protection: See approved materials list.
- J. Prairie dog enclosure: If required, contact Town or the Colorado Division of Wildlife for recommended enclosures.

PART 3 EXECUTION

3.1 GENERAL

- A. Locate all utilities prior to grading and trenching and protect from damage, per Section 31 00 00 of these Specifications.

3.2 CONCRETE PATHS AND BRIDGES

- A. Submit concrete mix design to Town for approval.
- B. Alignment to be per approved plans. Field modifications in alignment must be approved by Town Engineer prior to formwork.
- C. Coordinate with irrigation installation so necessary sleeves are placed beneath concrete path as needed. Sleeves to be set at standard trench depth per Section 3.4.E.3.
- D. Obtain testing of compaction and moisture and re-compact as needed in order to obtain minimum compaction requirements. Compaction testing needed in accordance with 31 00 00.
- E. Timing of concrete placement to allow for proper finish and product. No placement allowed if rain or snow is pending prior to reasonable cure. Excessively hot or cold weather may be reason for placement rescheduling by the Town of Mead. Weather damage due to precipitation may be cause for rejection of paving.
- F. Slab thickness to be six inch (6") minimum.
- G. No tooled joints are allowed on concrete path construction. Place expansion joints at maximum spacing of four hundred (400) lineal feet or three thousand, two hundred (3,200) square feet, whichever is less. Install expansion material at sufficient depth to allow for sealant and remain flush with finish surface elevation. Expansion joints where flatwork intersects vertical concrete. Dowel per Section 32 13 00 between all cold joints and between concrete path and bridge abutment.
- H. Install control joints on eight foot (8'-0") centers using zip-strip during placement operation so lines are straight and perpendicular to the edge of the concrete path or saw-cut after placement operation with straight and perpendicular cuts. Control joints also to be placed at intersections, radius points and elsewhere as needed to prevent cracking. Saw-cut joints to be timed properly with the setting of the concrete. Cutting shall be started as soon as the concrete has hardened

Town of Mead Design Standards and Construction Specifications

sufficiently to prevent aggregates from being dislodged by the saw, and shall be completed before shrinkage stresses has developed sufficiently to induce cracking.

- I. Testing to be done by an independent testing lab per 32 13 00 of these Specifications.
- J. Concrete finish to be smooth and consistent with a light broom finish. Heavy broom finish will not be permitted. Irregularities, poor finish and other deficiencies of workmanship or vandalism will require concrete work to be removed and replaced. Weather damage to finish will also be cause for removal and replacement. Contractor has option to provide sample panel of finish prior to work for Town approval.
- K. No concrete wash is to be dumped onto landscape areas. Any concrete water or spillage is to be contained and removed from the site prior to any landscaping.
- L. Protect concrete with curing compound and other means to prevent premature drying, and protect from frost and rain. Provide watchmen as needed to protect from vandalism until reasonable cure is obtained.
- M. Remove forms twenty four (24) hours after pour unless otherwise approved. Avoid damage to edges of pavement.
- N. Backfill edges of concrete path prior to opening to public use.
- O. Install signs at locations field verified by Town inspectors. Install posts with 30" minimum bury – backfill excavation with washed rock. Offset post from path edge so that edge of sign face is a minimum of 24" from the path edge. Install sign faces in correct orientation to path for sign message readability. Install sign face using vandal resistant fasteners.

3.3 FINE GRADING

- A. Locate all utilities prior to grading or trenching and protect from damage, per Section 31 00 00 of these Specifications.
- B. Install construction fencing and/or silt fencing Storm Water Construction Activity BMP's as needed prior to any grading activities in accordance with Section 31 25 00 – Erosion and Sedimentation Controls
- C. Apply general herbicide or broadleaf herbicide (2-4-D amine 4% A.I.) as applicable to areas where noxious weed beds have been established or where seed mix is to be planted. Herbicide must be applied by certified contractors at the rate recommended by the manufacturer after proper notification has been done in accordance with chemical applicator's standards. Precautions must be taken to avoid drifting of spray onto other properties and shall not be done in breezy conditions. Plant material not designated for herbicide application that is damaged shall be replaced by the Contractor. Timing of application shall allow complete weed kill prior to grading operations and again prior to final grade if re-growth has occurred.
- D. For arterial ROW development adjacent to a road slated for future expansion, survey and stake future horizontal and vertical alignment of the ultimate curb. These stakes are to be maintained throughout the ROW construction process, including irrigation layout, seeding and sodding. Disturbed stakes are to be re-surveyed, as necessary, to maintain the required information during construction. Grades outside the ultimate roadway are to be set to anticipate future road improvements. Grades between the existing road edge and the ultimate curb line are to be graded to provide drainage and a safe shoulder for vehicles.
- E. Take precautions to accommodate proper drainage and flow during and after grading and soil preparation.
- F. Clear and grub the site by removing unsuitable vegetation, woody and rock material present in the surface grade.
- G. Strip topsoil to a maximum depth, as determined by field inspection to recover as much quality topsoil material available and where site is scheduled for cutting or filling. If existing grades

Town of Mead Design Standards and Construction Specifications

- are to be maintained, topsoil can remain undisturbed. Stockpile stripped topsoil in location separated from grading activities and cover to protect from wind and other erosion.
- H. Proceed with earthwork operation per approved plans. When complete with rough grading, obtain approval from Town. Rough grade inspection is to allow for six inch (12") minimum depth of topsoil and specified soil amendments as part of the fine grading work.
 - I. Rip to twelve-inch (12") depth with agriculture subsoiler to receive plantings.
 - J. Re-spread or import topsoil to achieve twelve inch (12") minimum depth in all landscaped areas and grade to smooth and even lines. Establish swales and drainage as required per plans.
 - K. Evenly distribute soil amendment at rate of three (3) cubic yards per 1,000 square feet of area, or as recommended by Soil Test, over the entire area to be prepared. Till amendments and topsoil into top twelve inches (12") of soil. Compact to a firm, but not hard (80% of Standard Proctor Density at 2% optimum moisture) seed bed. Soil amendment shall be applied no more than thirty (30) days before planting operations.
 - L. Remove all objects greater than one-half inch (1/2") in diameter in all irrigated turf areas. For native grass seeded areas, two-inch (2") diameter objects or greater are to be removed.
 - M. Trim finish grade elevations adjacent to paved areas to one inch (1") below pavement finish grade.
 - N. Evenly distribute triple superphosphate fertilizer at the rate of fifteen (15) pounds per thousand square feet; modify type and rate if soils test recommends otherwise.
 - O. Remove all debris piles and other stockpiles from site.
 - P. Clean walkways and streets on daily basis to minimize mud tracking and siltation into drainage structures.
 - Q. Maintain silt fencing until site is re-vegetated.

3.4 IRRIGATION

- A. Inspect tap or other existing irrigation system, as applicable, prior to work.
- B. Water Service Connections (Taps): Contact Town and Water Provider 48 hours prior to schedule work for water taps and inspections. Backflow prevention devices shall meet Town and Water Provider requirements. Minimum two weeks prior notice to be given for installations which will require meters or backflow devices larger than two inches. Larger devices and meters are not always kept in stock and may have ordering stocking delay.
- C. Contractor is responsible for excavation, connection to corporation stop at the water main, providing the saddle for the PVC or A.C. pipe, making the connection to the existing water service, backfill and compaction, and pavement or shoulder surface treatment or replacement as needed. No soldered joints or fittings are allowed on water service lines where buried. Soldered joints or fittings are permissible above grade or inside a vault. No solder, sealants, fluxes, pipe dope, and other materials shall contain any lead. The contractor shall install all irrigation taps per the Water Provider Standards and IIT all taps and installations are subject to approval and inspection by Town and the Water Provider.
- D. Install meter, master valve, and drain valve inside specified areas and vaults. Inspection of service line (where appropriate), vault, water meter and backflow is to be coordinated with Town and Water Provider. Install meter, master valve, flow meter and drain valve and backflow inside specified vault per Town detail. Install flow meter, backflow, winterization assembly and drain valves as specified adjacent to precast vault per Town detail. Inspection of service line (where appropriate), vault, water meter and backflow is to be coordinated with Town and Water Provider.
 - 1. Meter vaults are to be 60" diameter for taps 2" or less in size. For taps larger than 2", the pipe layout inside the meter vault must be designed to determine the vault size.

Town of Mead Design Standards and Construction Specifications

2. Town Owned Areas: Non-potable (raw water) irrigation systems or systems with an in-line injection system are required to have a reduced pressure backflow device upstream of injection nipple, and which cannot be placed in vault.
 3. Install flow meter downstream of meter unit within meter vault with the following minimum spacing upstream and downstream of flow meter the first joint, bend or other fittings: 10 pipe diameters straight pipe upstream; 5 pipe diameters straight pipe downstream.
 4. Install master valve in meter vault within a reasonable distance downstream of flow meter (no closer than 10 pipe diameters).
 5. Copper pipe to be soldered so that a continuous bead shows around the joint circumference. Insert a dielectric union wherever a copper-based metal (copper, brass, bronze) and an iron-based metal (iron, galvanized steel, stainless steel) are joined.
 6. Install winterization assembly downstream of meter vault on copper PVC (with no size reduction) for mainlines greater than two inch (2"). Install winterization assembly on PVC (no size reduction) for mainlines two inch (2") or less.
- E. Pipe trenching:
1. Install pipe in open cut trenches of sufficient width to facilitate thorough tamping/puddling of suitable backfill material under and over pipe. Puddling is not allowed where next to walks, curbs and concrete paths. Install mainline and lateral lines in separate trenches.
 2. Pipe location to be offset two foot (2') maximum from walks and curbs to maximize tree planting zones. Field adjustments to this standard must be approved by Town inspectors prior to work.
 3. Trench depths:
 - a. Mainline: Minimum of twenty four inches (24") deep from top of pipe to finished grade.
 - b. Lateral: Minimum of eighteen inches (18") deep from top of pipe to finished grade.
 - c. Drip laterals: Minimum of twelve inches (12") deep from top of pipe to finished grade in the paved and sodded/seeded areas, four inch (4") minimum mulch cover in planting beds.
 4. Sleeves: Install sleeving at a depth that permits the encased pipe or wiring to remain at the specified burial depth.
 - a. Sleeving: Boring shall not be permitted unless obstruction in pipe path cannot be moved, or pipe cannot be re-routed.
 - b. Mainline installed in existing sleeves at greater depth than adjacent pipe, shall have a manual drain valve at the low end.
 - c. Install sleeve so both ends extend past edge of curb, gutter, sidewalk, concrete path or other obstruction, a minimum of two feet (2').
 - d. Mark all sleeves with a "V" chiseled in walk (or other surface) directly over sleeve location.
 - e. Shall be laid to drain at minimum grade of 5"/100'.
 - f. Shall be bedded in two inches (2") of fill sand and covered by six inches (6") of fill sand.
 - g. Sleeves installed for future use shall be capped at both ends.
 - h. Separate sleeve (two inch (2") minimum size) shall be used for all wiring.
 - i. Sleeving shall not have joints unless necessary due to length of sleeving run. If joints are necessary, only solvent welded joints are allowed.
 - j. Compaction of backfill for sleeves shall be 95% of Standard Proctor Density, ASTM D698-78. Use of water (puddling) around sleeves for compaction, will not be allowed.
- F. Pipe Installation:

Town of Mead Design Standards and Construction Specifications

1. Use Teflon tape on all threaded joints; only schedule 80 pipe may be threaded. All threaded joints shall be tightened to eliminate leaks per industry standards.
 2. Reducing pipe size shall be with reducing insert couplings: at least six inches (6") beyond last tee of the larger pipe.
 3. Snake PVC lateral pipe from side to side within trench.
- G. Provide emitters to each plant per these standards. Do not use spaghetti tubing.
1. Funny Pipe: Attach funny pipe to elbows using appropriately sized crimp-type clamps to secure.
- H. Thrust blocks:
1. Shall be installed where PVC mainline (2 1/2" or larger) changes direction over 20 degrees.
 2. Minimum of one cubic foot of concrete bearing against undisturbed soil.
 3. Keep pipe joint clean of concrete. Do not encase.
 4. Place wiring away from thrust block to avoid contact with concrete.
 5. #4 rebar wrapped with asphalt tar based mastic coating.
- I. Valve Installation: Install at least twelve inches (12") from and align with adjacent walls or paved edges.
1. Automatic Remote Valves: Install in such a way that valves are accessible for repairs. Make electrical connection to allow pigtail so solenoid can be removed from valve with twenty four inch (24") minimum slack to allow ends to be pulled twelve inches (12") above ground. Locate minimum twelve inches (12") from and align with walks, walls, etc.
 - a. Thoroughly flush piping system under full head of water for three minutes through furthest valve, before installing valves.
 - b. Valve assembly to include ball valve and union per detail for ease of maintenance and repair. Install in locking valve box per details.
 - c. Install a waterproof tag with permanent marker with each valve number. One tag shall be attached to each valve.
 2. Manual Drain Valve: Install per plans, but in no case shall be less than at the low points of the system and at the end of the mainline. Install in six inch (6") CL 200 PVC sleeve access with ten inch (10") locking valve box lid. Install valves on swing joint assembly per detail. Sump to be four (4) cubic feet of crushed gravel over filter fabric.
 3. Quick Coupler Valve: Install in ten inch (10") round locking valve box. Flush completely before installing valve. Thoroughly flush piping system under full head of water for three minutes through furthest valve, before installing valves.
 4. Isolation Gate valves: Install in valve box.
 5. Valve Boxes:
 - a. Brand all valve boxes with the following codes as appropriate: "SV" and the controller valve number per as-built plans for all remote control valves; "DV" for all drain valves; "GV" for all isolation valves; "DRGV" for all drip system isolation valves; "QC" for all quick coupling valves; "WA" for all winterization assemblies; "FM" for all flow meter assemblies; and "MV" for all master valve assemblies. Use a branding iron stamp with three inch (3") high letters.
 - b. Brand boxes in the center of the lids.
 - c. Valve box shall NOT rest on mainline; use brick or other approved non-compressible material per detail. Top of valve box to be flush with finish grade.

Town of Mead Design Standards and Construction Specifications

- d. All equipment shall be centered in valve boxes with adequate space to access equipment with ease. A hand should be able to pass unobstructed under the valve.
 - e. Valves shall not be so deep as to be inaccessible for repairs. Three inch (3") depth of 3/4" washed gravel to be placed in the bottom of each valve box with enough space to fully turn valve for removal (see detail).
- J. Head Installation:
- 1. Set heads plumb and level with finish grade. In sloped area, heads to be tilted to match slope to provide full radius spray pattern.
 - 2. Flush lateral lines before installing heads. Thoroughly flush piping system under full head of water for three minutes through furthest head before installing heads. Cap risers if delay of head installation occurs.
 - 3. Pop-Up Heads along walks and bikeways: Bed heads in six inch (6") layer of sand under the base of the head.
 - 4. Nozzles: Supply appropriate nozzle for best performance.
 - 5. Adjustment: Adjust nozzles and radius of throw to minimize overspray onto hard surfaces.
- K. Wiring and Electrical Connections:
- 1. All wire connection and exposed ends to be sealed using wire connectors and waterproof sealant specific for direct burial applications.
 - 2. Electrical installations will be inspected by the Town of Mead's Building Inspection Division and the final connection made by Electric provider. All work, including the low voltage installation to the electric source where applicable, to be supplied by the contractor. All materials to be provided by the contractor. When working near any electric facility, prior coordination and approval is required. Reference the building permit for telephone numbers to request an electrical inspection by the Building Inspector.
 - 3. Label each wire with waterproof tape and permanent marker at the controller and the furthest end of each wire.
- L. Controller Installation:
- 1. To be installed in an above-ground location suitable to prevent vandalism and provide protection from adverse weather conditions, and per Town field direction. All exposed wiring to and from the controller shall be encased in galvanized metal conduit. Exterior controllers to be installed on six inch (6") thick concrete pad with compacted subgrade per concrete specification.
 - 2. Install Controller in accordance with manufacturer's specifications. Install surge protection, grounding rods and other accessory components as specified.
 - 3. Attach wire markers to the ends of control wires inside the controller unit. Label wires with the identification number of the remote control valve active by the wire.
 - 4. Sequence wiring for irrigation zones in logical manner and so it matches as-built drawings.
- M. Wiring:
- 1. Comply with Town electrical codes.
 - 2. Power source brought to controller to a ground fault receptacle installed within controller casing. Clock shall be plugged into receptacle.
 - 3. String control wires as close as possible to mainline, consistently along and slightly below one side of the pipe.

Town of Mead Design Standards and Construction Specifications

4. Leave minimum loop of twenty four inches (24") at each valve and controller, at each splice, at the ends of each sleeve, at one hundred foot (100') intervals along continuous runs of wiring, and change of direction of 90 degrees or more. Band wires together at ten foot (10') intervals with pipe wrapping tape.
5. Install common ground wire and one control wire for each remote control valve. Multiple valves on a single control wire are not permitted. Install three extra wires, as specified, to the furthest valve on the system and each branch of the system.

N. Drip Emitter Installation

1. Install specified number of emitters directly onto lateral hose (spaghetti tubing not allowed).
 - a. Groundcover: one single outlet emitter per square foot planting area.
 - b. Shrubs: two single outlet emitters per shrub.
 - c. Trees: four single outlet emitters per 2-3" tree; six single outlet emitters per four inch (4") tree; eight single outlet emitters per six inch (6") + tree. No spaghetti tubing permitted.
2. All drip emitters are to be tested for operation prior to weed barrier and mulch installation.

O. Signs

1. Install Raw Water in use sign in prominent location.

P. Testing

1. All tests to be run in the presence of Town and Irrigation Design Professional. Irrigation Design Professional conducting inspections is to sign the certification statement on the as-built drawings. All irrigation inspections to be scheduled by coordinating with Town inspector. Schedule all tests and inspections a minimum of 48 hours in advance of tests. Repeat any failed tests until full acceptance is obtained. No testing shall be done when seasonal conditions minimize the ability to sufficiently inspect the system. Generally, testing is not available between the months of November and April. No chemical spraying shall be done within ten (10) days of any irrigation inspections.
 - a. Hydrostatic Test (during irrigation installation before sleeving and backfilling pipe joints): Maintain 120 PSI for four hours. No leakage or loss of pressure is accepted during test period. Test must be run in the presence of Town inspector as noted above. Contractors to provide at their own expense hydrostatic pump, water and other materials as necessary for test. The pressure gauge is to be installed on the end of a fitting, rather than directly into a quick coupler. The pump is to be disconnected at the start of the test.
 - b. Town requires that the Contractor perform an independent pressure test prior to scheduling the required inspection. If numerous tests are required for a system, Town reserves the option to bill the Contractor for numerous tests at \$50/hr. (with a one hour minimum).
2. Operational Test (at Construction Acceptance punch list walk-through): Activate each remote control valve from the controller in the presence of Town inspector and irrigation professional for Town Owned and Common Open Space areas. Replace, adjust or move heads and nozzles as needed to obtain acceptable performance of system. Replace defective valves, wiring or other appurtenances to correct operational deficiencies.
3. Drip Operational Test (after drip lateral installation, but prior to weed barrier and mulch installation): Activate remote control valves in presence of Town inspector and Irrigation Design Professional for Town owned and common open space areas. Replace any emitters that are clogged or not operational. Adjust lateral hose as needed to effectively irrigate plantings.

Town of Mead Design Standards and Construction Specifications

4. Central Control System Acceptance Test (at Construction Acceptance punch list walk-through): Town inspector and Irrigation Design Professional will activate each remote control valve from the Central Control System base station using the hand-held remote device.
5. Raw Water Pump Control Inspection: Demonstrate to Town inspectors for and Irrigation Design Professional at pump start up that pump system correctly operates automatically, all sensors perform properly and the system is built per approved plans. The pump designer and/or supplier will be required to attend this inspection.

3.5 ESTABLISHING SEEDING

- A. Inspection: Inspect finish grade and trim where needed to obtain finish grades of one inch (1") below adjacent pavements. Verify positive drainage away from all structures. Verify or complete removal of rock and debris larger than one half inch (1/2") from all irrigated turf grass areas to be seeded, and rock larger than two inches (2") from all dryland native grass areas to be seeded.
- B. Fertilizer
 1. Apply 8 lbs. per 1000 sq. ft. of irrigated turf grass seeded area (2 - 3 lbs. per 1000 sq. ft. of native grass seeded areas), unless soil test recommendation provides alternative fertilization rates, and rake lightly into top 1/8" of soil just prior to seeding operation. Native grass areas do not require fertilizer unless recommended on Soil Fertility test report.
- C. Seeding
 1. Do not sow seed in windy weather or when ground is frozen or otherwise untillable.
 2. Use billion type drill for slopes less than 3:1 in grade. Drill seed in manner such that after surface is raked and rolled, seed has 1/4" of cover.
 3. Hydraulic seeding methods can be used only on slopes steeper than 3:1 or in areas that are not accessible for machine methods. Hydraulic pump capable of being operated at 100 gallons per minute and at 100 pounds per square inch pressure to be used. The equipment shall have an acceptable pressure gauge and a nozzle adaptable to hydraulic seeding requirements. Storage tanks shall have a means of agitation and a means of estimating the volume used or remaining in the tank. Do not seed and mulch in the same operation.
 4. Broadcast seeding can be used only on areas not accessible for machine methods and too small to justify hydraulic seeding. Where broadcast seeding is done, seeding rates are to be doubled. Hand rake seed to cover at 1/4" depth.
 5. Seeding rates (drilled and hydraulic):
 - a. Urban, Non-Native Grass Mix - 20 lbs. pure live seed per acre.
 - b. Native Grass Mix - 12 lbs. pure live seed per acre.
 - c. Irrigated Turf Grass Mix - 150 lbs. pure live seed per acre.
- D. Mulching:
 1. Native Grass Mulch: Apply at a rate of two (2) tons per acre. Crimp into seed bed with disk set straight forward and two inches (2") deep. Disk mulch across slopes to prevent erosion. Mulch seed beds within 24 hours after seeding.
 2. Hydromulching: Wood cellulose fibers must become evenly dispersed when agitated in water. When sprayed uniformly on the soil surface, the fibers shall form a blotter like ground cover, which readily absorbs water and allows infiltration to the underlying soil. Cellulose fiber mulch shall be added with the proportionate quantities of water and other approved materials in the slurry tank. All ingredients shall be mixed to form a homogenous slurry. Using the color of the mulch as a metering agent, apply the slurry mixture by spraying uniformly over the seeded area. Apply with the specified tackifier at a rate of 120 lbs. per

Town of Mead Design Standards and Construction Specifications

acre. Unless otherwise ordered for specific areas, fiber mulch shall be applied at the rate of 2,000 pounds per acre.

- a. Hydraulic mulching shall not be performed in the presence of free surface water resulting from rains, melting snow or other causes.

E. Netting:

1. Net areas with slopes greater than 3:1. If Contractor fails to net and subsequent soil erosion occurs, contractor shall re-establish finish grade, soil preparation, seed bed and apply netting at no cost to the Town. Staple per manufacturer's specifications.

F. Watering:

1. Immediately after seeding and mulching, water seeded areas lightly to a depth of two inches, but with care so that no erosion takes place and no gullies are formed. Water lightly as needed to maintain moist seedbed two times per day and keep seeded area moist until turf is established. Sloped areas should be hand watered until turf is established to prevent erosion; water these areas more often but for shorter periods of time.

G. Clean up:

1. Remove all hydromulch and other mulch materials from all plant materials, fences, site furnishings, signs, concrete and other areas except for seed bed.

H. Protection:

1. Provide and install barriers as required to protect seeded areas from pedestrian and vehicular damage. Provide signage and barricades if needed.

3.6 SODDING

A. Inspection: Inspect finish grade and trim where needed to obtain finish grades of one inch (1") below all adjacent paved surfaces. Verify or complete removal of rock larger than one half inch (1/2") which may hinder sodding and perform fine grading as necessary to maintain drainage per plans. Verify that irrigation system is fully operational prior to sodding.

B. Preparation: Clean up and irrigation adjustment

1. Clean out drainage inlet structures.
2. Adjust irrigation heads to proper watering height according to depth of sod material, but lower than mower blade height, to enable lawn mowers to cut grass freely without damage to sprinkler system.

C. Sod cutting and delivery:

1. Cut no more than 24 hours prior to delivery, laid in place within 24 hours of delivery.

D. Transportation:

1. Do not pile sod more than two feet (2') deep. During delivery process, protect roots from exposure to drying sun, winds and heat. Store in shady area and keep moist or store covered with moistened burlap.

E. Timing:

1. Install sod only between spring and fall. Do not install on frozen or saturated soil.

F. Watering:

1. Lightly water area to be sodded.

G. Fertilizer:

1. Distribute fertilizer uniformly at a rate of 50 lbs. per acre, unless otherwise recommended by soils test. Apply within 48 hours before laying sod.

Town of Mead Design Standards and Construction Specifications

H. Sodding:

1. Lay sod on slightly moist soil.
2. Lay with longest dimension parallel to contours in continuous right-of-ways.
3. Tightly butt ends of sod together. Stagger joints. Compact vertical joints between sod strips by rolling so sod will be in contact with the ground surface. Cut right-of-ways terminating on property lines to straight line.
4. When sod and soil are moist, roll sod lightly as soon as possible after laying. Roll with enough weight to ensure contact with soil for proper rooting.
5. Add topsoil along exposed edges to match existing grade; feather topsoil out approximately one foot (1').
6. Make sure finished sodded areas positively drain so that no irrigation water or storm water will pond in sodded areas. Relay sod if necessary to correct.
7. Water thoroughly with fine spray immediately after planting.

I. Re-sodding:

1. Re-sod spots larger than 1 sq. ft. not having uniform stand of grass prior to Final Acceptance.

3.7 TREES, PLANTS AND GROUNDCOVER

A. Inspection

1. Schedule a tree delivery and layout inspection with Town. Trees will be inspected for form, condition and health. Rejected trees to be removed immediately from site and replaced. Replacements are subject to re-inspection by Town. Inspection requirements include trees to be off-loaded from trucks to allow for full access. Binding material and trunk protection to be removed by Contractor prior to inspection.
2. Tree layout inspection shall be done at the same time the tree materials are delivered. Utility line locates to be visible in all planting areas. Stakes for proposed tree locations to be placed in planting areas requiring Town inspection.

B. Delivery and storage of plant materials:

1. Shade cloth shall be used to cover trees during transportation. B&B trees should have limbs bound to prevent injury during delivery. Keep root systems moist and protect plants from adverse climate and transportation conditions. B&B stock shall be heeled in immediately upon delivery to the site unless it is planted within 4 hours. Store other plants in shade and protect from adverse weather and from drying out. When handling, do not lift plants by trunk or stem; handle only ball or container. Obtain Town inspection.

C. Layout:

1. Stake plant locations or set out plants per plans. Verify prior to planting that plants when mature will not interfere with existing trees, irrigation, lighting, utilities and other equipment, both underground and overhead. Also verify proper spacing between trees and other hard surfaces. Notify Town for approval if plant locations must be changed.
2. Obtain new utility locates if needed – all utilities must be clearly visible at the time of Town plant material layout inspection.
3. Obtain Town inspection.

D. Excavation of planting pits:

1. Excavate planting pits per Town details; dispose of any rocks off site.
2. Trees: Trees shall be planted at a depth where the root flare above the solid rootball is at grade in depth of pit shall be two inches (2") (non-irrigated areas) and four inches (4")

Town of Mead Design Standards and Construction Specifications

(above grade in irrigated turf areas) less than the depth of the root ball so that water will drain away from trunk. Contractor to contact Town staff if they are not sure where the root flare is located on the tree. Modify depth of pit if soil type or conditions warrant and/or per Town direction. Minimum diameter of the base of the planting pit shall be 2 times the diameter of the root ball (minimum). The width of the hole at the top of the pit shall be three (3) times the diameter of the root ball

3. Shrubs, perennials and ground cover: top of root ball shall be positioned slightly higher (1"-2") than finish soil grade so that water will drain away from plant. Modify depth of pit if soil type or conditions warrant and/or per Town direction. Diameter of the pit shall be 2 times the diameter of the root ball (minimum).

E. Planting:

1. Balled and Burlapped trees (B&B) (Do not plant if tree trunk is loose in root ball or if ball is cracked or broken before or during planting process.)
 - a. Remove bottom 1/3 of wire basket from root ball. Wire basket must be completely removed. Place wire on tree stakes for Town inspection prior to removal from site.
 - b. Place in pit with burlap intact on undisturbed soil in center of pit to proper grade, and plumb.
 - c. Face for best effect.
 - d. Cut and remove remaining wire and twine. Do NOT pull wrapping or wire from under ball as it may damage the root ball.
 - e. Backfill 2/3 of pit; remove top 1/3 of burlap; complete backfill. DO NOT compact backfill mix by tamping. DO NOT backfill over crown of root ball or exceed soil depth of root ball; crown must be at proper planting depth.
 - f. Install five inch (5") high watering basin around trees.
 - i. Remove and grade out berm around basin after two thorough waterings in irrigated areas. Mulch after berm basin is removed.
 - ii. Mulch and leave basin in dryland areas.
2. Container grown stock (Do not plant if root ball is cracked or broken before or during planting process.)
 - a. Carefully remove plants from containers without injury or damage to root ball; do not cut cans with spade or ax.
 - b. Vertically score root ball using sharp knife, about 1/8" deep and about every 2-3" in circumference. If stock is root bound, butterfly root ball by cutting ball in half, halfway up from the bottom; flair root ball out to sides when planting.
 - c. Set plant plumb, face for best effect, make sure crown of root ball is at correct grade.
 - d. Backfill and install four inch (4") high watering basin around planting pit. DO NOT compact backfill mix by tamping. DO NOT backfill over crown of root ball or exceed soil depth of container; crown must be at or slightly above finished ground level. Mulch after two thorough waterings.
3. Completion of planting:
 - a. Shape surface of finish grade around root ball so water drains away from trunk or stems and to match finish grade at the edge of the planting pit.
 - b. Remove plant tags from trees and shrubs.

F. Edging:

1. Steel Edging: Install so top of edging is two inch (2") maximum above finish grade and flush with the top elevation of curb or pavement which it abuts. Edging shall meet pavement or

Town of Mead Design Standards and Construction Specifications

curb at right angle. Stake at manufacturer's recommended intervals on smooth radius using steel stakes. Punch holes as needed for drainage.

2. Cut Edging: Where steel edging is not used, cut 6" deep vertical straight sided trench at mulch shrub bed edge. For individual trees, edger cut is to be a 3' radius from trunk of tree. Transition 6" deep cut edge to specified mulch depth (4") at a 45 degree angle.
- G. Mulching:
1. Mulch depth:
 - a. Tree pits - four inch (4") deep, keep two inch (2") from trunk.
 - b. Shrub pits – three inch (3") deep (minimum).
 - c. Remaining shrub bed - four inch (4") deep (minimum).
 - d. Groundcover beds – three inch (3") deep (minimum).
 2. Place geo-textile landscape fabric under mulch except in individual tree rings or where any other areas specifically approved for omission. Lay straight and even with eight inch (8") overlap at edges. Staple along edges with steel U pins on twenty four (24") spacing. Staple folds in fabric to keep below mulch material.
 3. Tree rings – mulch to extend to edge of planting pit and shall encompass tree stakes in mulch area.
 4. Timing: The Town recommends delaying mulch application at tree rings in irrigated turf areas until after turf is established to minimize moisture build-up at tree bases. All other plants shall be mulched within two days of planting or after specified number of waterings for individual trees and shrubs.
- H. Staking and guying:
1. Standard Guying System: Pound six-foot (6') long metal or wood stakes into undisturbed soil beyond the planting pit so that stake is secure. Where possible, locate stakes within the required mulched tree ring area. Secure STRAP-X or wire through metal grommets on canvas strap to tree and wrap above first branch on deciduous trees or at mid-point of tree on coniferous trees. Secure guy to stake so that it is taut but allows some movement. Where wire is used as a guy, secure it so that no sharp projections are extending from post and flag it with ½" PVC pipe or white plastic flagging for visibility. Adjust tension on guy if needed. If metal t-posts are used, place PVC caps on top of stakes. Wooden pole stakes (2"x6") may be used without PVC caps.
- I. Pruning:
1. Prune minimum necessary to remove injured twigs and branches, deadwood and suckers to insure healthy tree. Do not prune central leader.
- J. Beaver protection:
1. Install fencing in circle around all deciduous trees (existing and new) in areas prone to harvesting by beaver, as determined by Town. Fencing to be cut in lengths long enough to provide a minimum twelve inch (12") separation between trunk and fence (all sides). Additional sections of fencing are to be wired together in sections if needed to fully cover trunk from ground to first branch. Ends and additional sections of wire fence loop to be securely fastened. Fencing to be cut into lengths in such a manner as to allow cut ends to be bent to secure enclosure around trees. Ends to be bent in to tree to prevent safety hazards and projections. Fence must be in contact with ground around entire tree using steel U pins to secure, if needed.
- K. Prairie dog enclosure:
1. Contact Town or Colorado Division of Wildlife for recommended installation.

Town of Mead Design Standards and Construction Specifications

3.8 COMPLETION SERVICES

- A. Provide to Town record drawings including horizontal verification of concrete path and all other structures.
- B. Irrigation Systems:
 - 1. When project construction is substantially complete, request from Town inspector and coordinate with Irrigation Design Professional for inspection and demonstrate system to Town inspector.
 - 2. When project construction is ready for Construction Acceptance, request from Town inspector for an inspection (all punch list items must be complete) and coordinate with Irrigation Design Professional for inspection.
 - a. Demonstrate system to Town inspector and Irrigation Design Professional.
 - b. Submit turn-over items (items must be accompanied by a transmittal letter and delivered to the Town inspectors' offices. Delivery at the project site is not acceptable.
 - c. Provide Town personnel with list of equipment ordering information including model numbers, size and style for all components.
 - d. Provide one mylar, one blue-line set and one pdf format electronic file (for all projects), and one electronic file to be able to be opened in AutoCAD Release 2006, in .dwg format (for all Town capital projects), of as-built irrigation drawings no larger than 24" x 36". Common Open Space as-built drawings are to be a separate drawing package from Town Owned areas as-built drawings. The Town may require .dwg AutoCAD files for development projects if future development is anticipated in the area. (Construction plans may be used for as-built base map information. Coordinate with developer and consultant team to obtain). Drawings to have the following information as a minimum:
 - i. System shown as installed with each sheet clearly marked "RECORD DRAWINGS".
 - ii. The name of the project, date of installation, date of as-built drafting, company name of installer, name of as-built drafter, installer company phone number and back-up phone number for night and weekend contact.
 - iii. Sleeves and valves noted with dimensions to each from two different permanent objects.
 - iv. Control valves noted with gpm, valve number and valve size clearly indicated for each valve. Valve numbering to match as-built controller sequencing.
 - v. Horizontal verification of all irrigation pipes, irrigation heads, valve boxes, wiring, electrical boxes, controller, meter, and backflow prevention devices. Noted information shall include all pipe sizes, zone numbers, valve locations, head types, valve types and model numbers, controller type and model number, and drip emitter chart.
 - vi. Irrigation record drawings shall include all pertinent physical features (such as concrete paths, sidewalks, fences, ponds, buildings, pump house, parking lots and athletic fields).
 - vii. No contour lines shall be shown on irrigation record drawings unless required by the Town.
 - viii. Certification statement signed and executed by Irrigation Design Professional and Contractor.
 - e. Provide two sets of all irrigation sheets reduced to 11" x 17", with each zone color coded, and each sheet plastic laminated.
 - f. Provide Town and on-going HOA maintenance personnel with 1 each of all operating keys, servicing tools, test equipment, remote hand-held radios (programmed to Town frequency – for Town Owned areas only), warranties/guarantees, and maintenance

Town of Mead Design Standards and Construction Specifications

manuals as needed for on-going maintenance of area. Any exceptions to this requirement are to be obtained in writing from Town inspector staff.

- g. Clean Up: Remove all excess materials, tools, trash and debris from site.
- h. Complete additional punch list items if determined necessary Town Inspector and Irrigation Design Professional.
- i. Schedule re-inspection by Town and Irrigation Design Professional to verify completion and acceptance of all punch list items if necessary.
- j. Request Final Acceptance inspection.
 - i. Problems identified during the punch list inspection and project work-through will be coordinated with Town inspector and Irrigation Design Professional with solutions executed by the Contractor. Contractor shall complete punch list of items requiring resolution prior to issuance of Final Acceptance.
 - (a) At the discretion of Town inspector or Irrigation Design Professional, a new pressure test may be required at the time of Final Acceptance inspection.
 - (b) Clean up: Remove all excess materials, tools, trash and debris from site.
 - ii. Schedule a project re-inspection with Town inspectors and Irrigation Design Professional to verify completion of punch list items and project work-through issues if necessary.

C. Seeding

1. Turn over items to town inspector:
 - a. Seed tags to verify seeded mixture matches approved plans.
2. Maintenance
 - a. Mowing: When grasses reach three inches (3") in height, mow to two inches (2") in height. Repeat as needed in dryland areas to encourage spread of grass stolons and prevent seed development of weeds. Repeat in areas where mowing is to be standard maintenance practice, to maintain grass height at 2-1/2". Do not cut off more than 1/3 of grass leaf in a single mowing operation. Excessive clippings to be removed from turf areas. Adjacent paved areas to be swept after mowing.
 - b. Weed control: During establishment mechanical weed control should be employed to prevent weed flowering and seed set. When grasses are sufficiently established, chemical weed control can be applied to selectively eradicate invasive and noxious weeds.
 - c. Fertilizing: Apply balanced fertilizer to maintain turf vigor during warranty period.

D. Sod Maintenance

1. Mowing: When grass reaches three inches (3") in height, mow to two inches (2") in height. Mow weekly and maintain grass between two inches (2") and 2-1/2" in height. Do not cut off more than 1/3 of grass leaf in a single mowing. Remove grass clippings from all paved surfaces.
2. Fertilizing: Distribute fertilizer uniformly at a rate of 5 pounds of balanced fertilizer per 1000 square feet of sodded area unless otherwise recommended by soils test, three weeks after sodding is complete. Fertilizing thereafter is to be in accordance with standard maintenance practices for turf areas, and as needed to achieve and maintain a vigorous and healthy stand of grass.
3. Weed Control: During establishment use mechanical means to control weeds. When sod is sufficiently established, chemical weed control can be applied to selectively eradicate invasive and noxious weeds.

E. Record Drawings of trees, plants and groundcover

Town of Mead Design Standards and Construction Specifications

1. List of all plant material installed, including sizes and quantities as certified by a Landscape Architect.

3.9 GUARANTEE/WARRANTY

- A. Prior to final acceptance, all bridges, concrete paths and other miscellaneous improvements under this section are to be warranted against defects. Cracking, settling, displacement and damage to those improvements are to be repaired or replaced by the Developer at no cost to the Town. Repairs and replacements are to be covered by warranty.
- B. Irrigation Systems:
 1. For the period following Construction Acceptance notice by Town and prior to Final Acceptance, all irrigation materials, equipment, workmanship and other appurtenances are to be guaranteed/ warranted against defects. Settling of trenches or other depressions, damages to structures or landscaping caused by settling and other defects to be corrected by the contractor at no cost to the Town or homeowners association. Make repairs within seven days of notification by the Town staff representative or Irrigation Design Professional unless an emergency or hazardous situation dictates immediate correction. Guarantee/Warranty applies to all originally installed materials and equipment, and to replacements made during the guarantee/ warranty period.
- C. Seeding
 1. Warranty seeded areas for consistency and completion of coverage. Re-seed as needed to ensure a successful stand of grass as accepted by the Town. Once a vigorously growing stand of grass is achieved, the request for Final Acceptance may be made. A stand of grass is considered to be acceptable when each square foot of grass area has at least 90% coverage in irrigated turf grass areas. In native grass areas, it is considered established when the grass area has at least 70% coverage. Maximum single bare spot acceptable in dryland areas is 2 sq. ft. All seeded areas that do not meet the satisfactory standard of establishment qualifications shall be re-seeded and mulched.
 2. It is the developer's responsibility to maintain seeded areas in a weed free manner. Eradication of weeds prior to Final Acceptance shall be done on an as-needed basis to generally eradicate the noxious weeds.
 3. Extended warranty period may be required as determined by Town inspector.
- D. Sodding
 1. Warrant sodded areas for consistency and completion of coverage. Re-sod areas as needed to obtain acceptance by the Town. Once a vigorously growing stand of grass is achieved, the request for Construction Acceptance may be made.
- E. Trees Plants and Groundcover
 1. For the period prior to Final Acceptance, all plant materials, landscape materials, workmanship and other appurtenances are to be guaranteed/warranted against defects. Settling of depressions, replacement of dead or diseased plant materials and other defects are to be corrected by the contractor at no cost to the Town or Homeowners Association . Plant materials that are in an unhealthy or unsightly condition or that have lost their natural shape due to dead branches or excessive pruning of dead branches are to be replaced at no cost to the Town. Guarantee/Warranty applies to all originally installed materials, and to replacements made during the guarantee/warranty period.
 2. For areas to be maintained by Developer or subsequent property owners/HOAs, requirements per 3.9.C.2 apply in perpetuity.

END OF SECTION 33 47 00

Town of Mead Design Standards and Construction Specifications

TOWN OF MEAD LIST OF APPROVED LANDSCAPE MATERIALS

January, 2021

The following approved materials list applies to all Town of Mead related improvements per Sections 33 47 00 in Appendix A of the Town of Mead **Design Standards and Construction Specifications**:

Proposed substitutes to the following specific brands and/or models shall be submitted to the Town of Mead in writing with all necessary technical information needed for analysis. A written approval from the Town of substitute is REQUIRED for all products.

CONCRETE BIKE PATHS, BRIDGES AND UNDERPASSES

1. Control joints: Zip strip or saw cut.
2. Expansion joints: pre-formed compressible bituminous fiber Type M-213, ½" thick with removable 'void cap' to create ½" reveal for sealant. Sealant to be Tremco "Tremflex 834, Pecora "unicrylic +60, or Sonolastic "Sonolac".
3. Bridge decking: concrete or 2"x8" IPE Ironwood. Decks must be designed with ability to easily replace individual deck boards.
4. Underpass Lighting:
 - a. LED type Cooper Lighting Model FCC-S-2-3750-7-40-120-82/87-ED-SF3- VRSD
5. Root Barrier: Deep Root S24" barrier.
6. Underpass Pavement Markings: Yellow paint – 4" wide solid line at blind corners and through underpasses as approved by City staff.

GRADING AND FINE GRADING

1. Soil Amendment: Premium 3 by A-1 Organics composted aspen humus or other amendments certified as Class I or Class II by Rocky Mountain Organics Council.

IRRIGATION

1. Irrigation Heads: Hunter
 - a. All heads to be installed with Hunter SJ or HSJ Swing Joint
 - b. ½" Inlet
 1. PRO-SPRAY PRS40 bodies
 2. MP Rotator Nozzles
 - c. ¾" Inlet
 1. I-20 (plastic riser) factory check valve installed
 - d. 1" Inlet
 1. I-25 (plastic riser), factory check valve installed
 2. I-40, factory check valve installed
 3. I-40-ON, factory check valve installed
 4. I-90, factory check valve installed
2. Controllers: Rain Master
 - a. Eagle Plus – 2 wire system, wall or pedestal mount
 - b. All wire in the system must be certified by Irritrol, part numbers EV-CAB-COM, EV-CAB-SH-COM, EV-CAB-WS12, EV-CAB-SEN
 - c. Permanently mounted PRO MAX receiver
 - d. Irritrol flow sensor FS-B100, 125,150, 200, 250 or FS-150, 200, 300, 400
 - e. Weather station RM-WETHR-ETRS may be required at the Town's sole discretion
3. Valves: Irritrol
 - a. 100 series for domestic water supply

Town of Mead Design Standards and Construction Specifications

- b. 102 series for raw water supply
4. Backflow Device: FEBCO
 - a. 2" or smaller use 825YA model
 - b. Larger than 2" use LF880V
5. Backflow Enclosure: Guard Shack
 - a. S.S. Hinged Model
 - b. S.S. Tall Hinged Model
 - c. S.S. N Pattern
6. All Main lines and Lateral line shall be PVC
7. All PVC fittings shall be cleaned/primed and glued
8. All lateral lines shall be buried a minimum of 12" below final grade
9. All main lines buried a minimum of 18" below final grade
10. Thrust blocks shall be installed on any line that is 2" or larger, with a direction change of more than 20 degrees
11. Unless otherwise directed by the manufacturer, no joint that is directly connected to sprinkler heads, valves, or flow sensors shall have pipe compound or Teflon tape installed.
12. Flow Meter: Data Industrial. For 1" – 4" use drop-in style model # IR228PV. For 6" taps, use threaded style model # IR220BR.
13. Mainline:
 - a. For pipe sizes larger than 3" - J.M. Ringtite Class 200 PVC pipe.
 - b. For Pipe sizes 3" and smaller – Schedule 40 PVC
14. Joint Restraints: For all mainline sized 4" and larger - Leemco ductile iron gasketed fittings and Leemco pipe restraints shall be used.
15. Drip line: Irritrol blue stripe drip pipe, 80 PSI rated. Centennial drip tubing or Rainbird XT-700 only.
16. Valve Boxes: Highline (formerly Pentek) or Carson. Jumbo – sized only.
17. Drip system:
 - a. Emitters: Rainbird XB series with spiral barb emitters.
 - b. Flush caps: Agrifim model #CETC-34. 11.
18. Irrigation Pump Station
 - a. SyncroFlo Eagle Model 820-32L-100-850 prefabricated vertical turbine pump station designed to meet 850 GPM at a discharge pressure of 100 psi. Pump station to include: pumps shafts, bowls, filter screen, motors and associated piping and fittings all mounted on a metal skid. The system shall be factory tested and UL listed.
19. Miscellaneous Irrigation Equipment:
 - a. Waterproof connections:
 1. 3M DBR direct bury splice kits only on common wires
 2. Blazing Snaploc wire connector BVS-2 on 14 gauge (hot) wires
 - b. Elbows: Rainbird SBE-050 - to match pipe brand.
 - c. Risers: Funny pipe for pop-up heads; nipples for rotors.
 - d. Fabricate each swing joints – no prefabricated swing joints permitted
 - e. Pipe Glue: WELD-ON 711 grey glue with P70 purple primer
 - f. Upon the discretion of the Town for large scale projects, a two-wire control system may be utilized. If approved, the two-wire control path wire shall be Page Model P7072D-12 AWG and alterations to the approved controller specification will need to be made to function with this alternate system.

SEEDING

1. Pre-approved Dryland Mixes (for temporary or permanent unmowed and/or non- permanent areas):
 - a. Native Areas (typically below the pathway trail or on the side without the trail):
Canada wildrye 2.84 PLS pounds per acre

Town of Mead Design Standards and Construction Specifications

- Thickspike wheatgrass (Critana variety) 0.71 PLS lbs. per acre
 - Slender wheatgrass (San Luis or Pryor variety) 2.05 PLS lbs. per acre
 - Western wheatgrass (Arriba variety) 1.98 PLS lbs. per acre
 - Little bluestem (Cimarron or Pastura variety) 0.84 PLS lbs. per acre
 - Switchgrass (Trailblazer, Nebraska 28, or Blackwell variety) 0.28 PLS lbs. per acre
 - Alkali sacaton (Salado variety) 0.06 PLS lbs. per acre
 - Sand dropseed 0.02 PLS lbs. per acre
 - Side oats grama (Vaughn variety) 1.14 PLS lbs. per acre
 - Blue grama (Alma, Bad River, or Hachita variety) 0.26 PLS lbs. per acre
 - Buffalograss 3.89 PLS lbs. per acre
 - b. Native Areas between trail and residential area:
 - Blue grama (Alma, Bad River, or Hachita variety) 0.40 PLS lbs. per acre
 - Buffalograss 5.83 PLS lbs. per acre
 - Inland saltgrass 0.42 PLS lbs. per acre
 - Slender wheatgrass 1.37 PLS lbs. per acre
 - Sandberg bluegrass 0.82 PLS lbs. per acre
 - Alkaligrass 0.27 PLS lbs. per acre
 - c. Rights of way in areas of future road expansion:
 - Inland saltgrass 1.26 PLS lbs. per acre
 - Blue Grama (Alma, Bad River, or Hachita variety) 0.40 PLS lbs. per acre
 - Alkaligrass 0.64 PLS lbs. per acre
 - Sandberg bluegrass 0.47 PLS lbs. per acre
2. Pre-approved Irrigated Turf Seed Mixes:
- a. 60% Eldorado, Silverado and Monarch Turf type Tall Fescue
30% Manchar Smooth Brome
10% Bluegrass mix (drought tolerant blends)
 - b. 40% Barrington Tall Fescue
40% Labarinth RTF Tall Fescue
20% Barrister Kentucky Bluegrass
 - c. 35% Creeping Red Fescue
25% SR3200 Blue Fescue 12.5% SR3100 Hard Fescue
15% Reubens Canadian Blue
12.5% SR5100 Chewings Fescue
 - d. 30% Matador Tall Fescue
30% Tomahawk RT Tall Fescue
30% Pure Gold Tall Fescue
10% North Star Kentucky Bluegrass

SODDING

1. Pre-approved Sod Mixes:
- a. 60% Eldorado, Silverado and Monarch Turf type Tall Fescue
30% Manchar Smooth Brome
10% Bluegrass Mix (drought tolerant blends)
 - b. 40% Barrington Tall Fescue
40% Labarinth RTF Tall Fescue
20% Barrister Kentucky Bluegrass
 - c. 35% Creeping Red Fescue
25% SR3200 Blue Fescue
12.5% SR3100 Hard Fescue
15% Reubens Canadian Blue
12.5% SR5100 Chewings Fescue
 - d. 30% Matador Tall Fescue
30% Tomahawk RT Tall Fescue

Town of Mead Design Standards and Construction Specifications

- 30% Pure Gold Tall Fescue
- 10% North Star Kentucky Bluegrass
- e. VorTEX Texas Bluegrass from Korby Sod LLC

TREES, PLANTS AND GROUNDCOVER

1. Backfill mix: Premium-3 composted aspen humus, by A-1 Organics.
2. Tree wrap: 4" wide Kraft tree wrap.
3. Weed barrier fabric: Mirafi geo-textile fabric 140N.
4. Steel edging: 3/16" x 4" x 16' Ryerson steel edging.
5. Mulch: Aspen bark mulch, pole peelings (linear strips only), recycled rubber (with staff-approved cut sheet), 3"-6" cobble or shredded cedar. Cobble is not to be used in Greenway areas unless otherwise approved by staff.
6. Tree Stakes: Two inch (2") x six feet (6') round wooden posts or six foot (6') long, heavy-duty t-bar steel posts with white tops.
7. Tree Guys: ½" STRAP-X (flat synthetic webbing material) or ½" Central Bag polyester strapping with 17 gauge galvanized steel wire.
8. Tree Grates: Cast Iron only. Minimum 40 square feet (4' x 10' (comes in two pieces) or 9' x 5' (comes in 4 pieces))
9. Misc. Tree Equipment: White tee post caps; Canvas strap; White plastic flagging tape or 1/2" white PVC pipe; four inch (4") wide tree wrap.
10. Beaver protection: Galvanized four foot (4') high (2" x 4" openings) fencing.

MISCELLANEOUS LANDSCAPE ITEMS

1. Benches: Webcoat expanded metal six foot bench – surface mount on appropriately sized concrete pad (B6WBRCM), black color.
2. Trash Receptacles: Webcoat – 32 gallon (TR32 – TSRM) – surface or in-ground mount as appropriate – black color with DOME32 gray top. Also include 30 gallon galvanized trash can (no lid) inside receptacle.
3. Recycling Receptacles: Recycle Away Landscape 34 Gallon Dome (RC-34R DM CANS RBL). Blue color with dome lid.
4. Picnic Tables: Webcoat T6RC and T8RCHDCP tables – surface mount – black color, including Play World #1409 PVC-coated clamps to bolt tables to appropriately sized concrete pad.
5. Bike racks: Madrax inverted U-style #U238-SF, surface mount – black color on appropriately sized concrete pad.
6. Play Equipment: all play equipment shall meet all standards in the most current version of the Public Playground Safety Handbook as set fourth by the United States Consumer Product Safety Commission. The hand book can be found at <https://www.cpsc.gov/s3fs-public/325.pdf> .
 - a. Manufacturers
 1. Gametime
 2. Miracle
7. Surfacing Material:
 - a. Engineered Wood Fiber (EWF)
 - b. Poured-In-Place Rubber
8. All parks shall be designed to meet the most current ADA requirements

Town of Mead Design Standards and Construction Specifications

Approved Plant Materials List

The following lists are trees specifically PROHIBITED from Town of Mead regulated areas (and discouraged from use elsewhere)

Tree Name	Any Area	Streetscapes	Trail Corridors
Russian Olive	•	•	•
Lombardy Poplar	•	•	•
Siberian Elm	•	•	•
Boxelder Maple	•	•	•
Ash – any species	•	•	•
Fruit-Bearing Trees*		•	
Thorn-Bearing Trees*		•	
Willow (all varieties)		•	
Tree of Heaven		•	
Cottonwood (all varieties)		•	
Silver Maple		•	

* Trees that drop fruit or bear thorns may be allowed in streetscape areas only if the mature size of the tree does not come within 5' of paths, walks or other pedestrian areas.

RECOMMENDED TREES for Town of Mead regulated areas

Growth rate: S = Slow, M = Medium, F = Fast

Adaptability: H = Hardy, A = Average, M = Marginal)

(Adaptability rating includes cold, soils, moisture tolerance & disease resistance)

Use: S-6 = Street tree in areas 6' maximum tree lawn width

S-8 = Street tree in areas 8' minimum tree lawn width

G = Pathway and Common Open Space

Tree Name	Botanical Name	Growth Rate	Adaptability	Use
Ornamental Trees				
Alder, Thinleaf	Alnus tenuifolia	F	H	S-6,G
Birch, Native River	Birch, Native River	M	A	G
Birch, Whitespire	Betula platyphylla japonica	M	A-M	G
Cherry, Bird (Mayday)	Prunus padus	S	H-A	S-6, G
Cherry, Canada Red	Prunus virginians 'Schubert	M	H	G
Cherry, Montmorency	Prunus cerasus	M	A	G
Cherry, Sargent	Prunus sargentii	M	H	G
Crabapple, Adams	Malus 'Adams'	M	H-A	G
Crabapple, Adirondak	Malus 'Adirondak'	M	H-A	G
Crabapple, Brandywine	Malus 'Brandywine'	M	H-A	G
Crabapple, Centurion	Malus 'Centurion'	M	H-A	G

Town of Mead Design Standards and Construction Specifications

Tree Name	Botanical Name	Growth Rate	Adaptability	Use
Crabapple, Coralburst	Malus 'Coralburst'	M	H-A	G
Crabapple, David	Malus 'David'	M	H-A	G
Crabapple, Indian Magic	Malus 'Indian Magic'	M		
Crabapple, Prairifire	Malus 'Prairifire'	M		
Crabapple, Profusion	Malus 'Profusion'	M	H-A	G
Crabapple, Radiant	Malus 'Radiant'	M	H-A	G
Crabapple, Red Barron	Malus 'Red Barron'	M	H-A	G
Crabapple, Royalty	Malus 'Royalty'	M	H-A	G
Crabapple, Spring Snow	Malus 'Spring Snow'	M	H-A	G
Crabapple, Thunderchild	Malus 'Thunderchild'	M	H-A	G
Crabapple, White Cascade	Malus 'White Cascade'	M	H-A	G
Goldenrain Tree	Koelreuteria paniculata	S	M	S-8
Hawthorn, Crusader	Crataegus ambigua	S	H	G
Hawthorn, Russian	Crataegus ambigua	S	H	G
Hawthorn, Thornless Cockspur	Crataegus crus-gali inermis	S	H	G
Hawthorn, Washington	Crataegus phaenopyrum	S	H	G
Hornbeam, Pyridimal Eruopean	Carpinus betulus	M	H	S-6
Lilac, Japanese Tree	Syringa reticula	M	A	S-6
Maple, Ginnala	Acer ginnala	S	H	S-6, G
Maple, Tartarian	Acer tartaricum	S	H	S-6, G
Pear, Aristocrat	Pyrus Calleryanna 'Aristocrat'	M	A	S-6
Pear, Autumn blaze	Pyrus Calleryanna 'Autumn blaze'	M	A	S-6
Pear, Chanticleer	Pyrus Calleryanna 'Chanticleer'	M	A	S-6
Pear, Redspire	Pyrus Calleryanna 'Redspire'	M	A	S-6
Pear, Stonehill	Pyrus Calleryanna 'Stonehill'	M	A	S-6
Plum, American	Prunus americana	S	H	G
Plum, Newport	Prunus cerasifera	S	A	S-6
Redbud, Eastern	Cercis canadensis	S	M	S-6
Serviceberry, Autumn Brilliance	Amelanchier grandiflora 'Autumn Brilliance'	S	H	S-6, G
Serviceberry, Robin Hill	Amelanchier grandiflora 'Robin Hill'	S	H	S-6, G
Serviceberry, Saskatoon	Amelanchier alnifolia 'Saskatoon'	S	H	S-6, G
Serviceberry, Shadblow	Amelanchier cmandensis 'Shadblow'	S	H	S-6, G
Shade (Canopy) Trees				
Tree Common Name	Botanical Name	Growth Rate	Adaptability	Use

Town of Mead Design Standards and Construction Specifications

Tree Name	Botanical Name	Growth Rate	Adaptability	Use
Catalpa, Western	Catalpa speciosa	S	H	S-8, G
Coffeetree, Kentucky	Gymnocladus dioica	S	H	S-8, G
Cottonwood, Lanceleaf	Populus acuminata	F	H	G
Cottonwood, Narrowleaf	Populus andustifolia	F	H	G
Cottonwood, Plains	Populus sargentii	F	H	G
Filbert, Turkish	Corylus colurna	M	A	S-8,G
Hackberry, Western	Celtis occidentalis	M	H	S-8, G
Hornbeam, American	Carpinus caroliniana	M	H	S-8,G
Honeylocust, Imperial	Gleditsia tricanthos inermis 'Imperial'	M	H	S-8,G
Honeylocust, Shademaster	Gleditsia tricanthos inermis 'Shademaster'	M	H	S-8,G
Honeylocust, Skyline	Gleditsia tricanthos inermis 'Skyline'	M	H	S-8,G
Locust, Black	Robinia pseudoacacia	F	H	G
Locust, Purple Robe	Robinia pseudoacacia 'Purple Robe'	F	H-A	S-8, G
				S-8
Maple, Hedge	Acer campestre	S	H	S-8
Maple, Autumn Blaze	Acer freemanii	M	M	S-8
Maple, Deborah	Acer platanoides 'Deborah'	S	A-M	S-8
Maple, Emerald Lustre	Acer platanoides 'Emerald Lustre'	S	A-M	S-8
Maple, Emerald Queen	Acer platanoides 'Emerald Queen'	S	A-M	S-8
Maple, Green Mountain Sugar	Acer saccharum 'Green Mountain'	S	A-M	S-8
Maple, Legacy	Acer saccharum 'Legacy'	S	A-M	S-8
Maple, Northwood	Acer rubrum 'Northwood'	M	M	S-8
Maple, Red Sunset	Acer rubrum 'Red Sunset'	M	M	S-8
Maple, Pacific Sunset	Acer truncatum 'Pacific Sunset'	S	A-M	S-8
Linden, American	Tilia Americana	M	H	S-8
Linden, Redmond	Tilia Americana 'Redmond'	M	H	S-8
Linden, Glenleven	Tilia cordata 'Glenleven'	M	H	S-8
Linden, Greenspire	Tilia cordata 'Greenspire'	M	H	S-8
Oak, Bur	Quercus macrocarpa	S	H	S-8, G
Oak, Chinkapin	Quercus muehlenbergii	M	H	S-8, G
Oak, English	Quercus robur	M	H	S-8, G
Oak, Northern Red	Quercus rubra	M	A-M	S-8, G
Oak, Shingle	Quercus imbricaria	M	A	S-8, G
Oak, Shumard	Quercus shumardii	M	A	S-8, G
Oak, Swamp White	Quercus bicolor	M	H-A	S-8, G
Elm, American	Ulmus americana	F	H	S-8, G

Town of Mead Design Standards and Construction Specifications

Tree Name	Botanical Name	Growth Rate	Adaptability	Use
Elm, Accolade	Ulmus japonica x wilsonii 'Accolade'	F	H	S-8, G
Elm, Frontier	Ulmus carpinifoli x parvifolia 'Frontier'	F	H	S-8, G
Willow, Niobe Weeping	Salix alba 'Tristis'	F	H	G
Willow, Peach Leaf	Salix amygdaloides	F	H	G
Willow, Prairie Cascade	Salix pentandra	F	H	G
Willow, Russian Golden	Salix alba vitellina	F	H	G
Conifer (Evergreen) Trees				
Fir, Concolor	Abies concolor	M	A	G
Fir, Douglas	Psuedotsuga menziesii	M	A	G
Juniper, Rocky Mountain	Juniperus scopulorum var.	S	H	G
Pine, Austrian	Pinus nigra	M	H	G
Pine, Bosnian	Pinus heldreichii	M	H	G
Pine, Bristlecone	Pinus ariatada	S	A	S-8, G
Pine, Mugo	Pinus mugo	M	H	G
Pine, Pinon	Pinus edulis	M	H	S-8, G
Pine, Ponderosa	Pinus ponderosa	M	H	S-8, G
Pine, Scotch	Pinus sylvestris	M	H	G
Pine, Southwestern White	Pinus strobiformis	S	A	G
Pine, Swiss Stone	Pinus cembra	M	A	G
Pine, Vanderwolf	Pinus flexilis	M	A	G
Spruce, Bacheri	Picea pungems 'bacheri'	M	H	G
Spruce, Black Hills	Picea glauca densata	M	H	G
Spruce, Colorado Blue	Picea pungens	M	H	G
Spruce, Siberian	Picea omorika	M	H	G



Appendix B

Construction Details

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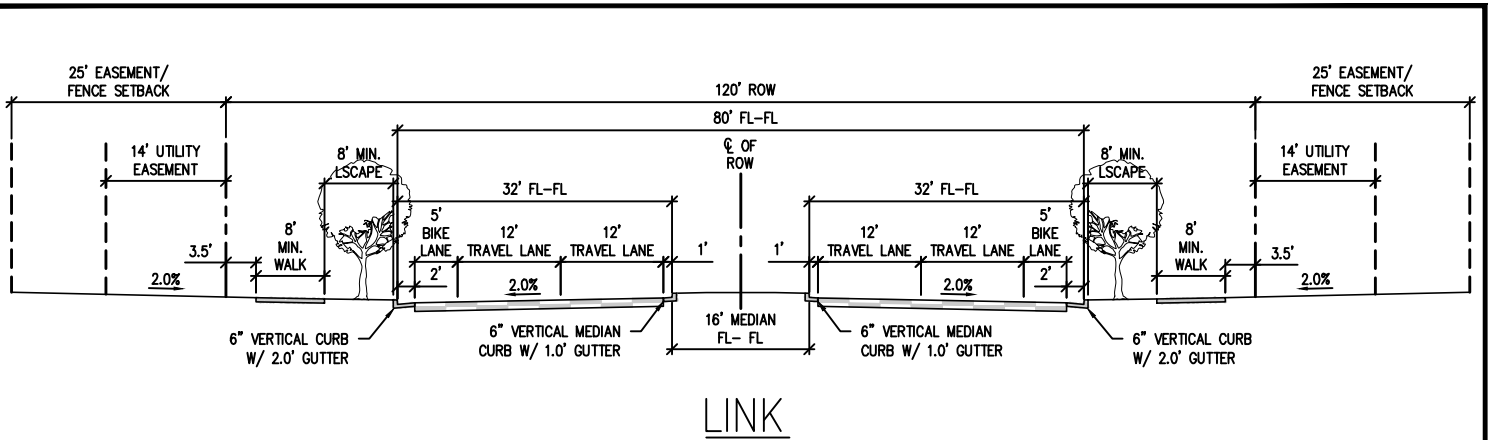
Town of Mead Design Standards and Construction Specifications

DETAILS

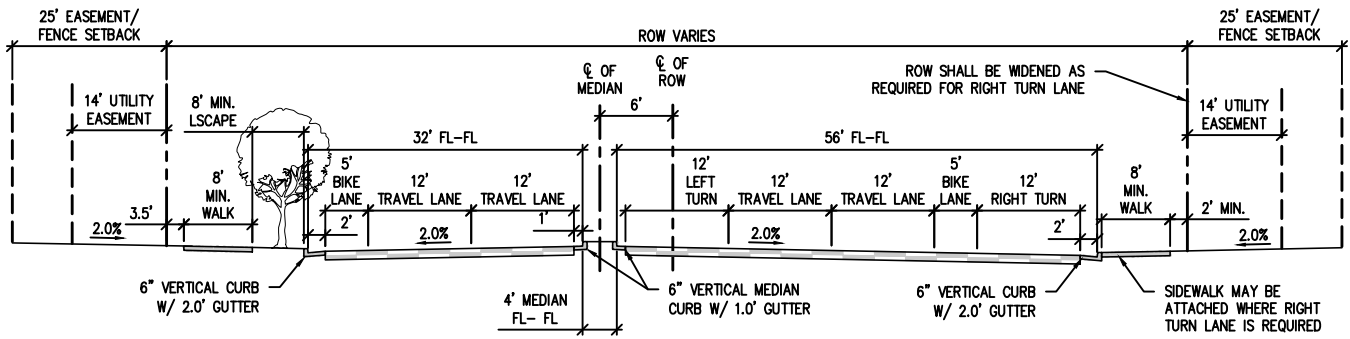
D3.01A	4-Lane Major Arterial Street
D3.01B	2-Lane Major Arterial Street
D3.02A	2-Lane Minor Arterial Street
D3.02B	2-Lane Minor Arterial Street Half Section
D3.03	Major Residential Collector and Business Collector Street
D3.04	Minor Collector Street
D3.05	Residential Local Street
D3.06	Rural Road
D3.07	Vertical Curb and Gutter Detail
D3.08	Mountable Curb and Gutter Detail
D3.09	Vertical Curb Catch to Spill Transition Detail
D3.10	Vertical to Mountable Curb Transition Detail
D3.11	Sidewalk and Joint Detail
D3.12	Directional Curb Ramp Detail
D3.13	Diagonal Curb Ramp Detail
D3.14	Mid-Block Curb Ramp
D3.15	Concrete Pan Layout Detail
D3.16	Concrete Pan Detail
D3.17	Concrete Driveway with Detached Sidewalk Detail
D3.18A	Concrete Driveway with Attached Walk Detail
D3.18B	Concrete Driveway with Attached Walk Detail
D3.19	Driveway Detail (Rural Road Only)
D3.20	Street Intersection Detail
D3.21	Street Intersection Striping Detail
D3.22A	Concrete Chase at Curb Detail
D3.22B	Concrete Chase Detail
D3.23A	Asphalt Patch Detail (1 of 4)
D3.23B	Asphalt Patch Detail (2 of 4)
D3.23C	Asphalt Patch Detail (3 of 4)
D3.23D	Asphalt Patch Detail (4 of 4)
D3.24	Sign Post Detail
D3.25	Street Name Sign Detail
D3.26A	Local Cul-De-Sac Detail
D3.26B	Local Offset Cul-De-Sac Detail
D3.27	Widening Detail for Street Knuckle (Local Streets Only)
D3.28	Guardrail Detail
D4.01	General Construction Notes
D4.02	Example Site Plan
D4.03	Standard Sanitary Manhole
D4.04	Sanitary Drop Manhole
D4.05	Monitoring Sanitary Manhole
D4.06	Monitoring Sanitary Manhole Diagrams
D4.07	Sanitary Manhole Base
D4.08	Flexible Joint Pipe Penetrations
D4.09	Manhole Ring and Cover - Non-Bolted
D4.10	Manhole Ring and Cover - Bolted
D4.11	Pipe Trenching
D4.12	Pipe Trenching with Underdrain System
D4.13	Sanitary Cleanout

Town of Mead Design Standards and Construction Specifications

D4.14	Typical Service Connection
D4.15	Tapping Saddle
D4.16	Pipe Encasement
D4.17	Pipe Encasement Specifications
D4.18	Standard Pipe Casing
D4.19	Cut-Off Wall
D4.20	Sanitary Utility Marker Post
D5.01	Fire Hydrant Placement
D5.02	Water Utility Marker Post
D6.01A	Storm Manhole
D6.01B	Storm Manhole Ring and Cover
D6.02	Storm Cleanout
D6.03	Storm Sewer Bedding Detail
D6.04A	CMP Type 1 Flared End Section
D6.04B	RCP Flared End Section
D6.05	Rip Rap Flared End Section
D6.06	Type C Inlet
D6.07A	Combination Inlet (1 of 2)
D6.07B	Combination Inlet (2 of 2)
D6.08	Direct Connection RCP To PVC Connection
D6.09A	Valley Inlet (CDOT Type 13) (1 of 2)
D6.09B	Valley Inlet (CDOT Type 13) (2 of 2)
D6.10A	Type R Curb Inlet (1 of 3)
D6.10B	Type R Curb Inlet (2 of 3)
D6.10C	Type R Curb Inlet (3 of 3)
D6.11	Small Pipe Headwall
D6.12	Headwall with Circular Pipe
D6.13	Storm Utility Marker Post
D8.01	Shrub Planting Detail
D8.02	Tree Planting Detail
D8.03	Winterization Assembly
D8.04	Remote Control Valve Assembly
D8.05	Quick Coupler Assembly
D8.06	Pop Up Spray Sprinkler Assembly
D8.07	Pop Up Rotor Sprinkler Assembly
D8.08	Master Valve Assembly
D8.09	Valve Drain Assembly
D8.10	Gate Valve Assembly
D8.11	Flush Cap Assembly
D8.12	Flow Meter Assembly
D8.13	Drip Remote Control Valve Assembly
D8.14	Shrub Bed Drip Detail
D8.15	Drip to Trees in Open Turf Areas
D8.16	Backflow Preventer Concrete Vault
D8.17	Concrete Thrust Block
D8.18	Flood Gate



LINK



INTERSECTION

ROADWAY WIDTH: 80' BETWEEN INTERSECTIONS; WIDEN AT INTERSECTION AS NEEDED.

RIGHT OF WAY WIDTH: 120' MIN. BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

TRAVEL LANES: 4 LANES AT 12' WIDE (EXCLUSIVE OF GUTTER OR MIN. 12' WHERE NO GUTTER).

LEFT TURN LANE: 12' WIDE, REQUIRED AT INTERSECTION.

BIKE LANES: 2 LANES, 5' WIDE MIN. (EXCLUSIVE OF GUTTER).

PARKING: NONE

SIDEWALK: 8' MIN. WIDE IF DETACHED BY AT LEAST 8'. ADDITIONAL WIDTH MAY BE REQUIRED FOR HIGHER PEDESTRIAN TRAFFIC IN AND LEADING TO ACTIVITY AREAS.

MEDIAN: 16' WIDE (FLOWLINE TO FLOWLINE), 4' IN LEFT TURN AREA. COLORED CONCRETE OR LANDSCAPED.

DESIGN SPEED: 50 MPH

POSTED SPEED: 40 MPH

ACCESS: NO PRIMARY ACCESS TO INDIVIDUAL LOTS PERMITTED. 1/2 MILE SPACING TO SIGNALIZED INTERSECTIONS IS REQUIRED.

CONTINUITY: UNLIMITED.

FENCES: FENCES SHALL BE PLACED OUTSIDE OF THE LANDSCAPING AND PEDESTRIAN EASEMENT. (25' FROM ROW)

LANDSCAPING: TREE LAWN, MEDIAN, AND BUFFER AREA LANDSCAPING MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA.

CURB AND GUTTER: VERTICAL CURB AND GUTTER.

CR 9.5 (HIGH PLANS BOULEVARD): ADDITIONAL REQUIREMENTS MAY APPLY. SEE CDOT FOR SPECIFIC DESIGN CRITERIA.

SCALE: NTS

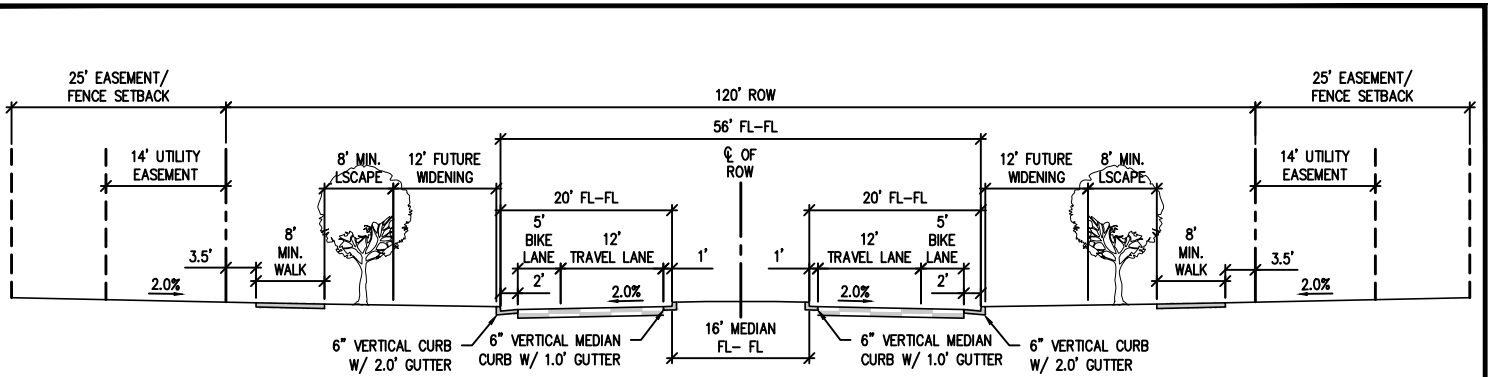


TOWN OF MEAD STANDARD DESIGN CRITERIA

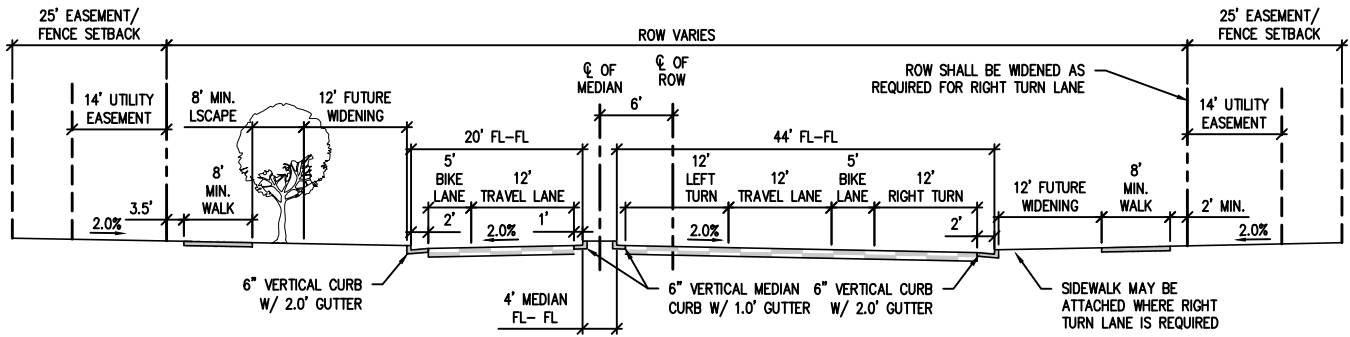
4-LANE MAJOR ARTERIAL STREET

D3.01A

DATE: 04/2021



LINK



INTERSECTION

ROADWAY WIDTH: 56' BETWEEN INTERSECTIONS; WIDEN AT INTERSECTION AS NEEDED.

RIGHT OF WAY WIDTH: 120' MIN. BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

TRAVEL LANES: 2 LANES AT 12' WIDE (EXCLUSIVE OF GUTTER OR MIN. 12' WHERE NO GUTTER).

LEFT TURN LANE: 12' WIDE, REQUIRED AT INTERSECTION.

BIKE LANES: 2 LANES, 5' WIDE MIN. (EXCLUSIVE OF GUTTER).

PARKING: NONE

SIDEWALK: 8' MIN. WIDE IF DETACHED BY AT LEAST 8'. ADDITIONAL WIDTH MAY BE REQUIRED FOR HIGHER PEDESTRIAN TRAFFIC IN AND LEADING TO ACTIVITY AREAS.

MEDIAN: 16' WIDE (FLOWLINE TO FLOWLINE), 4' IN LEFT TURN AREA. COLORED CONCRETE OR LANDSCAPED.

DESIGN SPEED: 50 MPH

POSTED SPEED: 40 MPH

ACCESS: NO PRIMARY ACCESS TO INDIVIDUAL LOTS PERMITTED. 1/2 MILE SPACING TO SIGNALIZED INTERSECTIONS IS REQUIRED.

CONTINUITY: UNLIMITED.

FENCES: FENCES SHALL BE PLACED OUTSIDE OF THE LANDSCAPING AND PEDESTRIAN EASEMENT. (25' FROM ROW)

LANDSCAPING: TREE LAWN, MEDIAN, AND BUFFER AREA LANDSCAPING MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA.

CURB AND GUTTER: VERTICAL CURB AND GUTTER.

CR 9.5 (HIGH PLANS BOULEVARD): ADDITIONAL REQUIREMENTS MAY APPLY. SEE CDOT FOR SPECIFIC DESIGN CRITERIA.

SCALE: NTS

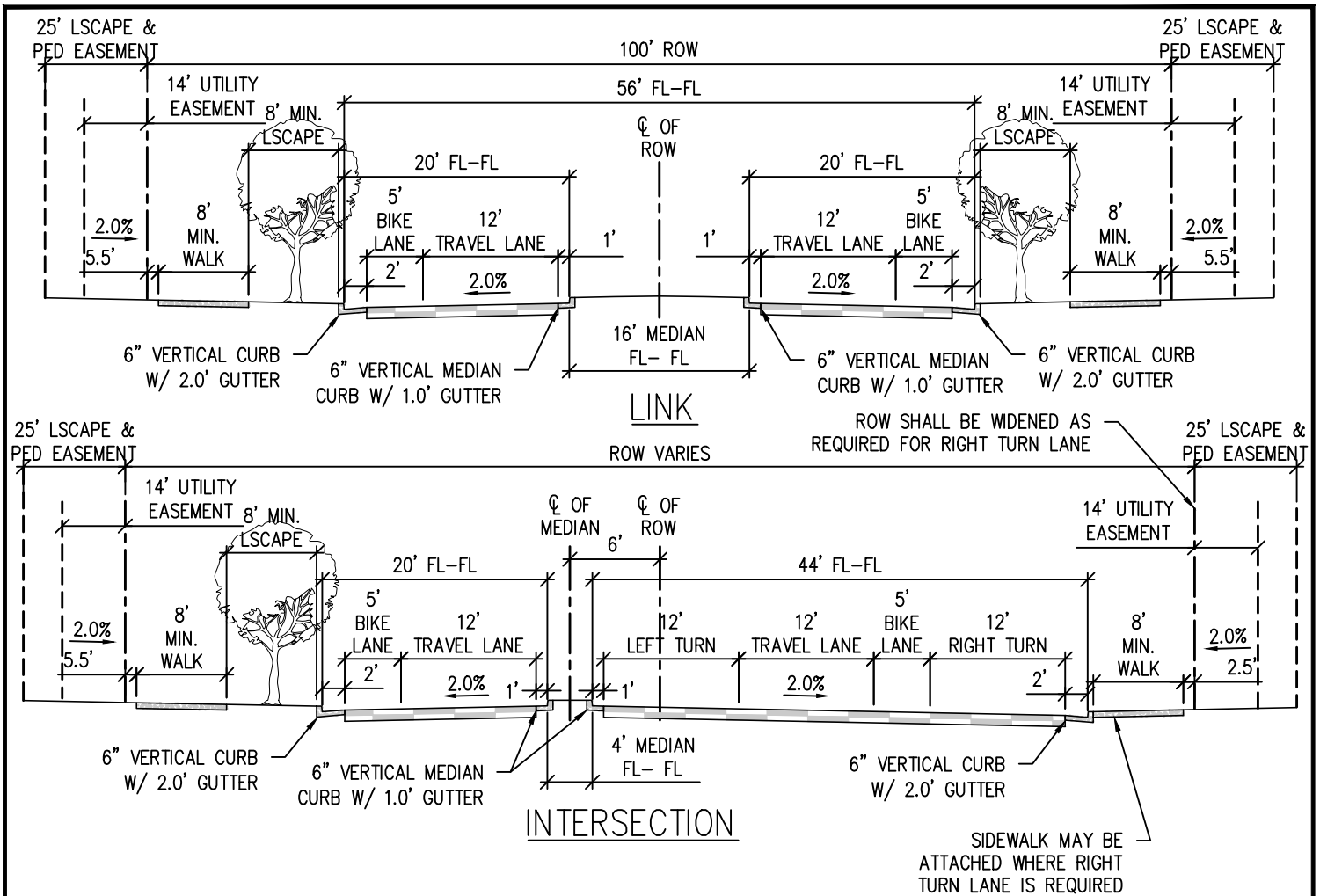


TOWN OF MEAD STANDARD DESIGN CRITERIA

2-LANE MAJOR ARTERIAL STREET

D3.01B

DATE: 04/2021



ROADWAY WIDTH: 56' BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

RIGHT OF WAY WIDTH: 100' MIN. BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

TRAVEL LANES: 2 LANES AT 12' WIDE (EXCLUSIVE OF GUTTER).

LEFT TURN LANE: 12' WIDE, REQUIRED AT INTERSECTION.

BIKE LANES: 2 LANES, 5' WIDE MIN. (EXCLUSIVE OF GUTTER).

PARKING: NONE.

SIDEWALK: 8' MIN. WIDE IF DETACHED BY AT LEAST 8'. ADDITIONAL WIDTH MAY BE REQUIRED FOR HIGHER PEDESTRIAN TRAFFIC IN OR IF ATTACHED TO ACTIVITY AREAS. 8' MIN. WIDE DETACHED FOR REDEVELOPMENT.

MEDIAN: 16' WIDE (FLOWLINE TO FLOWLINE), 4' IN LEFT TURN AREA. COLORED CONCRETE OR LANDSCAPED.

DESIGN SPEED: 45 MPH

POSTED SPEED: 40 MPH

ACCESS: NO PRIMARY ACCESS TO INDIVIDUAL LOTS PERMITTED. 1/4 MILE SPACING TO SIGNALIZED INTERSECTIONS IS REQUIRED.

CONTINUITY: UNLIMITED.

FENCES: FENCES SHALL BE PLACED OUTSIDE OF THE LANDSCAPING. (25' FROM ROW)

LANDSCAPING: TREE LAWN, MEDIAN, AND BUFFER AREA LANDSCAPING MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA.

CURB AND GUTTER: VERTICAL CURB AND GUTTER.

SIDEWALK MAY BE ATTACHED WHERE RIGHT TURN LANE IS REQUIRED

SCALE: NTS

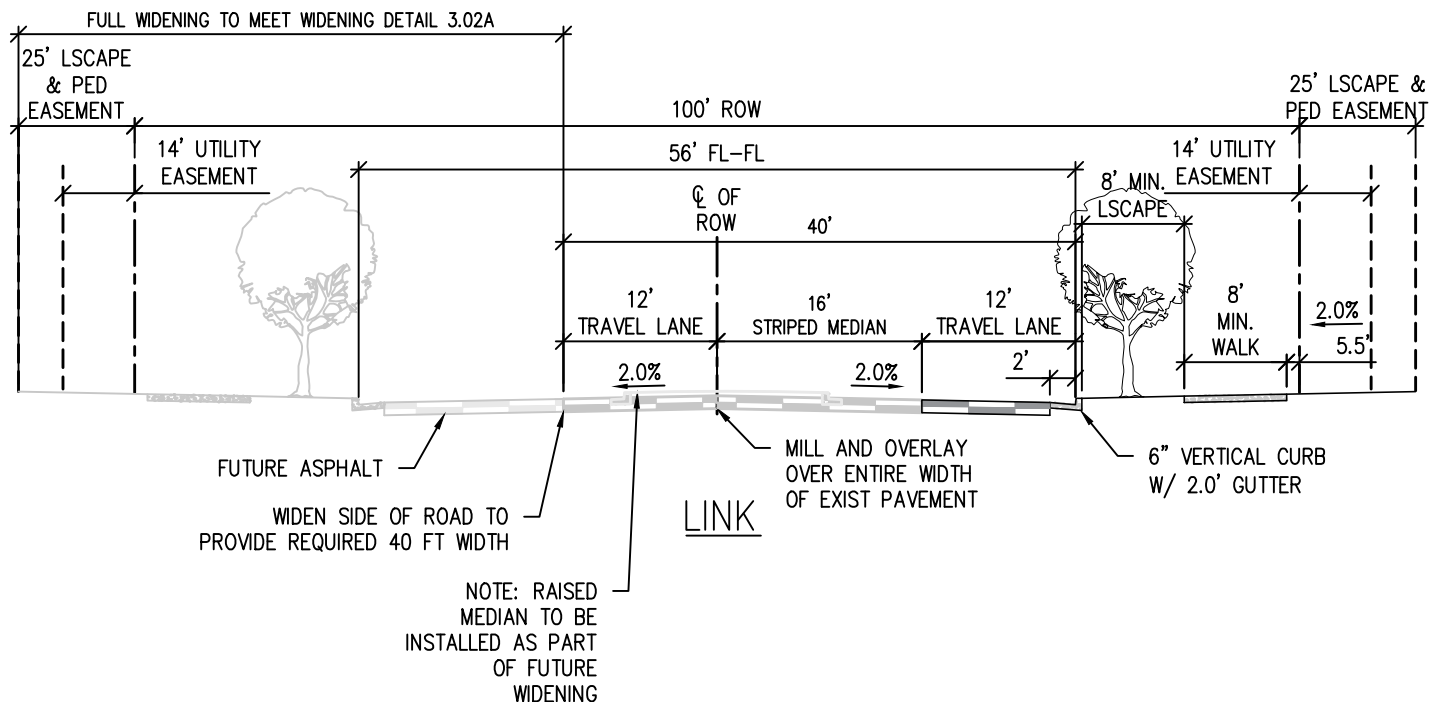


TOWN OF MEAD STANDARD DESIGN CRITERIA

2-LANE MINOR ARTERIAL STREET

D3.02A

DATE: 04/2021



ROADWAY WIDTH: 56' BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

RIGHT OF WAY WIDTH: 100' MIN. BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

TRAVEL LANES: 2 LANES AT 12' WIDE (EXCLUSIVE OF GUTTER).

LEFT TURN LANE: 12' WIDE, REQUIRED AT INTERSECTION.

BIKE LANES: 2 LANES, 5' WIDE MIN. (EXCLUSIVE OF GUTTER).

PARKING: NONE.

SIDEWALK: 8' MIN. WIDE IF DETACHED BY AT LEAST 8'. ADDITIONAL WIDTH MAY BE REQUIRED FOR HIGHER PEDESTRIAN TRAFFIC IN AND LEADING TO ACTIVITY AREAS. 8' MIN. WIDE DETACHED FOR REDEVELOPMENT.

MEDIAN: 16' WIDE (FLOWLINE TO FLOWLINE), 4' IN LEFT TURN AREA. COLORED CONCRETE OR LANDSCAPED.

DESIGN SPEED: 45 MPH

POSTED SPEED: 40 MPH

ACCESS: NO PRIMARY ACCESS TO INDIVIDUAL LOTS PERMITTED. 1/4 MILE SPACING TO SIGNALIZED INTERSECTIONS IS REQUIRED.

CONTINUITY: UNLIMITED.

FENCES: FENCES SHALL BE PLACED OUTSIDE OF THE LANDSCAPING. (25' FROM ROW)

LANDSCAPING: TREE LAWN, MEDIAN, AND BUFFER AREA LANDSCAPING MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA.

CURB AND GUTTER: VERTICAL CURB AND GUTTER.

MILL AND OVERLAY: IF DEPTH OF PAVEMENT DOES NOT ALLOW FOR A MILL AND OVERLAY A FULL DEPTH REPLACEMENT IS REQUIRED

SCALE: NTS

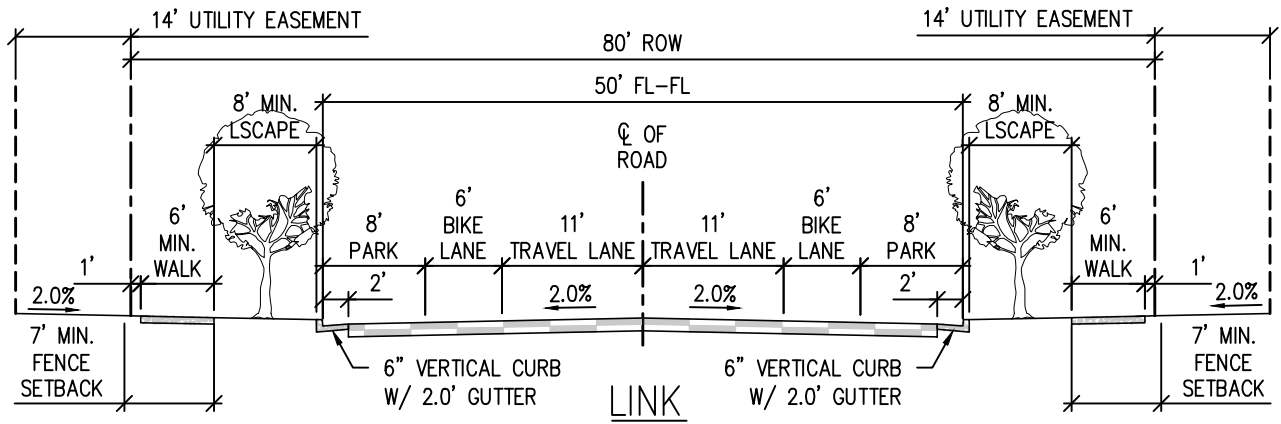


TOWN OF MEAD STANDARD DESIGN CRITERIA

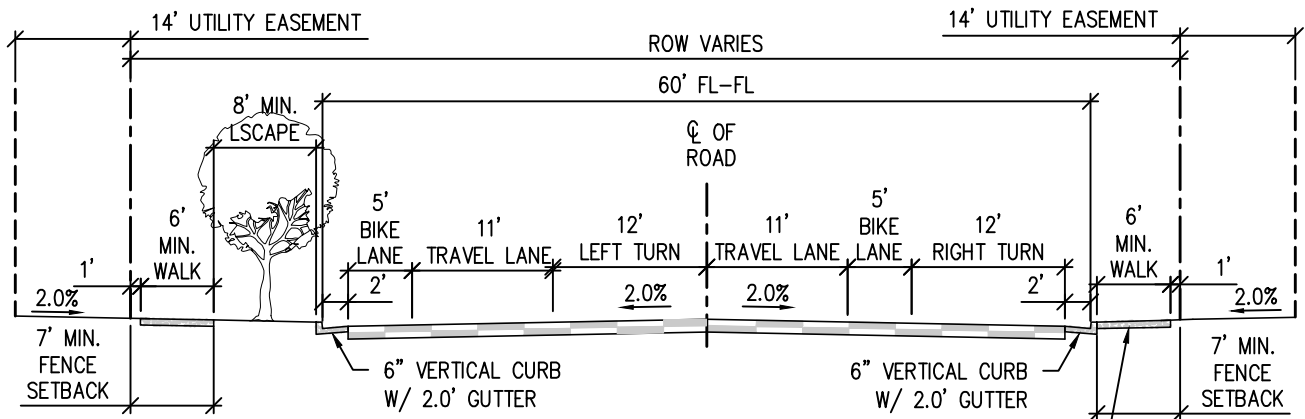
2-LANE MINOR ARTERIAL STREET HALF SECTION

D3.02B

DATE: 04/2021



LINK



INTERSECTION

SIDEWALK MAY BE ATTACHED WHERE RIGHT TURN LANE IS REQUIRED

ROADWAY WIDTH: 50' BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

RIGHT OF WAY WIDTH: 80' MIN. BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

TRAVEL LANES: 2 LANES AT 11' WIDE (EXCLUSIVE OF GUTTER OR MIN. 12' WHERE NO GUTTER).

LEFT TURN LANE: 12' WIDE, AT INTERSECTION WHERE NEEDED.

BIKE LANES: 2 LANES, 6' WIDE MIN. (EXCLUSIVE OF GUTTER). 7' WIDE WHERE ADJACENT TO CURB.

PARKING: TWO LANES, 8' WIDE (MIN.); PARKING MAY BE REMOVED AT CERTAIN LOCATIONS TO PROVIDE A LEFT TURN LANE WHERE NEEDED.

SIDEWALK: 6' MIN. WIDE (MIN.) ADDITIONAL WIDTH MAY BE REQUIRED IF ATTACHED OR FOR HIGHER PEDESTRIAN TRAFFIC IN OR LEADING TO ACTIVITY AREAS.

MEDIAN: NOT REQUIRED, EXCEPT WHERE NECESSARY TO CONTROL ACCESS AND/OR TO PROVIDE PEDESTRIAN REFUGE. ADDITIONAL ROADWAY AND ROW WIDTH MAY BE REQUIRED.

DESIGN SPEED: 40 MPH

POSTED SPEED: 25-30 MPH

ACCESS: ACCESS WILL BE LIMITED. POINTS OF ACCESS MUST BE APPROVED BY THE LOCAL ENTITY.

CONTINUITY: THE STREET SHALL BE CONTINUOUS FOR NO MORE THAN 1,320 FT.

FENCES: FENCES SHALL BE PLACED OUTSIDE OF THE ROW.

LANDSCAPING: TREE LAWN, MEDIAN, AND BUFFER AREA LANDSCAPING MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA.

CURB AND GUTTER: VERTICAL CURB AND GUTTER.

SCALE: NTS

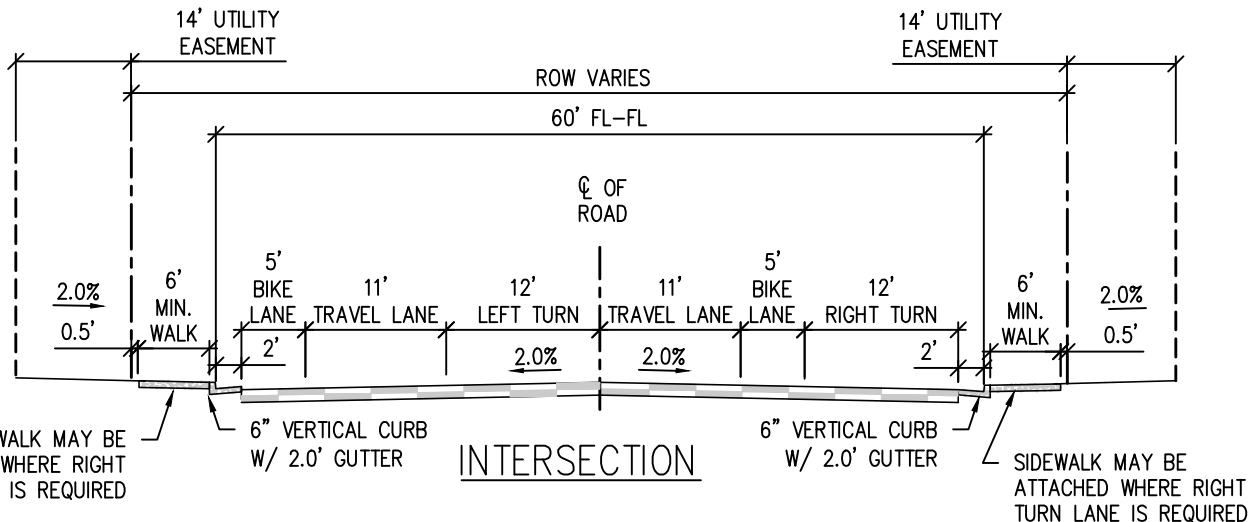
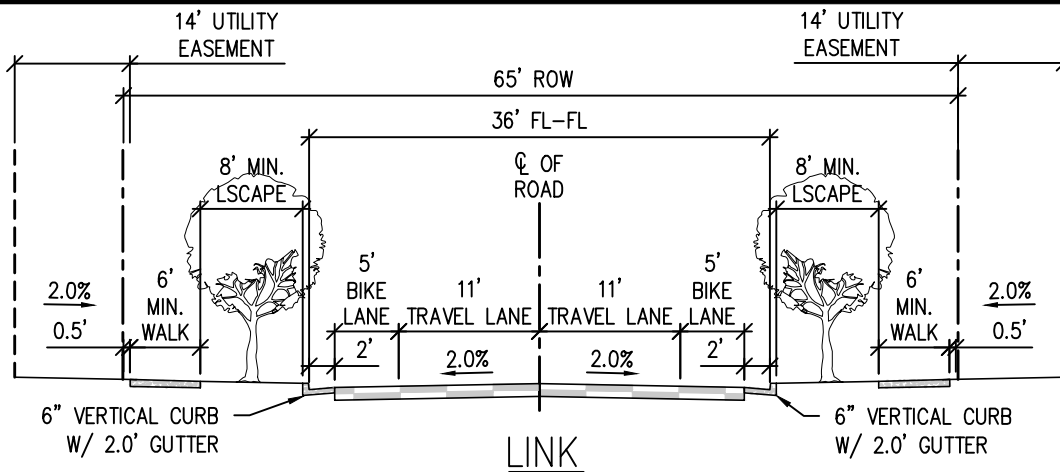


TOWN OF MEAD STANDARD DESIGN CRITERIA

MAJOR RESIDENTIAL COLLECTOR AND
BUSINESS COLLECTOR STREET

D3.03

DATE: 04/2021



ROADWAY WIDTH: 36' BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

RIGHT OF WAY WIDTH: 68' MIN. BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

TRAVEL LANES: 2 LANES AT 11' WIDE (EXCLUSIVE OF GUTTER OR MIN. 12' WHERE NO GUTTER).

LEFT TURN LANE: 12' WIDE, REQUIRED AT INTERSECTION.

BIKE LANES: 2 LANES, 7' WIDE MIN. (EXCLUSIVE OF GUTTER).

PARKING: NONE.

SIDEWALK: 6' MIN. WIDE (MIN.) ADDITIONAL WIDTH MAY BE REQUIRED IF ATTACHED OR FOR HIGHER PEDESTRIAN TRAFFIC IN OR LEADING TO ACTIVITY AREAS.

MEDIAN: NOT REQUIRED, EXCEPT WHERE NECESSARY TO CONTROL ACCESS AND/OR TO PROVIDE PEDESTRIAN REFUGE. ADDITIONAL ROADWAY AND ROW WIDTH MAY BE REQUIRED.

DESIGN SPEED: 40 MPH

POSTED SPEED: 25-30 MPH

ACCESS: ACCESS WILL BE LIMITED. POINTS OF ACCESS MUST BE APPROVED BY THE LOCAL ENTITY.

CONTINUITY: THE STREET SHALL BE CONTINUOUS FOR NO MORE THAN 1,320 FT.

FENCES: FENCES SHALL BE PLACED OUTSIDE OF THE ROW.

LANDSCAPING: TREE LAWN, MEDIAN, AND BUFFER AREA LANDSCAPING MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA.

CURB AND GUTTER: VERTICAL CURB AND GUTTER.

SCALE: NTS

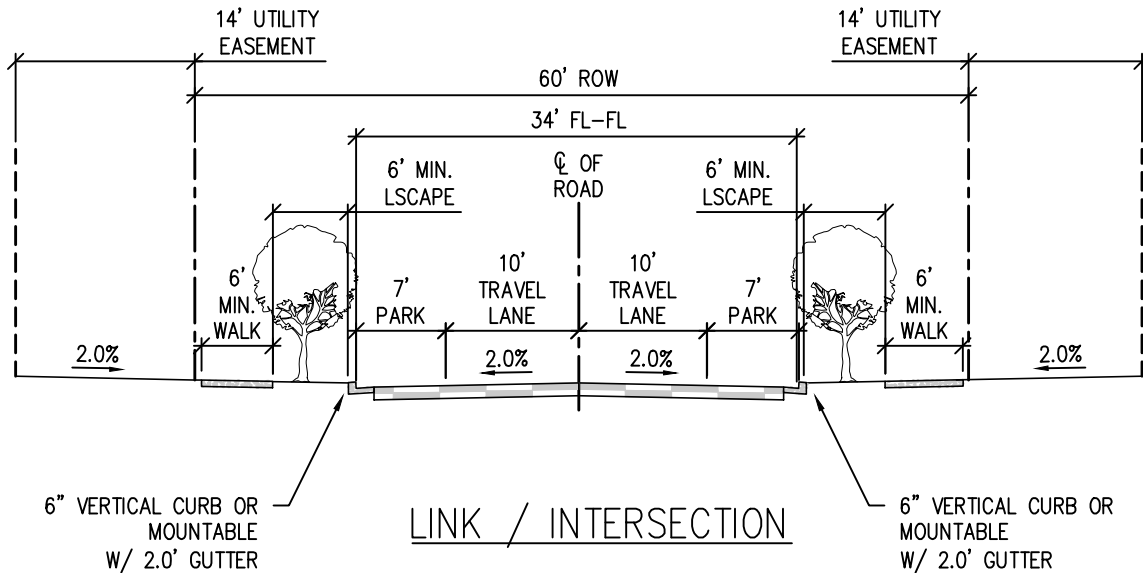


TOWN OF MEAD STANDARD DESIGN CRITERIA

MINOR COLLECTOR STREET

D3.04

DATE: 04/2021



ROADWAY WIDTH: 36' BETWEEN INTERSECTIONS; WIDEN AT INTERSECTIONS AS NEEDED.

RIGHT OF WAY WIDTH: 50' MIN.

TRAVEL LANES: 2 LANES AT 11' WIDE (EXCLUSIVE OF GUTTER OR MIN. 12' WHERE NO GUTTER).

LEFT TURN LANE: NONE.

BIKE LANES: SHARED STREET.

PARKING: TWO LANES, 7' WIDE SHARED WITH BIKE LANE.

SIDEWALK: 6' MIN. WIDE (MIN.) ADDITIONAL WIDTH MAY BE REQUIRED IF ATTACHED OR FOR HIGHER PEDESTRIAN TRAFFIC IN OR LEADING TO ACTIVITY AREAS.

MEDIAN: NOT REQUIRED, EXCEPT WHERE NECESSARY TO CONTROL ACCESS AND/OR TO PROVIDE PEDESTRIAN REFUGE. ADDITIONAL ROADWAY AND ROW WIDTH MAY BE REQUIRED.

DESIGN SPEED: 25 MPH

POSTED SPEED: 25 MPH

ACCESS: NO LIMIT.

CONTINUITY: THE STREET SHALL BE CONTINUOUS FOR NO MORE THAN 660 FT.

FENCES: FENCES SHALL BE PLACED OUTSIDE OF THE ROW.

LANDSCAPING: TREE LAWN, MEDIAN, AND BUFFER AREA LANDSCAPING MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA.

CURB AND GUTTER: VERTICAL OR MOUNTABLE CURB AND GUTTER.

SCALE: NTS

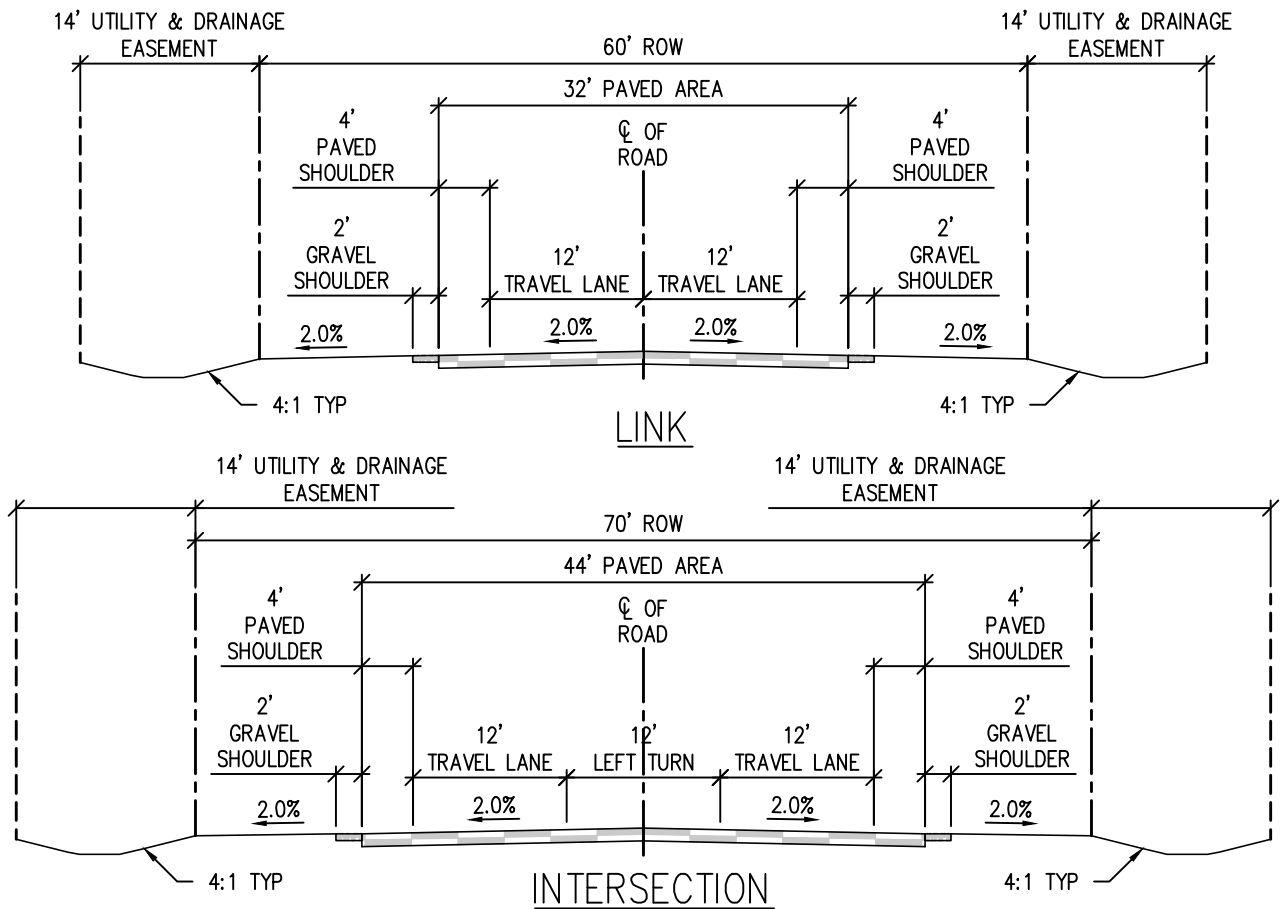


TOWN OF MEAD STANDARD DESIGN CRITERIA

RESIDENTIAL LOCAL STREET

D3.05

DATE: 04/2021



ROADWAY WIDTH: 32' BETWEEN INTERSECTIONS; 44' AT INTERSECTIONS WITH TURN LANE.

RIGHT OF WAY WIDTH: 60' MIN. BETWEEN INTERSECTIONS; WIDEN TO 70' AT INTERSECTIONS.

TRAVEL LANES: 2 LANES AT 12' WIDE.

LEFT TURN LANE: NONE.

BIKE LANES: SHARED STREET OR ON PAVED SHOULDER.

PARKING: NO PARKING PERMITTED ON ARTERIAL ROADS, SHOULDER MAY BE USED FOR OTHER ROADS.

SIDEWALK: NONE.

MEDIAN: NOT REQUIRED, EXCEPT WHERE NECESSARY TO CONTROL ACCESS AND/OR TO PROVIDE PEDESTRIAN REFUGE. ADDITIONAL ROADWAY AND ROW WIDTH MAY BE REQUIRED.

WHERE USED: THESE SPECIFICATIONS MAY BE USED FOR ESTATE TYPE DEVELOPMENTS GROSS DENSITY ≤ 2 DWELLING UNITS / ACRE OR WITHIN SEPARATOR OR TRANSITION AREAS AS RECOMMENDED IN OTHER STUDIES ADOPTED BY LOCAL ENTITIES.

DESIGN SPEED: ARTERIAL 45 MPH; COLLECTOR 40 MPH; LOCAL 30 MPH

POSTED SPEED: ARTERIAL 40 MPH; COLLECTOR 35 MPH; LOCAL 25 MPH

ACCESS: NO LIMIT.

CONTINUITY: UNLIMITED.

FENCES: NONE.

LANDSCAPING: NATIVE GRASS.

DRAINAGE MAINTENANCE: MAINTENANCE SHALL BE THE RESPONSIBILITY OF THE ADJACENT PROPERTY OWNER OR HOA

CURB AND GUTTER: NONE.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

RURAL ROAD

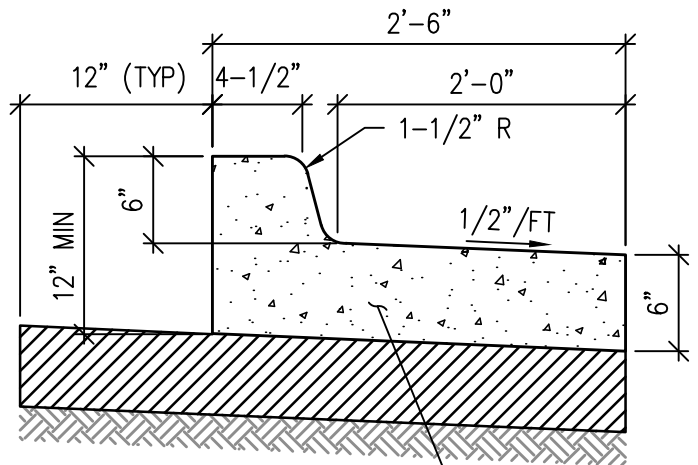
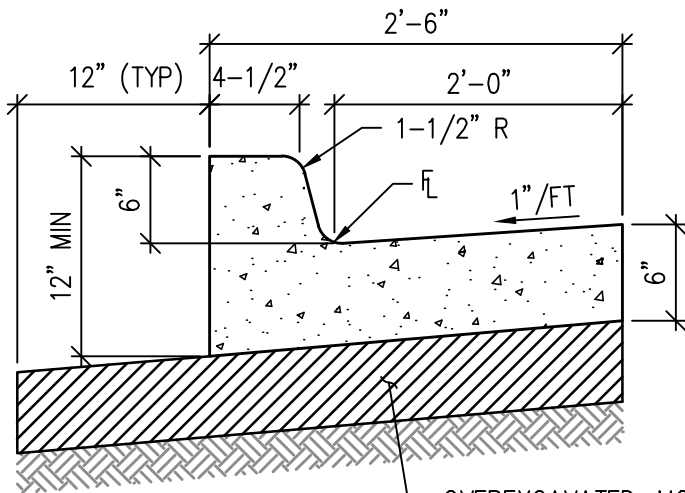
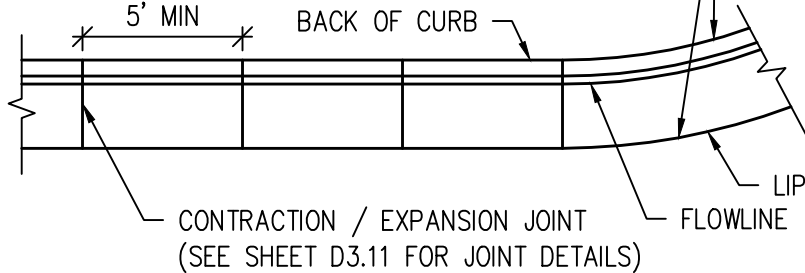
D3.06

DATE: 04/2021

EXPANSION JOINT FOR CONC PAVEMENT JOINTS
 NOT REQUIRED FOR LANDSCAPE OR ASPHALT
 (SEE SHEET D3.11 FOR JOINT DETAILS)

10' MAX
 5' MIN

BACK OF CURB



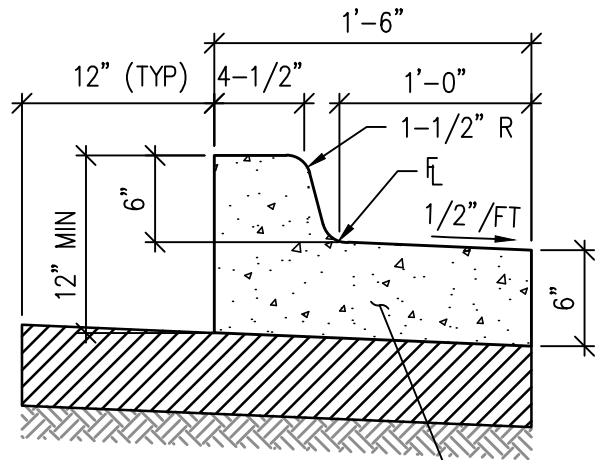
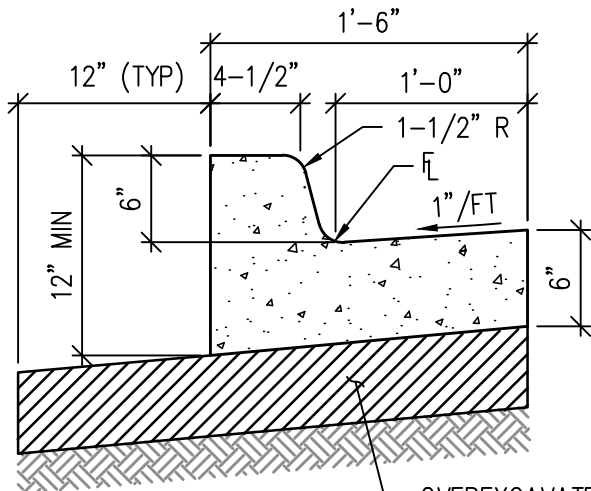
CATCH

OVEREXCAVATED, MOISTURE-TREATED, AND
 RECOMPACTED SUBGRADE PER SPECIFICATIONS, (TYP)

SPILL

CONCRETE
 CURB AND
 GUTTER (TYP)

2.0' CURB AND GUTTER



CATCH

OVEREXCAVATED, MOISTURE-TREATED, AND
 RECOMPACTED SUBGRADE PER SPECIFICATIONS, (TYP)

SPILL

CONCRETE
 CURB AND
 GUTTER (TYP)

1' CURB AND GUTTER (MEDIAN)

SCALE: NTS

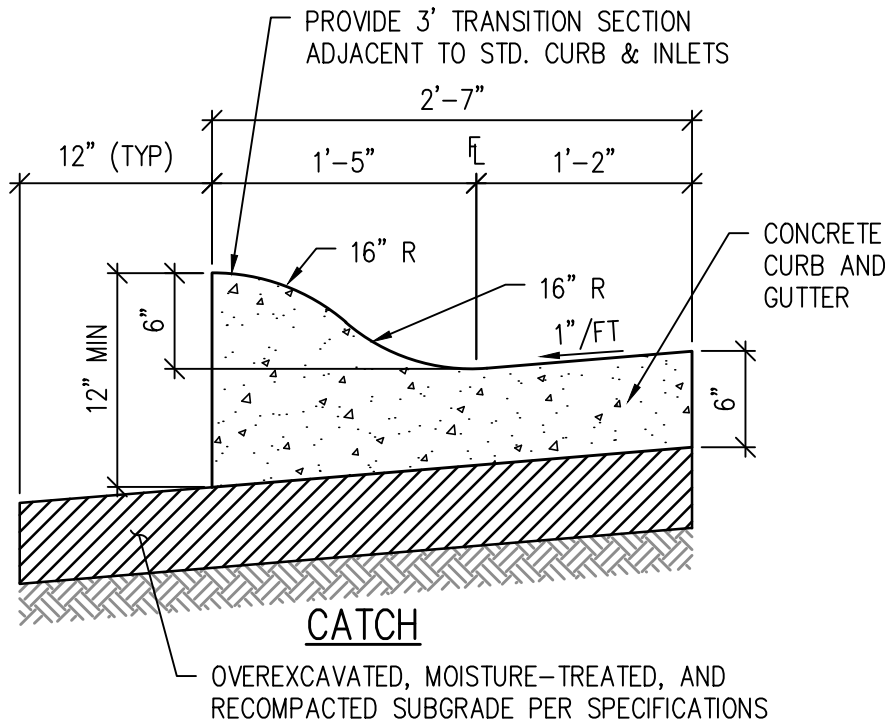
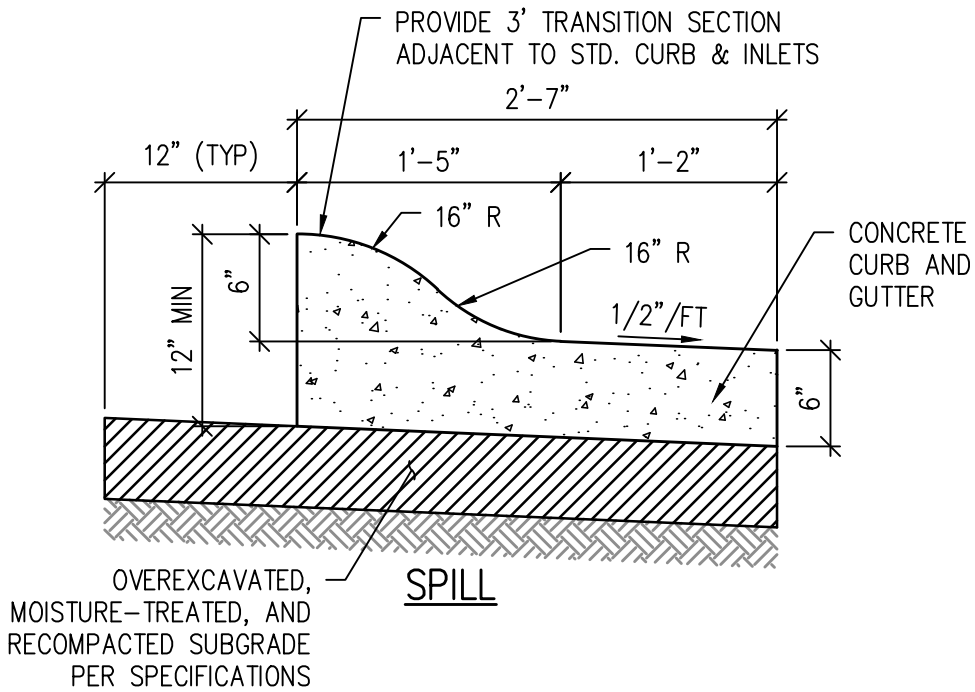


TOWN OF MEAD STANDARD DESIGN CRITERIA

VERTICAL CURB AND GUTTER DETAIL

D3.07

DATE: 04/2021



SCALE: NTS

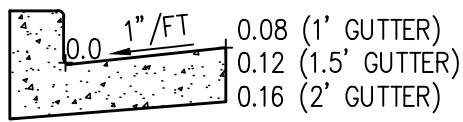
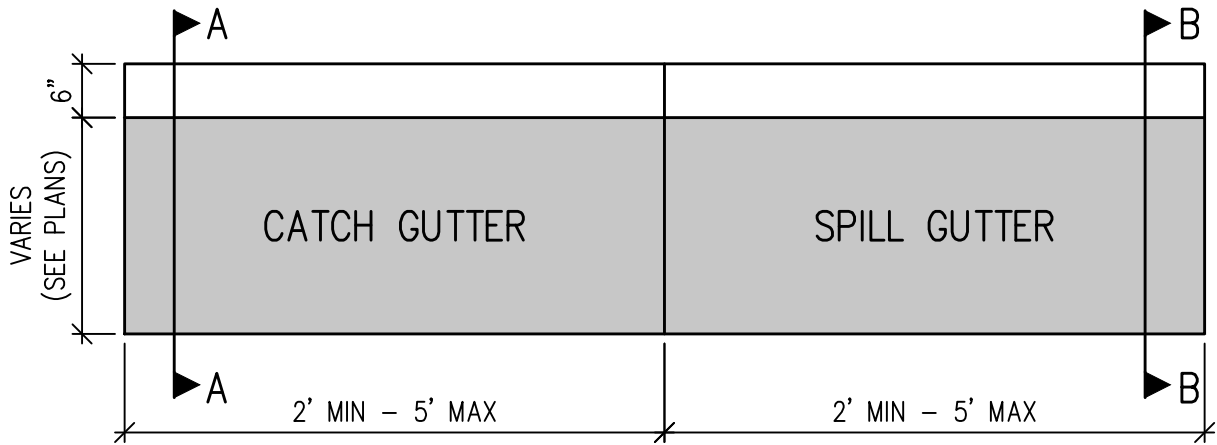
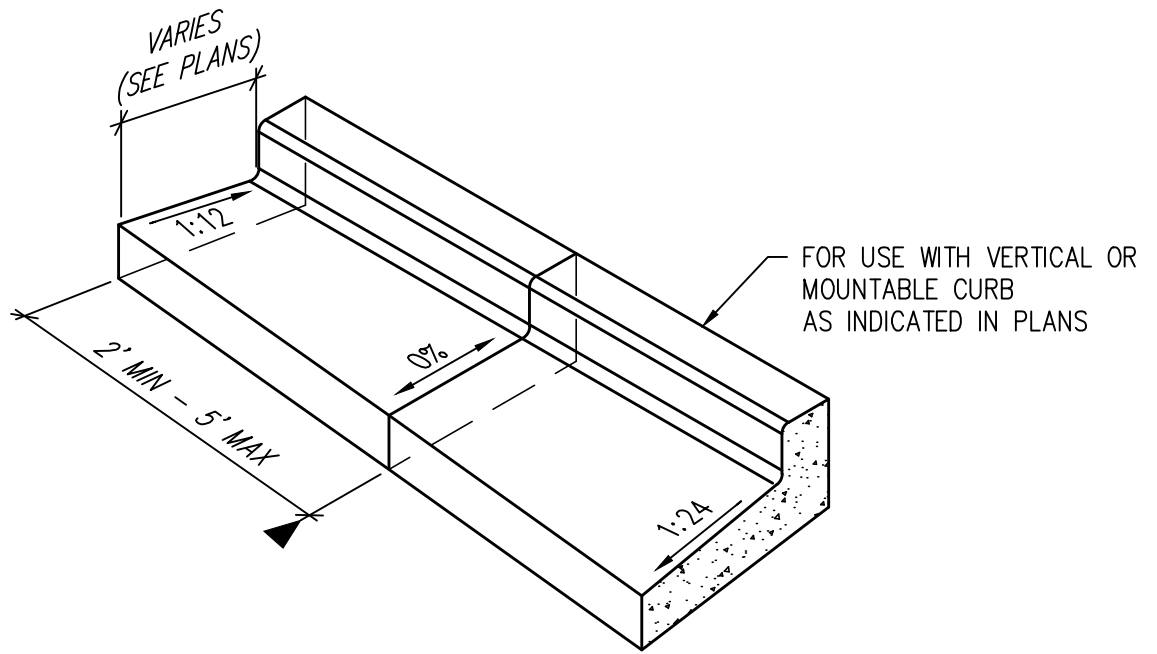


TOWN OF MEAD STANDARD DESIGN CRITERIA

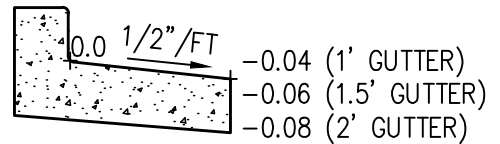
MOUNTABLE CURB AND GUTTER DETAIL

D3.08

DATE: 04/2021



SECTION A-A



SECTION B-B

SCALE: NTS

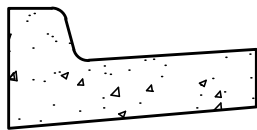
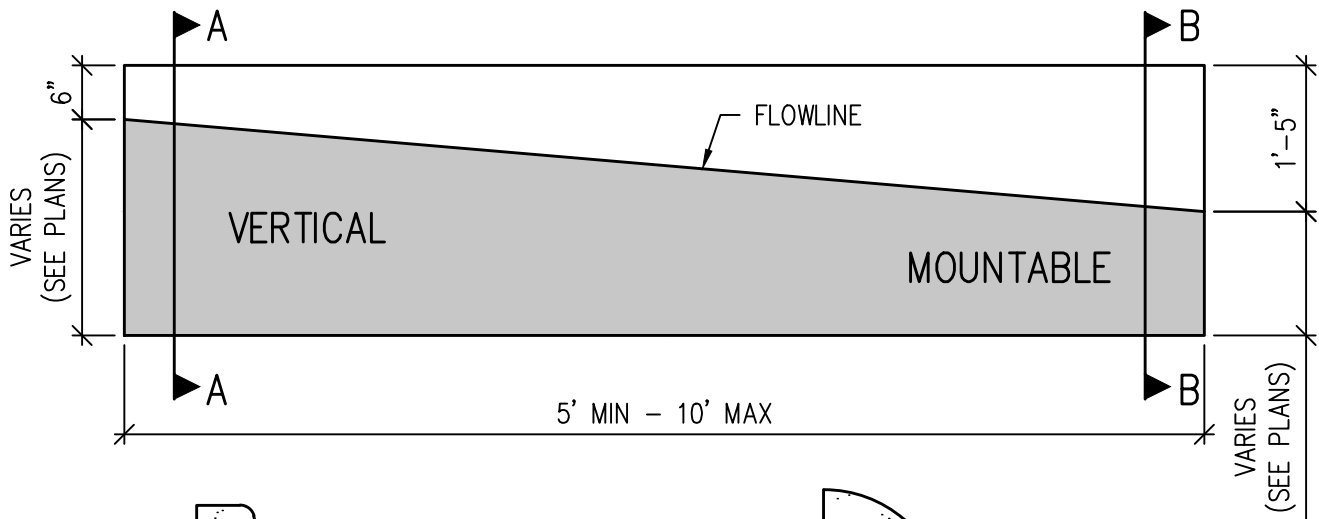
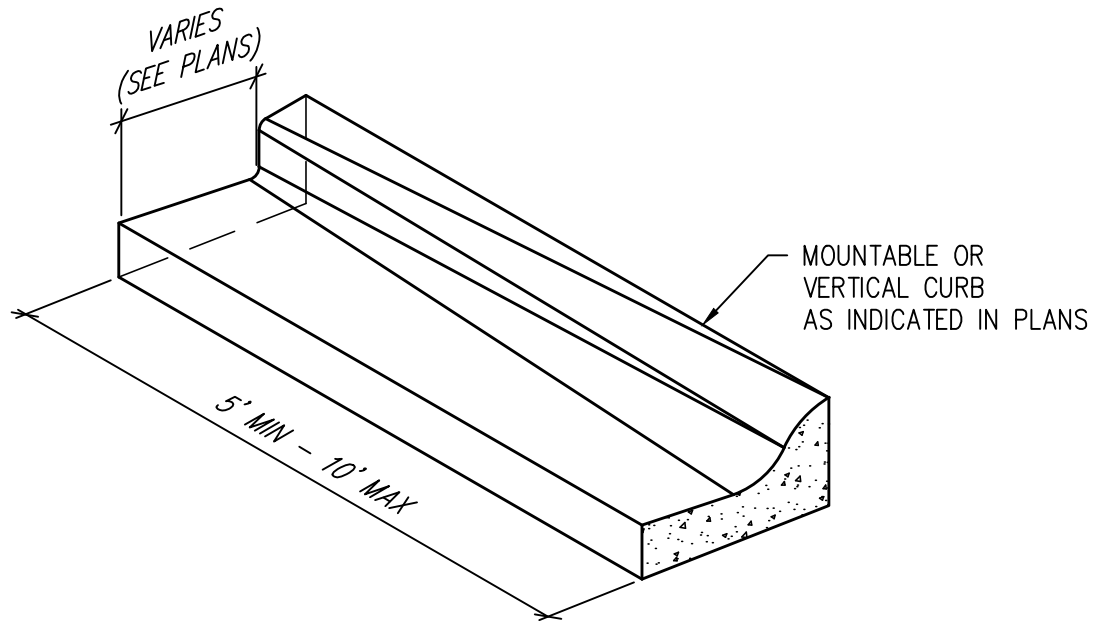


TOWN OF MEAD STANDARD DESIGN CRITERIA

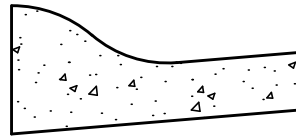
VERTICAL CURB CATCH TO SPILL
TRANSITION DETAIL

D3.09

DATE: 04/2021



VERTICAL CURB
SECTION A-A



MOUNTABLE CURB
SECTION B-B

NOTES:

1. FLOW LINE DIMENSIONS SHALL BE ADJUSTED FOR ALL STREET SECTIONS WHERE MOUNTABLE CURB IS FOUND IN PLACE OF VERTICAL CURB.

SCALE: NTS

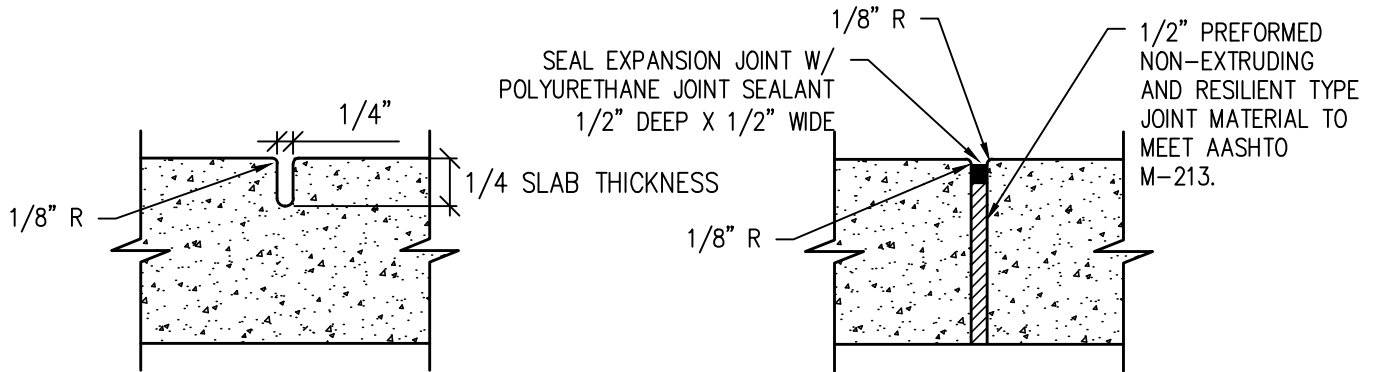
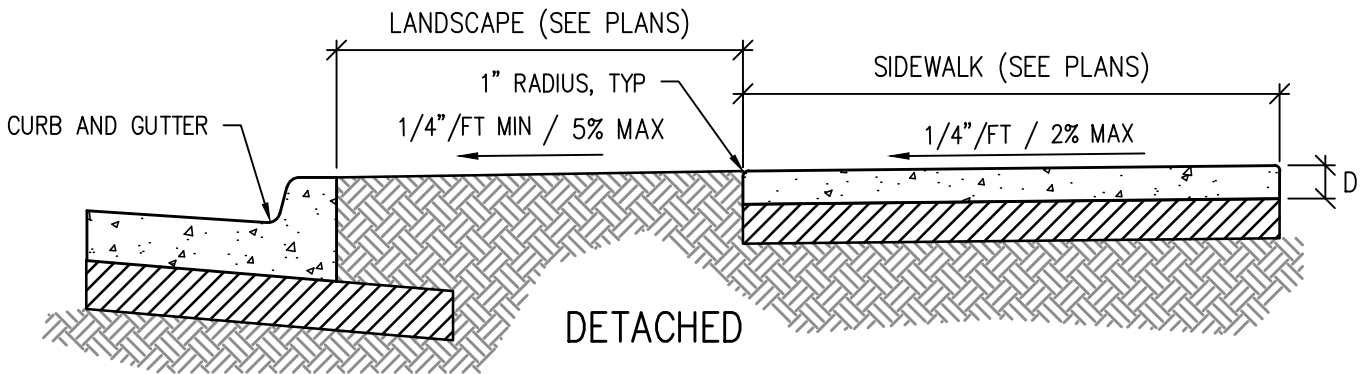
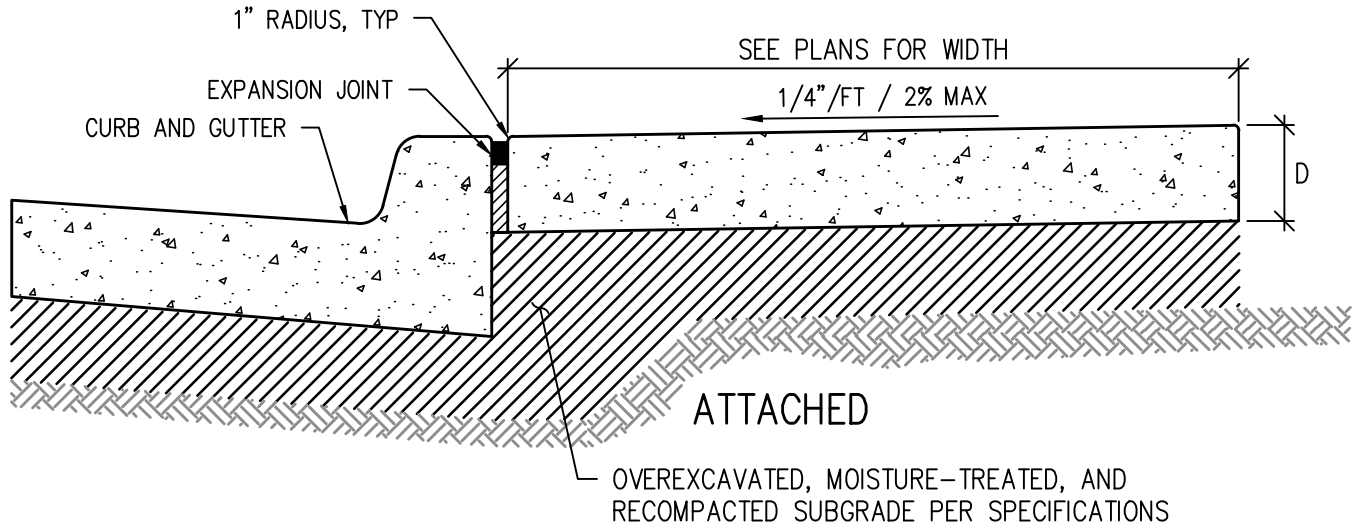


TOWN OF MEAD STANDARD DESIGN CRITERIA

VERTICAL TO MOUNTABLE CURB
TRANSITION DETAIL

D3.10

DATE: 04/2021



WEAKENED PLANE JOINT
NOTES:

EXPANSION JOINT

1. CONSTRUCT SIDEWALK WITH JOINTS AT 10' INTERVALS AND ALIGNED WITH SCORING ON CURB
2. EXPANSION JOINTS SHALL BE INSTALLED WHEN ABUTTING EXISTING CONCRETE OR FIXED STRUCTURE AND BE EVERY 200' ON CENTER, MAX.
3. EXPANSION JOINT MATERIAL SHALL BE 1/2" THICK AND SHALL EXTEND THE FULL DEPTH OF CONTACT SURFACE.
4. CONCRETE DEPTH "D"
-6" MIN.
-8" MIN. AT COMMERCIAL DRIVE CROSSINGS

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

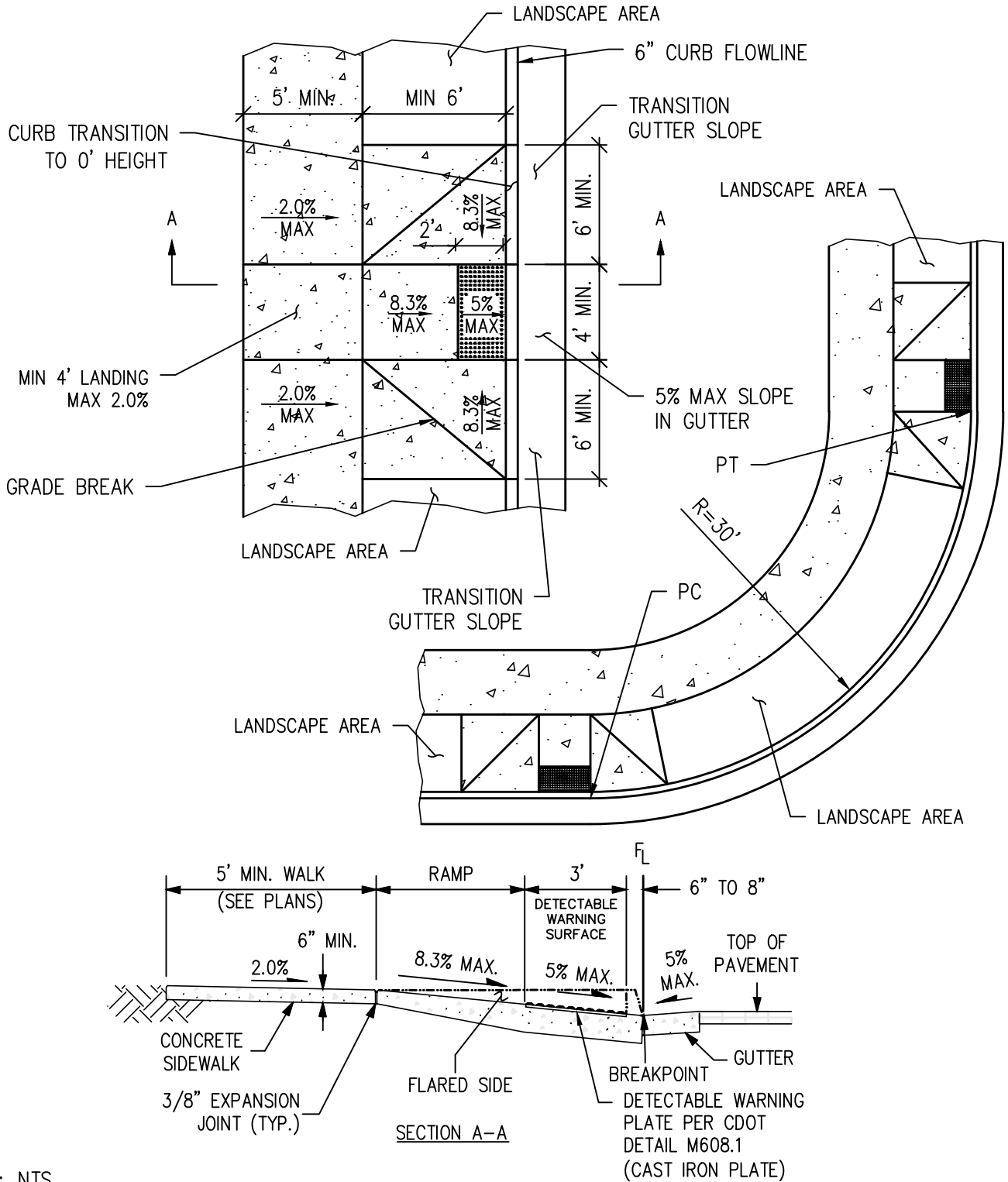
SIDEWALK AND JOINT DETAIL

D3.11

DATE: 04/2021

NOTE:

1. DIRECTIONAL RAMPS TO BE USED FOR INTERSECTIONS WITH A CLASS ABOVE LOCAL-LOCAL.
2. REFER TO CDOT DETAIL M-608-1 FOR NON-MODIFIED VERSION OF CURB RAMP.



SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

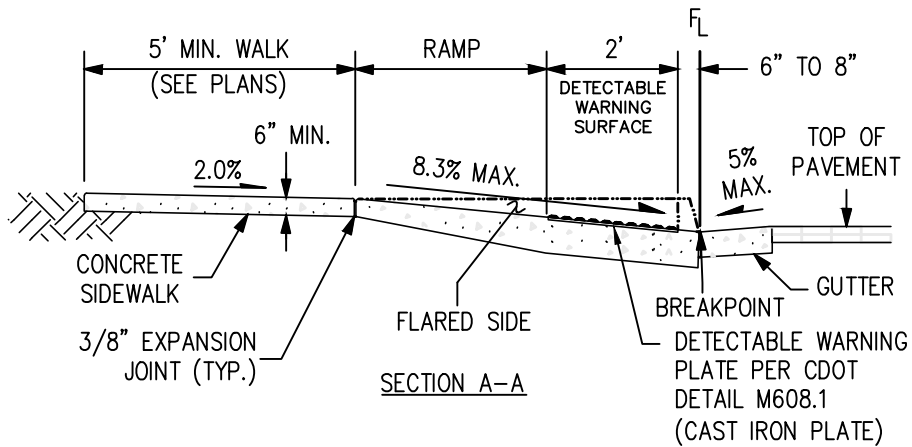
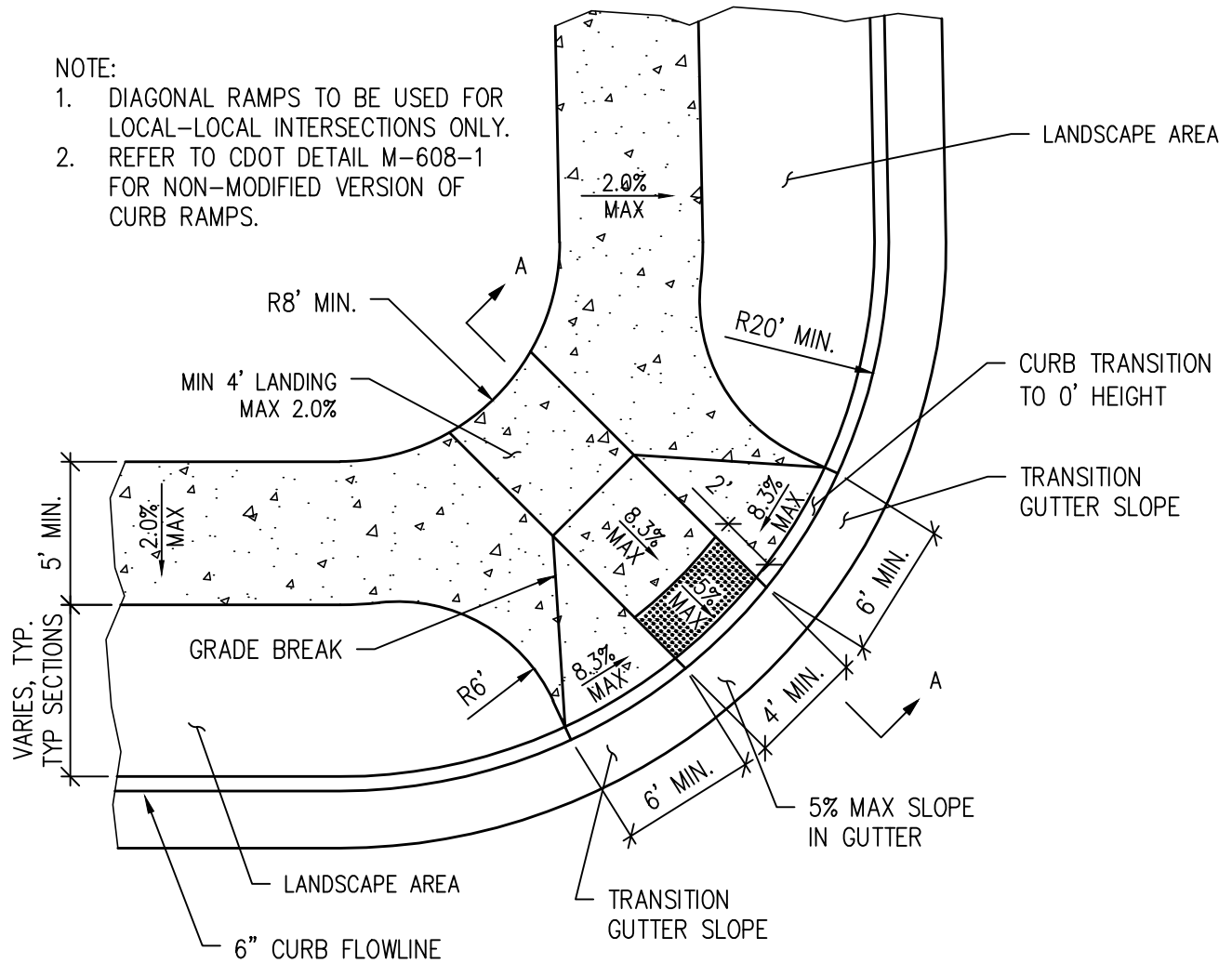
DIRECTIONAL CURB RAMP DETAIL

D3.12

DATE: 04/2021

NOTE:

1. DIAGONAL RAMPS TO BE USED FOR LOCAL-LOCAL INTERSECTIONS ONLY.
2. REFER TO CDOT DETAIL M-608-1 FOR NON-MODIFIED VERSION OF CURB RAMPS.



SCALE: NTS



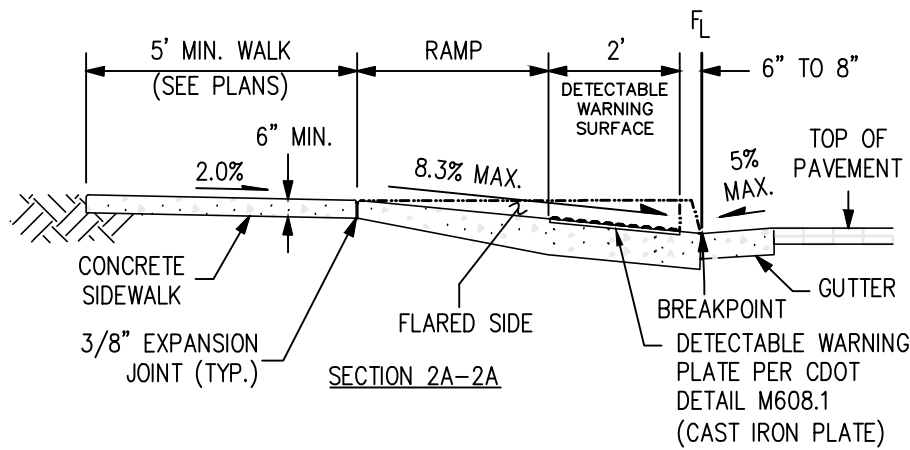
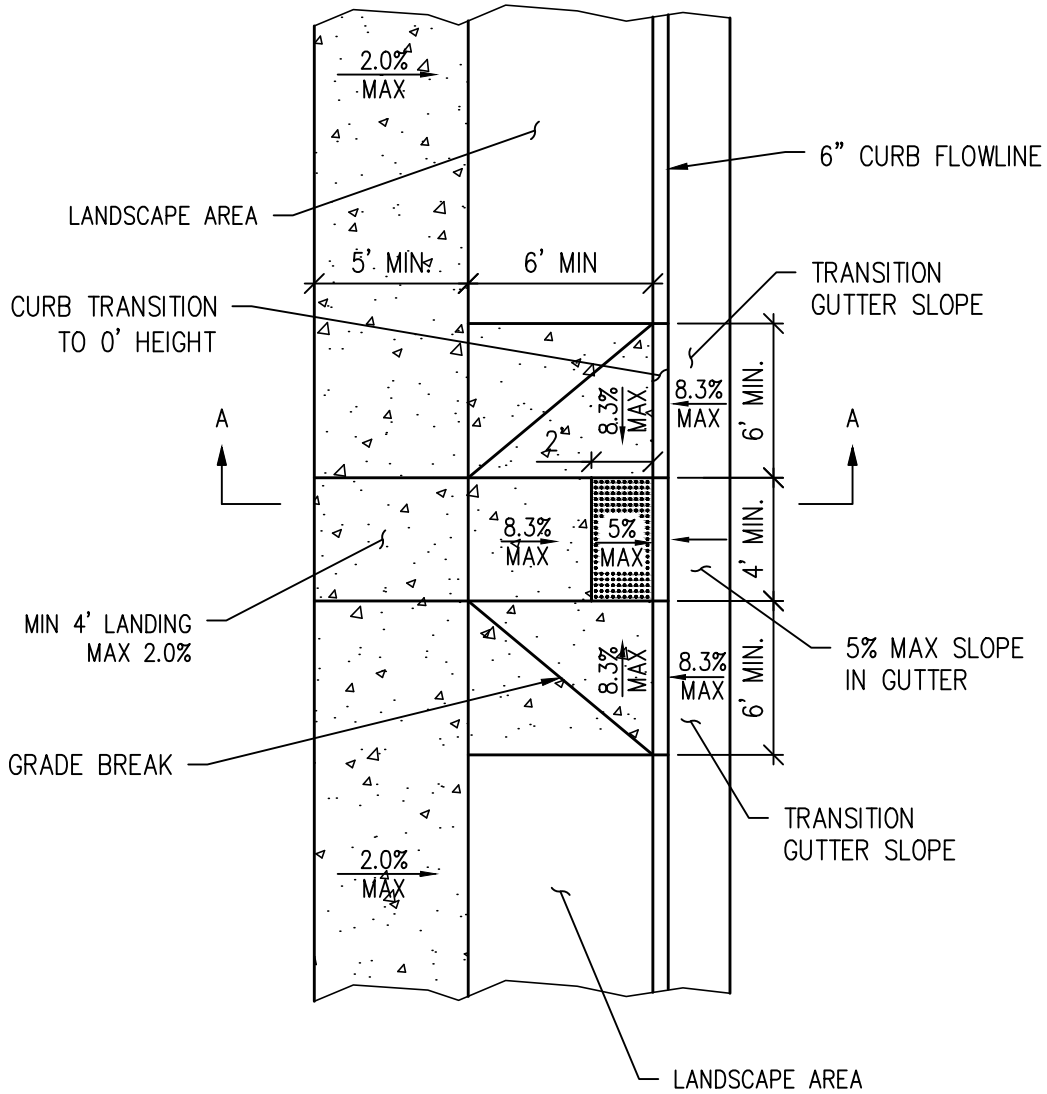
TOWN OF MEAD STANDARD DESIGN CRITERIA

DIAGONAL CURB RAMP DETAIL

D3.13

DATE: 04/2021

NOTE:
 REFER TO CDOT DETAIL M-608-1 FOR
 NON-MODIFIED VERSION OF CURB RAMP.



SCALE: NTS



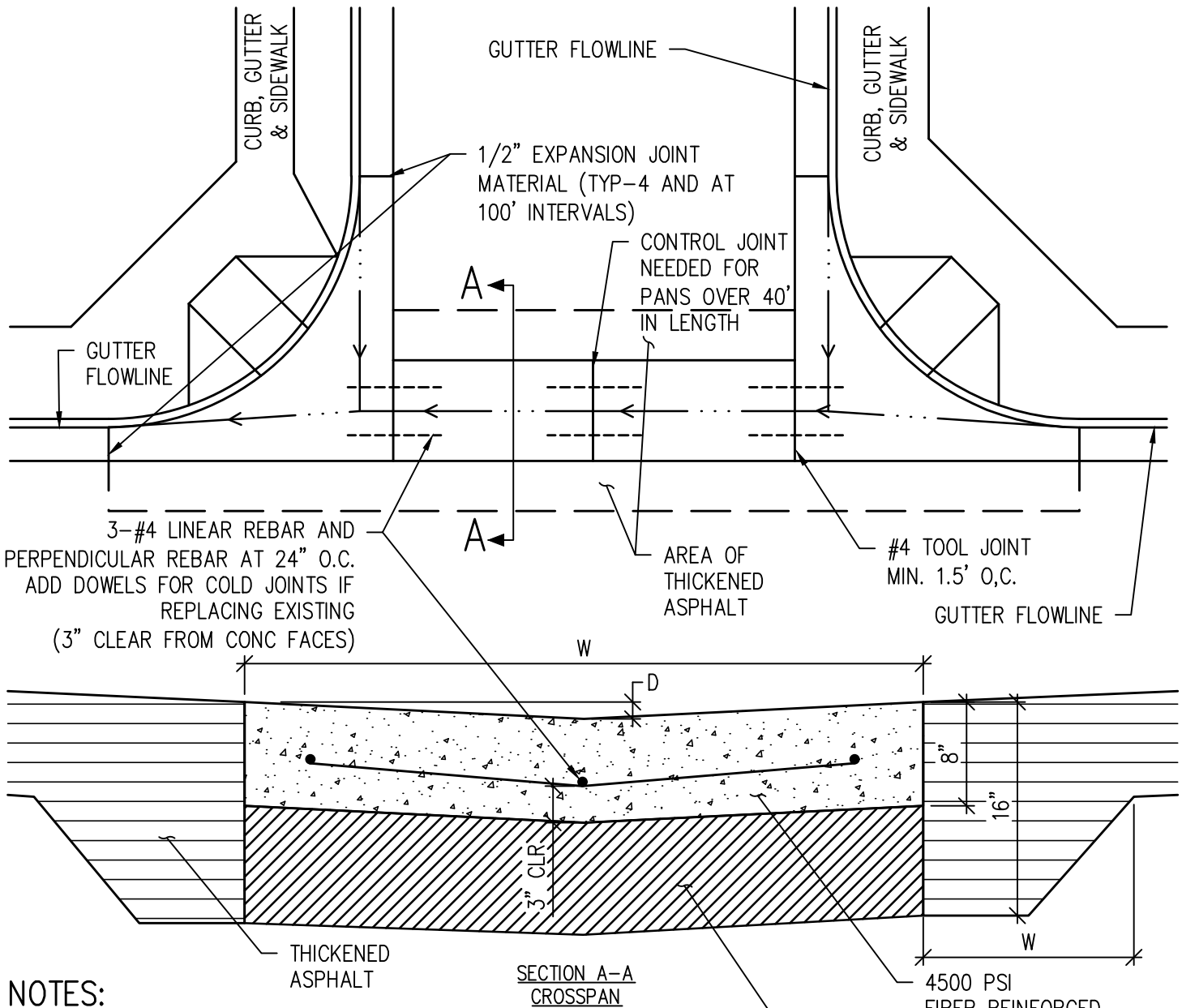
TOWN OF MEAD STANDARD DESIGN CRITERIA

MID-BLOCK CURB RAMP

D3.14

DATE: 04/2021

PARALLEL STREET CLASSIFICATION	CROSS PAN WIDTH (W)	DEPTH OF INVERT	
		D (MIN.)	D (MAX.)
ARTERIAL	10'	1-1/4"	2-1/2"
COLLECTOR	8'	1"	2"
LOCAL	6'	3/4"	1-1/2"



NOTES:

1. CROSSINGS AT RAMPS MUST BE ADA COMPLIANT.
2. SEE PLANS FOR ROAD AND CURB RETURN DIMENSIONS AND ELEVATIONS.
3. APRON SHALL BE POURED MONOLITHICALLY WITH CURB AND GUTTER AND SHALL BE A MINIMUM OF 8" THICK.

SCALE: NTS

OVEREXCAVATED,
MOISTURE-TREATED AND
RECOMPACTED SUBGRADE
PER SPECIFICATIONS

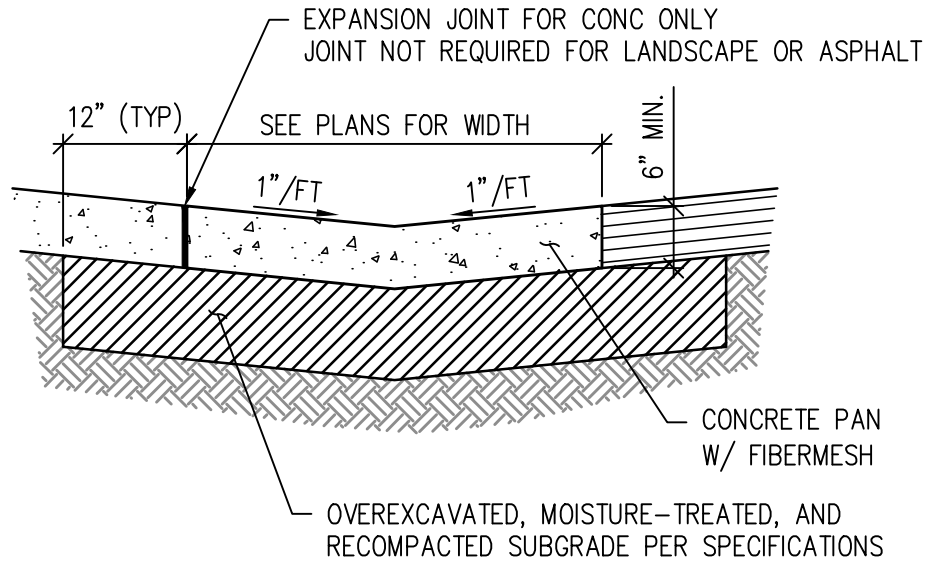


TOWN OF MEAD STANDARD DESIGN CRITERIA

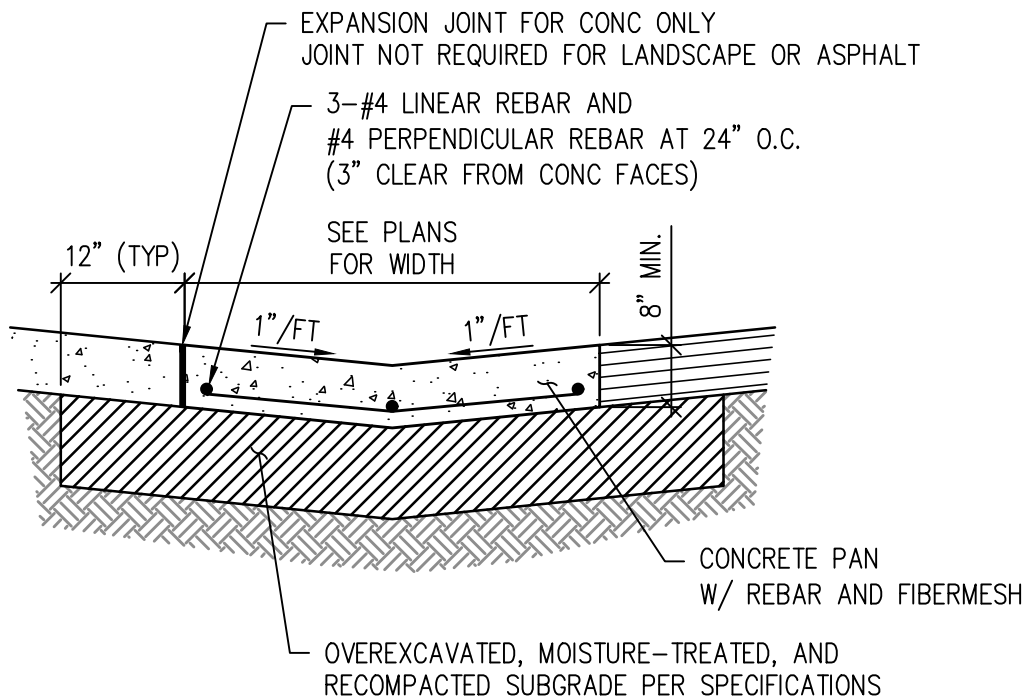
CONCRETE PAN LAYOUT DETAIL

D3.15

DATE: 04/2021



PAN IN LANDSCAPE AREAS



PAN IN TRAFFIC AREAS

NOTES:

1. USE REBAR REINFORCED PAN WHERE VEHICLE TRAFFIC IS EXPECTED.
2. SEE PLANS FOR INVERT ELEVATIONS AND HORIZONTAL CONTROLS.
3. SEE SHEET D3.11 FOR CONTRACTION AND EXPANSION JOINT DETAILS.
4. PROVIDE JOINT LAYOUT PLAN TO OWNER FOR APPROVAL PRIOR TO CONSTRUCTION. JOINTS TO MATCH ADJOINING SIDEWALK.

SCALE: NTS

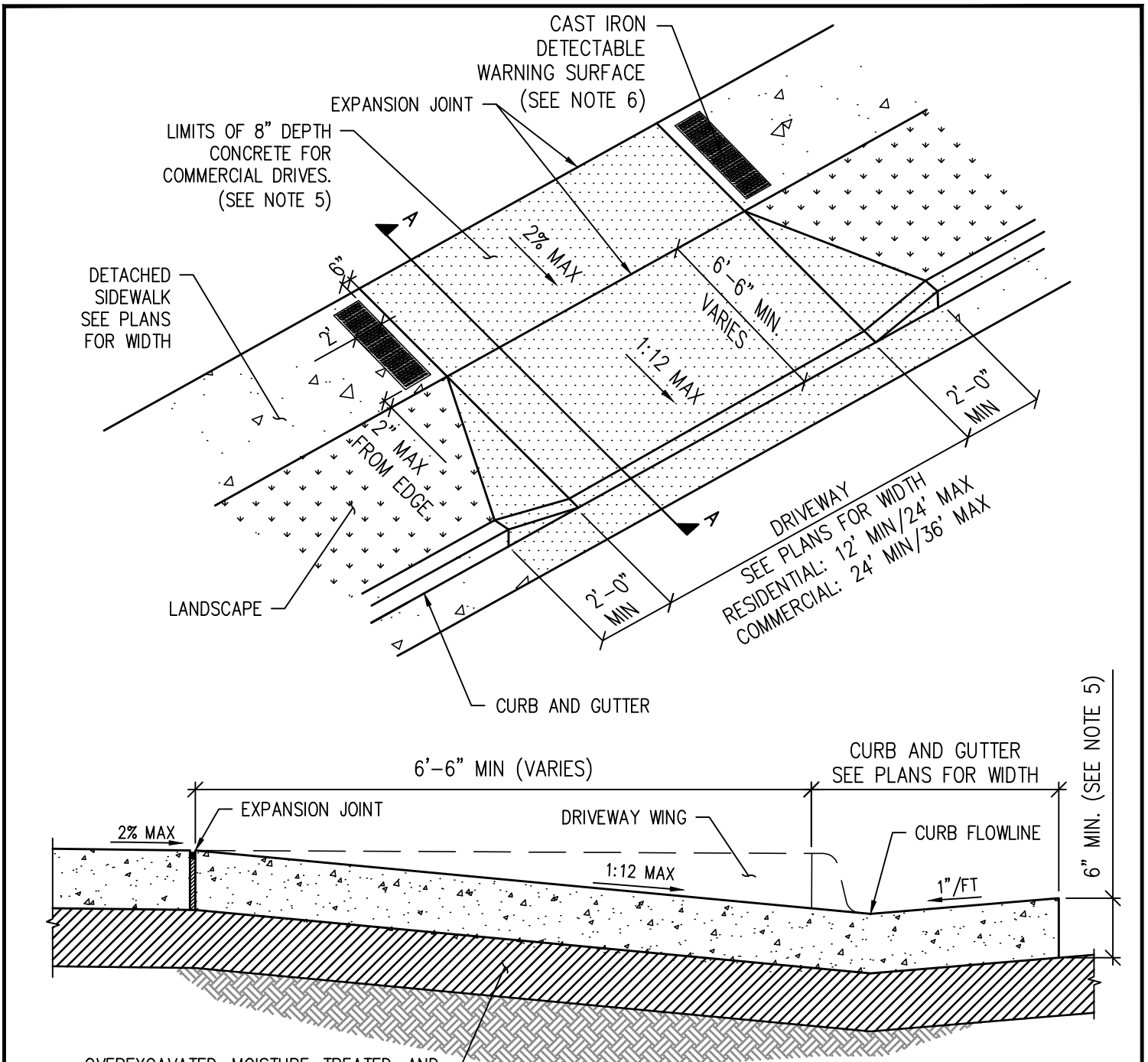


TOWN OF MEAD STANDARD DESIGN CRITERIA

CONCRETE PAN DETAIL

D3.16

DATE: 04/2021



OVEREXCAVATED, MOISTURE-TREATED, AND RECOMPACTED SUBGRADE PER SPECIFICATIONS

SECTION A-A

NOTES:

1. COARSE BROOM FINISH SURFACE OF DRIVEWAY CONCRETE AND WINGS
2. MAINTAIN NORMAL GUTTER FLOW AND PROFILE THROUGH RAMP AREA
3. PROVIDE 1/2" EXPANSION JOINT WHERE CONCRETE RAMP JOINS ANY RIGID PAVEMENT OR STRUCTURE
4. RAMP, CURB AND GUTTER CONSTRUCTION MAY BE POURED MONOLITHICALLY
5. COMMERCIAL DRIVEWAYS AND ADJACENT SIDEWALK SHALL BE A MINIMUM OF 8" THICK.
6. DETECTABLE WARNING SURFACE ONLY REQUIRED FOR HIGH VOLUME OR COMMERCIAL DRIVEWAYS.

SCALE: NTS

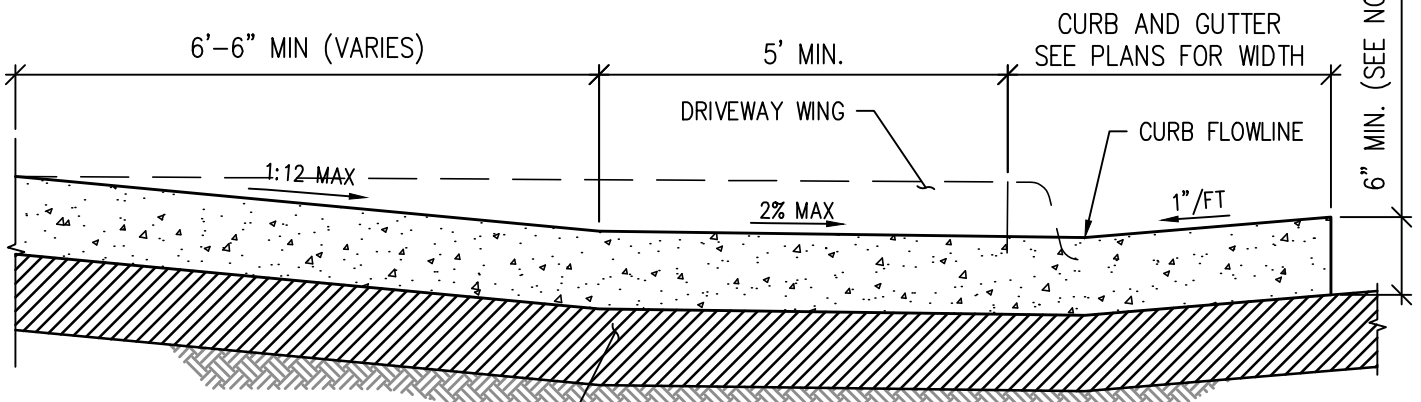
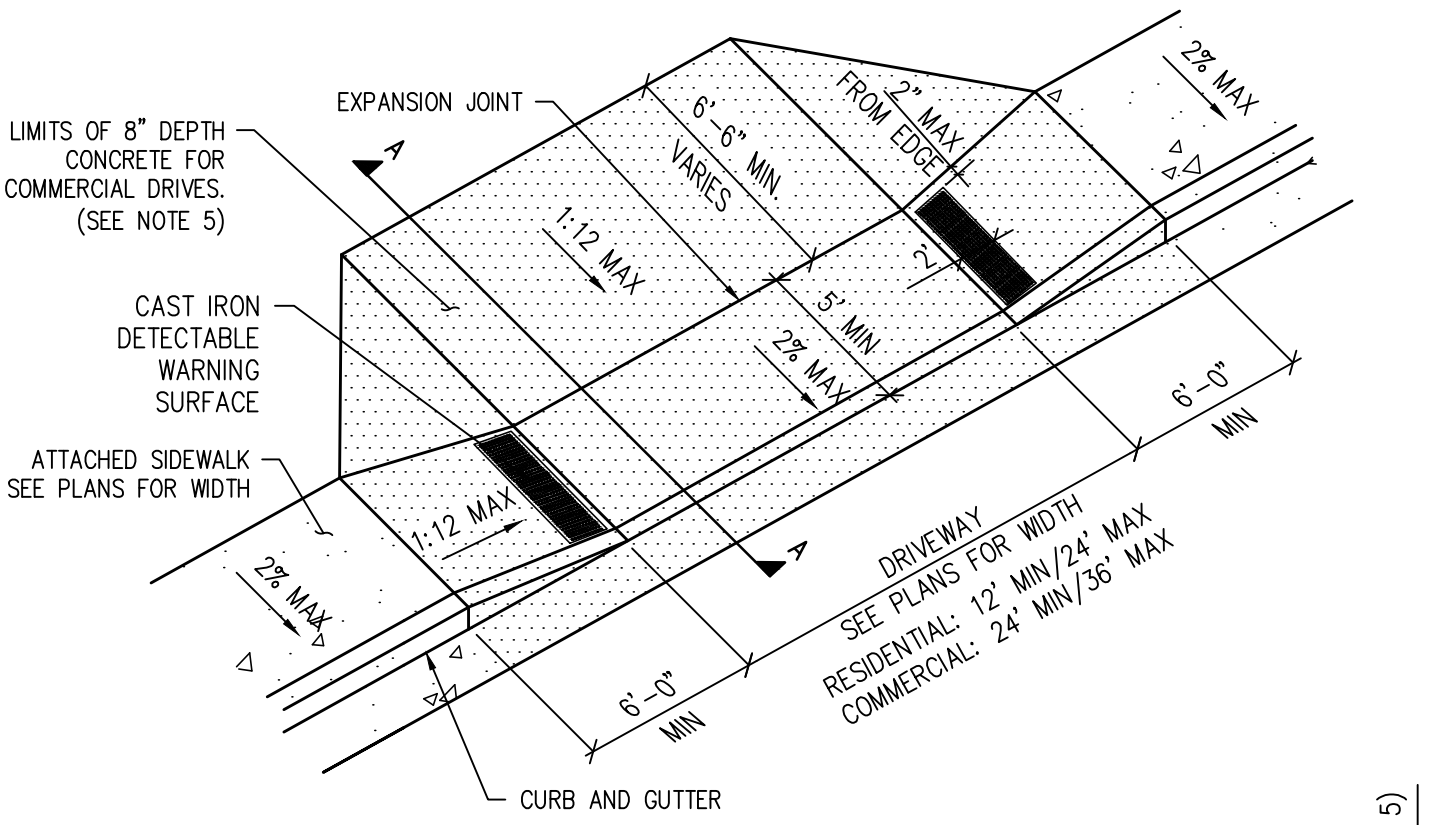


TOWN OF MEAD STANDARD DESIGN CRITERIA

CONCRETE DRIVEWAY WITH
DETACHED SIDEWALK DETAIL

D3.17

DATE: 04/2021



OVEREXCAVATED, MOISTURE-TREATED, AND RECOMPACTED SUBGRADE PER SPECIFICATIONS

SECTION A-A

NOTES:

1. COARSE BROOM FINISH SURFACE OF DRIVEWAY CONCRETE AND WINGS
2. MAINTAIN NORMAL GUTTER FLOW AND PROFILE THROUGH RAMP AREA
3. PROVIDE 1/2" EXPANSION JOINT WHERE CONCRETE RAMP JOINS ANY RIGID PAVEMENT OR STRUCTURE
4. RAMP, CURB AND GUTTER CONSTRUCTION MAY BE POURED MONOLITHICALLY
5. COMMERCIAL DRIVEWAYS AND ADJACENT SIDEWALK SHALL BE A MINIMUM OF 8" THICK.
6. DETECTABLE WARNING SURFACE ONLY REQUIRED FOR HIGH VOLUME OR COMMERCIAL DRIVEWAYS

SCALE: NTS

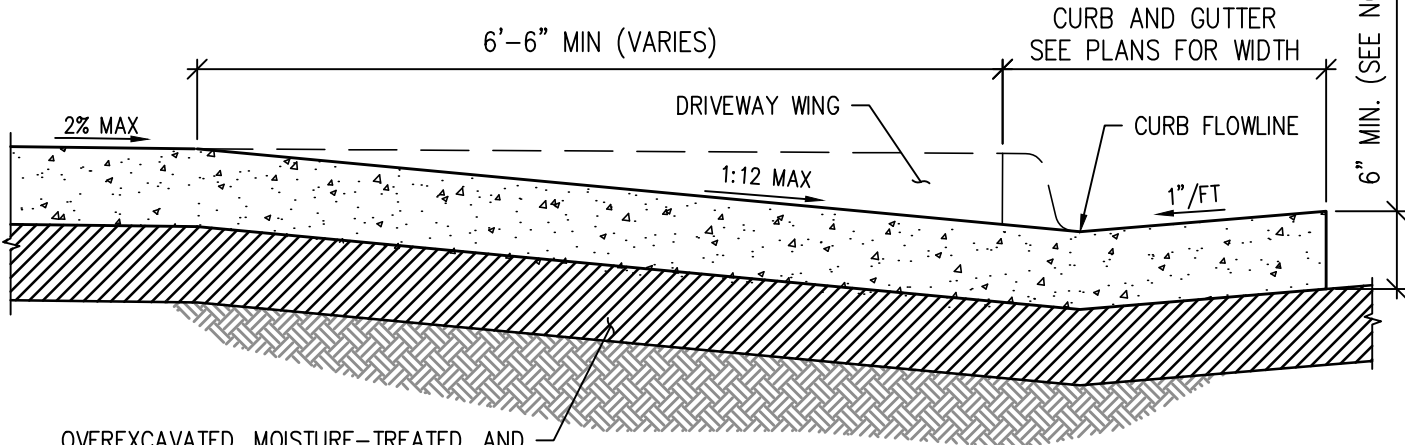
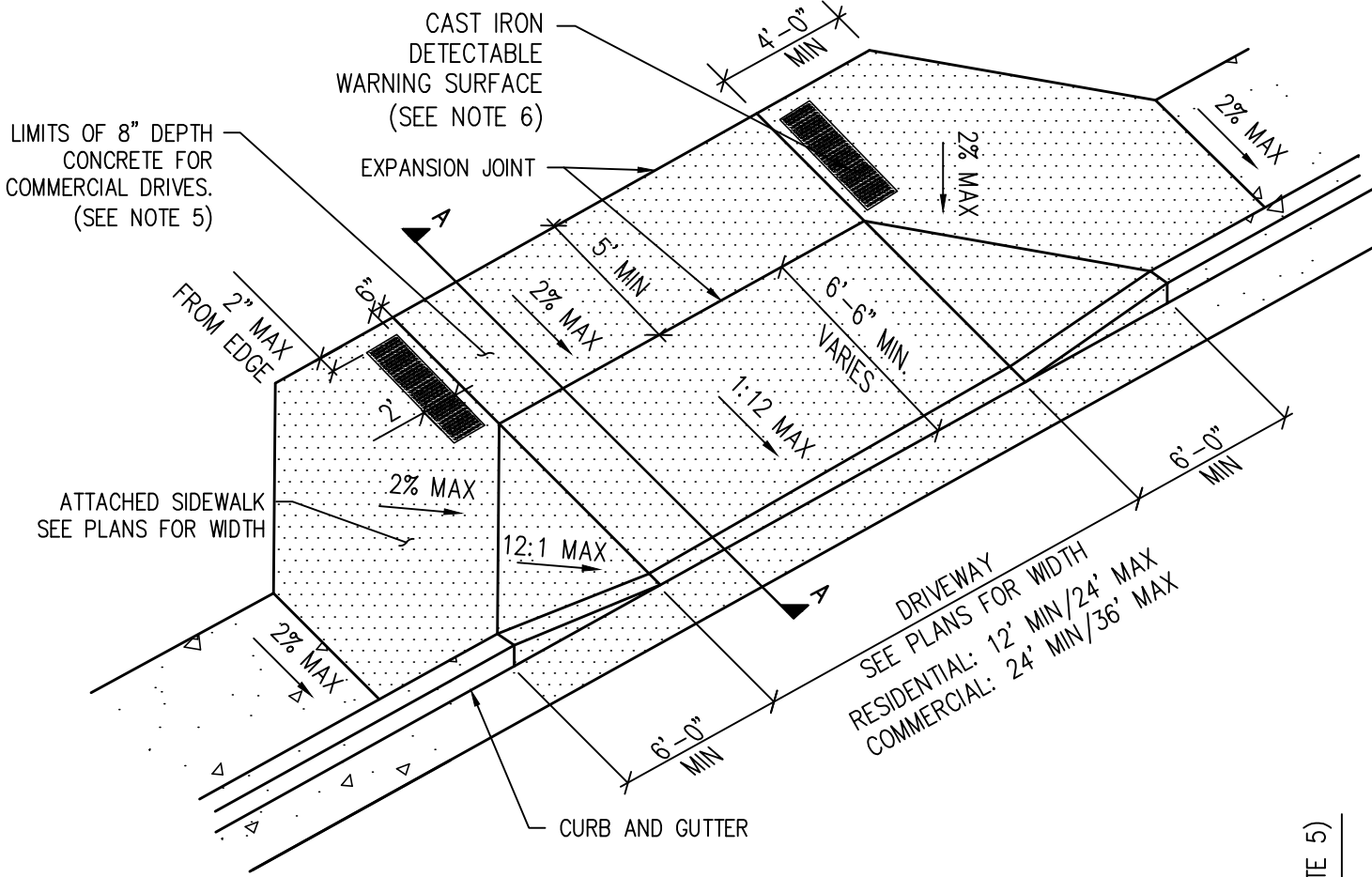


TOWN OF MEAD STANDARD DESIGN CRITERIA

CONCRETE DRIVEWAY WITH ATTACHED WALK DETAIL

D3.18A

DATE: 04/2021



OVEREXCAVATED, MOISTURE-TREATED, AND RECOMPACTED SUBGRADE PER SPECIFICATIONS

SECTION A-A

NOTES:

1. COARSE BROOM FINISH SURFACE OF DRIVEWAY CONCRETE AND WINGS
2. MAINTAIN NORMAL GUTTER FLOW AND PROFILE THROUGH RAMP AREA
3. PROVIDE 1/2" EXPANSION JOINT WHERE CONCRETE RAMP JOINS ANY RIGID PAVEMENT OR STRUCTURE
4. RAMP, CURB AND GUTTER CONSTRUCTION MAY BE POURED MONOLITHICALLY
5. COMMERCIAL DRIVEWAYS AND ADJACENT SIDEWALK SHALL BE A MINIMUM OF 8" THICK.
6. DETECTABLE WARNING SURFACE ONLY REQUIRED FOR HIGH VOLUME OR COMMERCIAL DRIVEWAYS

SCALE: NTS

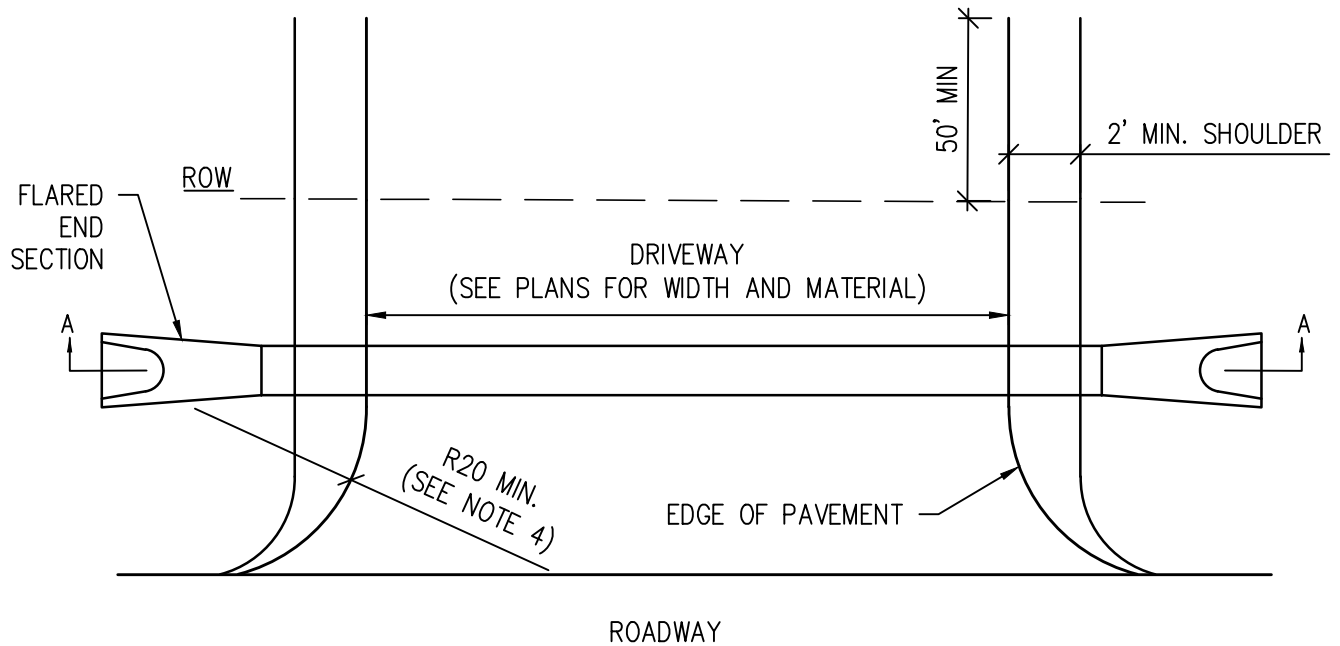


TOWN OF MEAD STANDARD DESIGN CRITERIA

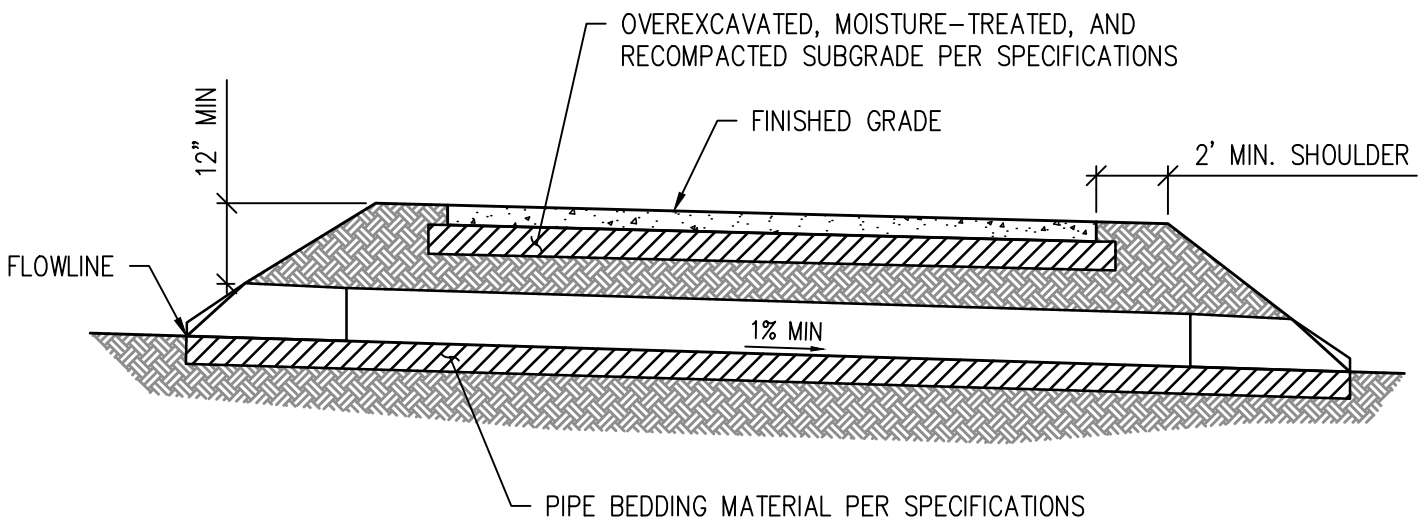
CONCRETE DRIVEWAY WITH ATTACHED WALK DETAIL

D3.18B

DATE: 04/2021



PLAN VIEW



SECTION A-A

NOTES:

1. DRIVEWAY SHALL BE ASPHALT OR CONCRETE AND SHALL EXTEND A MIN OF 50' BEHIND ROW
2. A FLARED END SECTION IS REQUIRED AT EACH END OF PIPE. PIPE SHALL BE A MINIMUM OF 18" IN DIAMETER.
3. DITCH SIDE SLOPES SHALL BE A MAX OF 4:1
4. DRIVEWAY RADIUS SHALL BE 50' MIN WHERE LARGE TRUCK TRAFFIC IS ANTICIPATED.

DRIVE WIDTH	MIN	MAX	CULVERT MATERIAL
RESIDENTIAL	20'	24'	RCP OR CMP
COMMERCIAL	24'	36'	RCP ONLY

SCALE: NTS

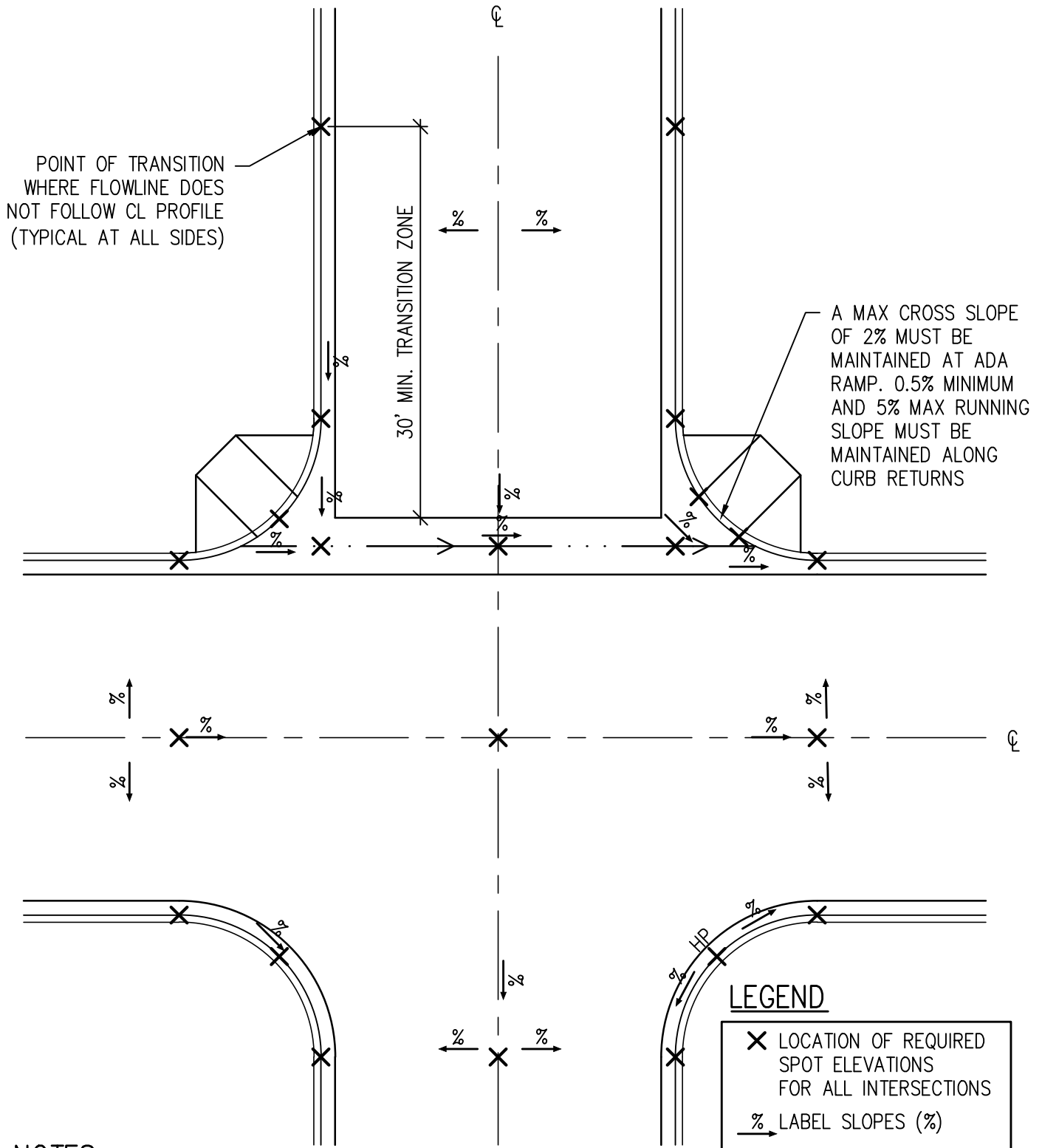


TOWN OF MEAD STANDARD DESIGN CRITERIA

DRIVEWAY DETAIL (RURAL ROAD ONLY)

D3.19

DATE: 04/2021



NOTES:

1. ALL NEW STREETS SHALL BE DESIGNED WITH A 2-3% SLOPE FROM THE CROWN TO THE LIP OF GUTTER.
2. VARIANCES FROM THE TYPICAL CROSS SLOPE (2%) WILL BE REVIEWED ON A CASE BY CASE BASIS.
3. ALL PUBLIC IMPROVEMENT PLANS SHALL DEPICT THE REQUIRED MINIMUM INFORMATION AS SHOWN ABOVE.

SCALE: NTS

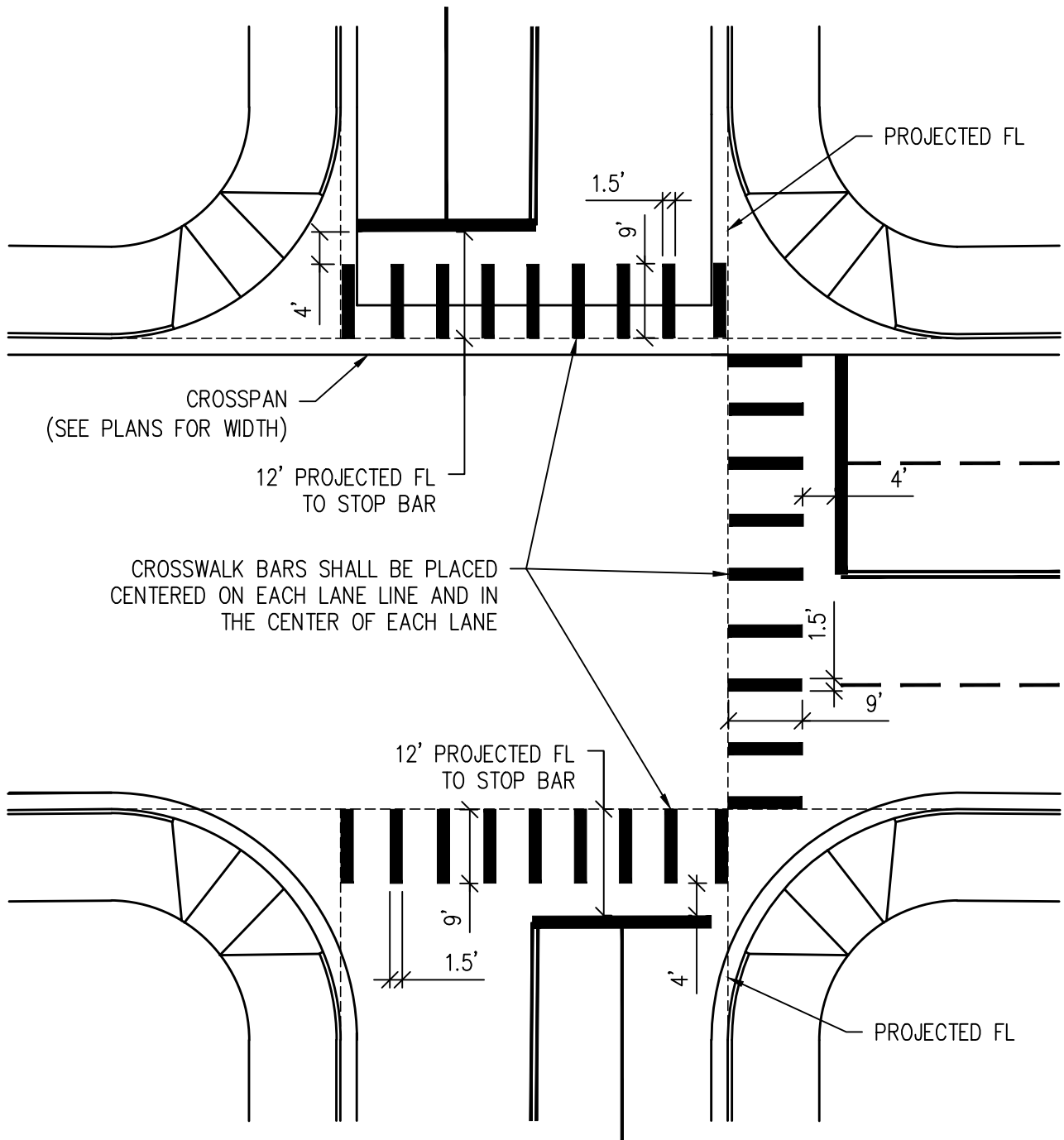


TOWN OF MEAD STANDARD DESIGN CRITERIA

STREET INTERSECTION DETAIL

D3.20

DATE: 04/2021



SCALE: NTS

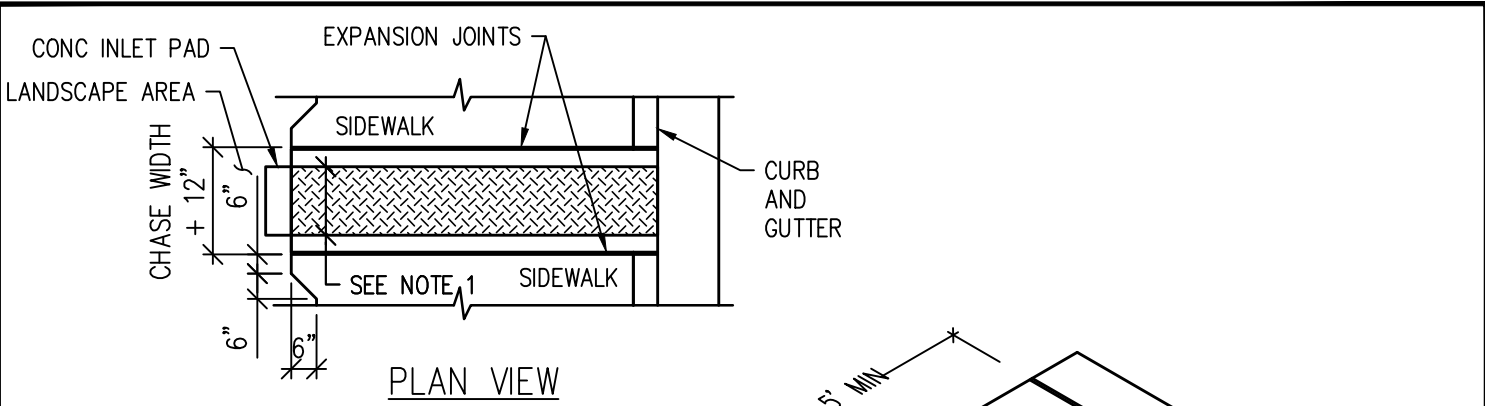


TOWN OF MEAD STANDARD DESIGN CRITERIA

STREET INTERSECTION STRIPING DETAIL

D3.21

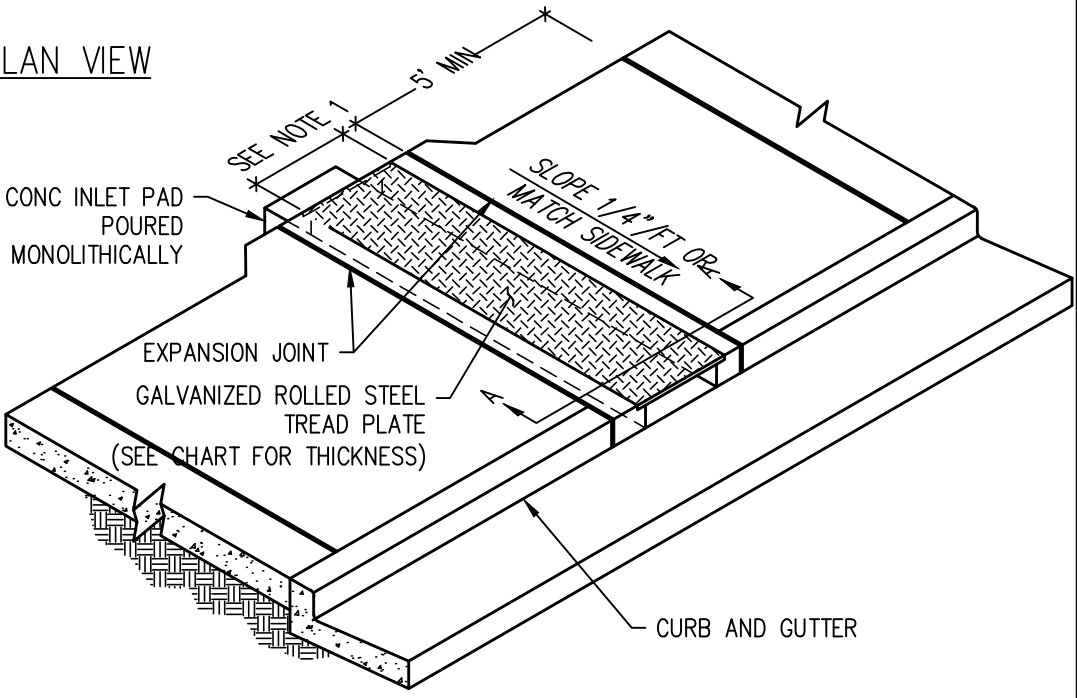
DATE: 04/2021



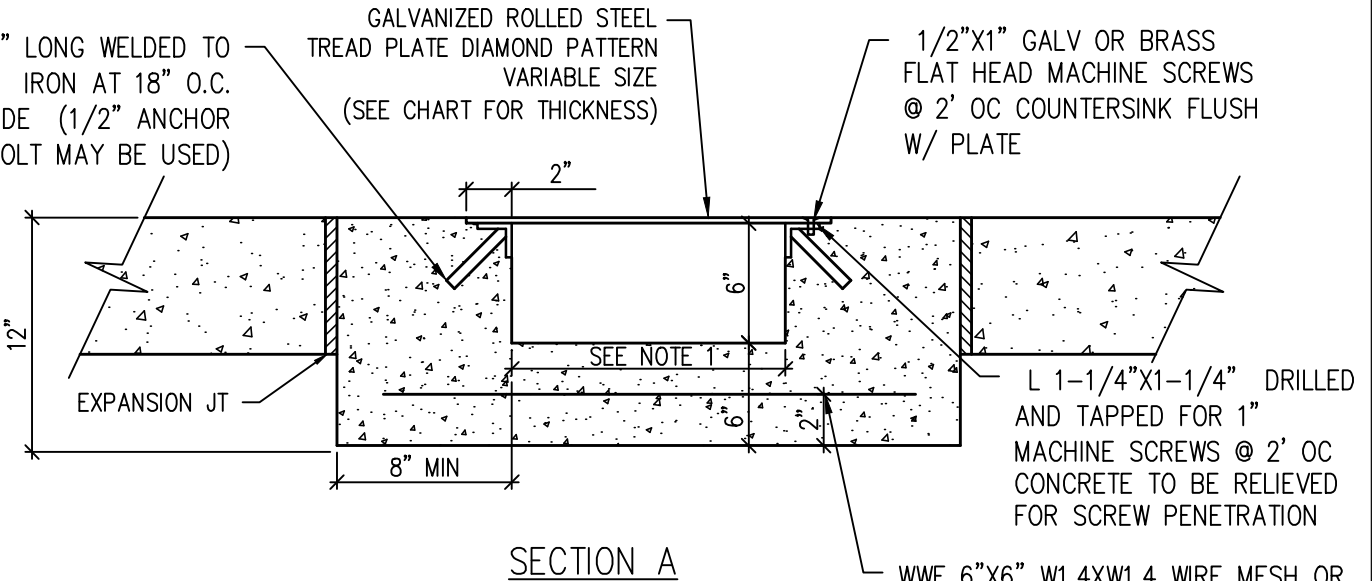
WIDTH OF OPENING	TREAD PLATE THICKNESS
12"–18"	1/2"

NOTES:

1. WIDTH AS NOTED ON PLANS, MIN 12", MAX 18". ADD MIDDLE SUPPORT WITH (2) PLATES IF SPAN IS GREATER THAN 18"
2. 90° UNLESS OTHERWISE SPECIFIED
3. DIMENSIONS TO BE INCLUDED IN DETAILED CONSTRUCTION PLANS



#4 6" LONG WELDED TO ANGLE IRON AT 18" O.C. EACH SIDE (1/2" ANCHOR BOLT MAY BE USED)



SECTION A

SCALE: NTS

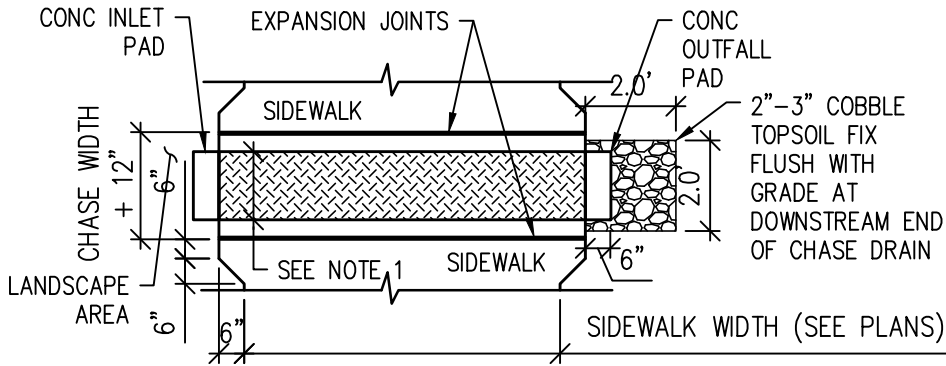


TOWN OF MEAD STANDARD DESIGN CRITERIA

CONCRETE CHASE AT CURB DETAIL

D3.22A

DATE: 04/2021

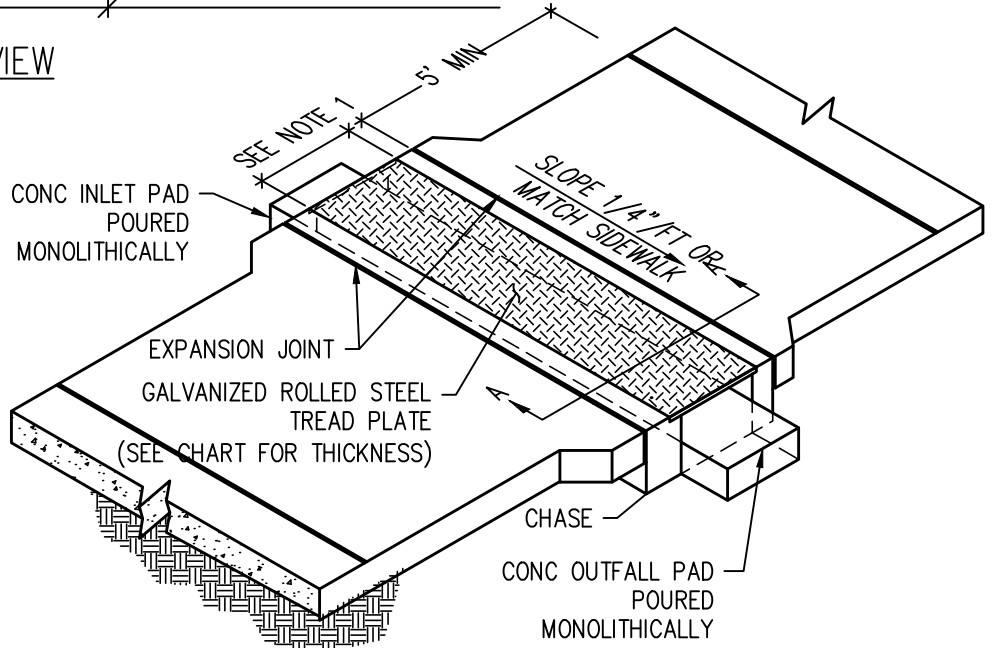


PLAN VIEW

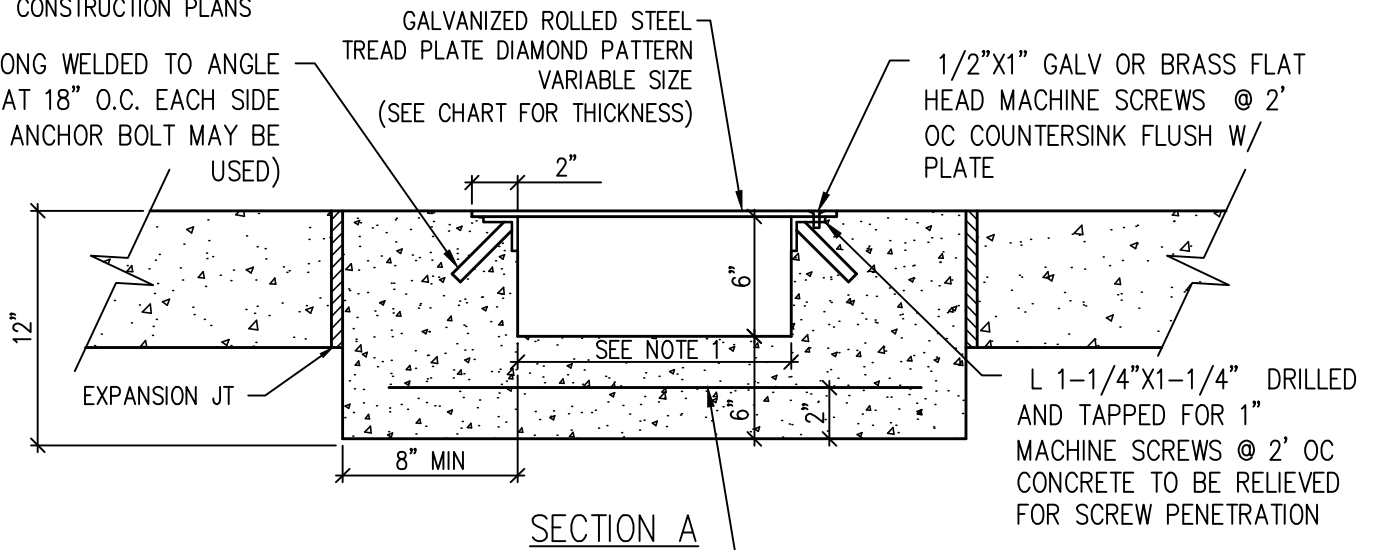
WIDTH OF OPENING	TREAD PLATE THICKNESS
12"-18"	1/2"

NOTES:

1. WIDTH AS NOTED ON PLANS, MIN 12", MAX 18". ADD MIDDLE SUPPORT WITH (2) PLATES IF SPAN IS GREATER THAN 18"
2. 90° UNLESS OTHERWISE SPECIFIED
3. DIMENSIONS TO BE INCLUDED IN DETAILED CONSTRUCTION PLANS



#4 6" LONG WELDED TO ANGLE IRON AT 18" O.C. EACH SIDE (1/2" ANCHOR BOLT MAY BE USED)



WWF 6"X6" W1.4XW1.4 WIRE MESH OR #4 REBAR AT 12" O.C. BOTH WAYS 4000 PSI CONC @ 28 DAYS W/ FIBERMESH

SCALE: NTS

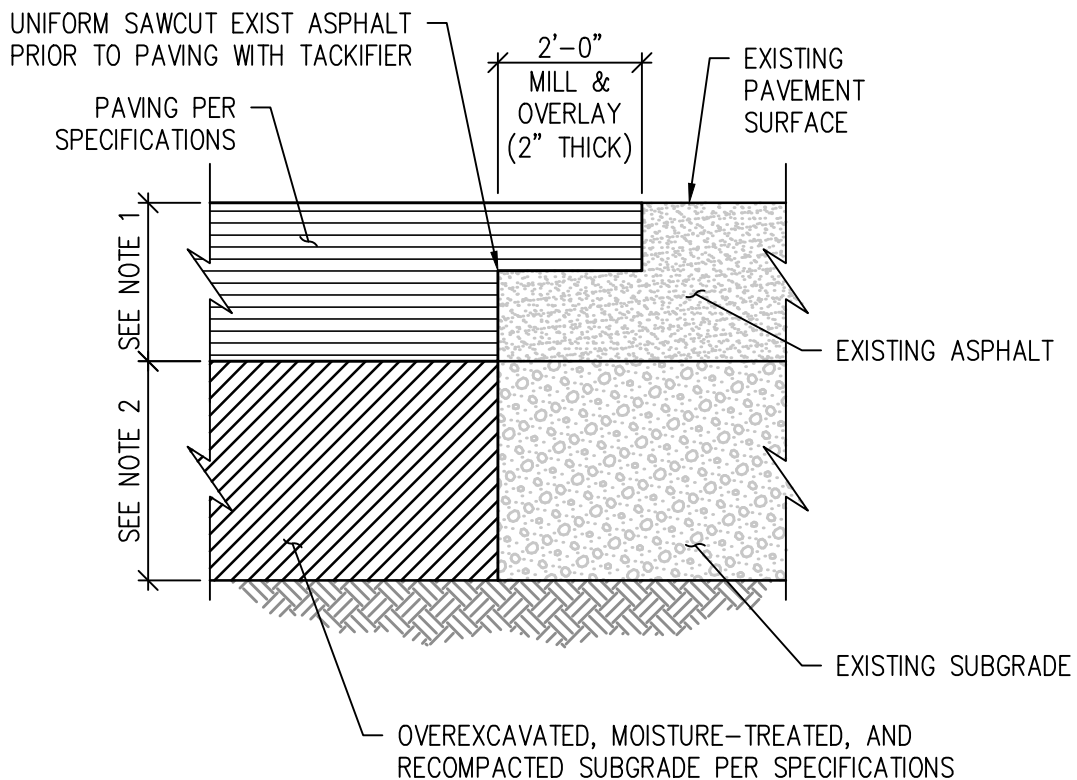


TOWN OF MEAD STANDARD DESIGN CRITERIA

CONCRETE CHASE DETAIL

D3.22B

DATE: 04/2021



NOTE:

1. MATCH EXISTING DEPTH +1". (REFER TO STANDARDS FOR MINIMUM ASPHALT DEPTHS BASED ON STREET CLASSIFICATION, WHICHEVER IS GREATER)
2. MATCH EXIST SUBGRADE DEPTH UNLESS OTHERWISE SPECIFIED (MIN 12")
3. PATCH LIMITS PER D23.23B AND D23.23C.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

ASPHALT PATCH DETAIL (1 OF 4)

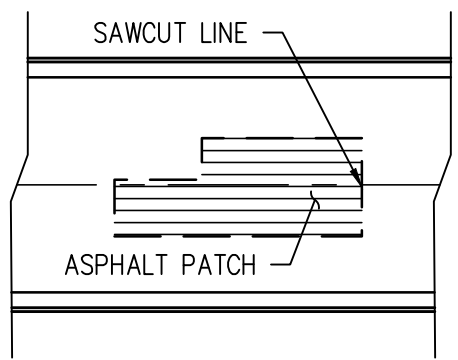
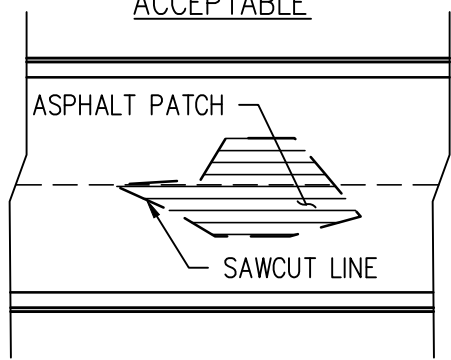
D3.23A

DATE: 04/2021

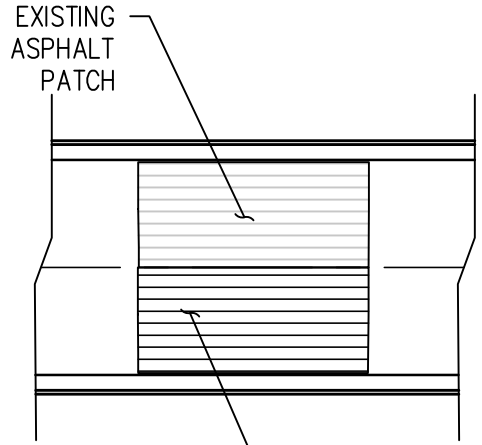
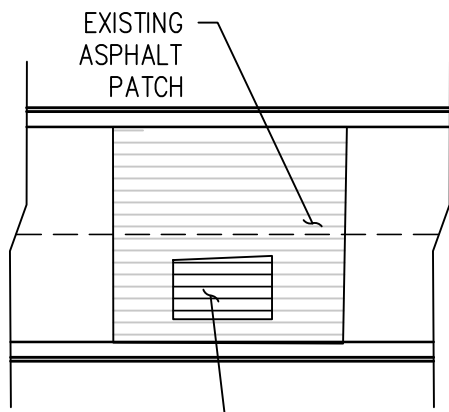
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ACCEPTABLE

ACCEPTABLE

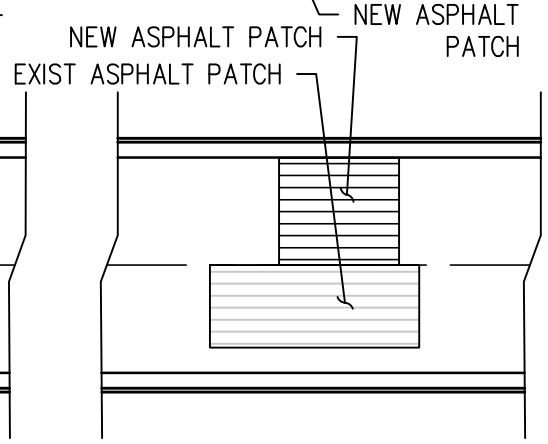
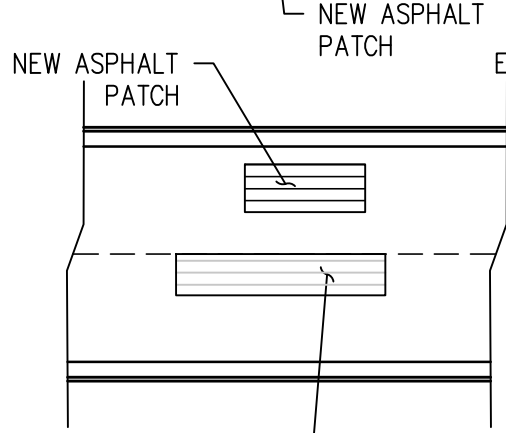
A. PARALLEL AND PERPENDICULAR



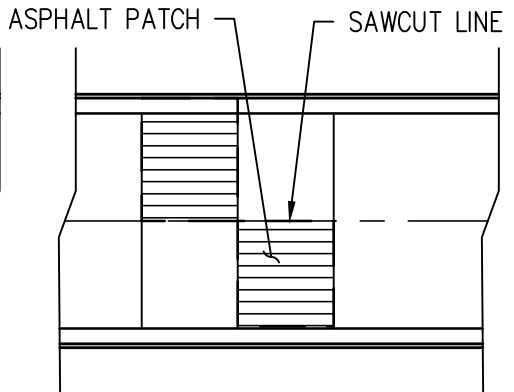
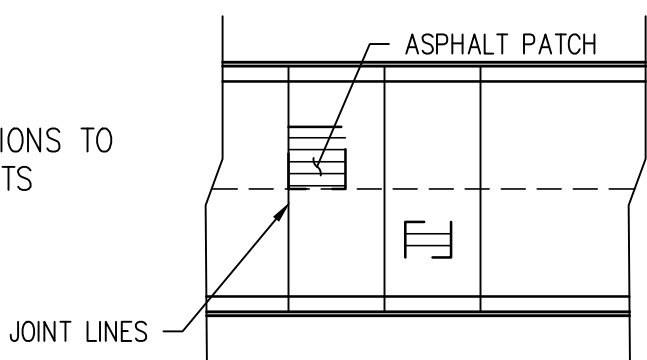
B. AVOID PATCHES WITHIN EXISTING PATCHES



C. STRIPS OF PAVEMENT < 1/2 LANE WIDTH



D. REMOVE SECTIONS TO EXISTING JOINTS



SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

ASPHALT PATCH DETAIL (2 OF 4)

D3.23B

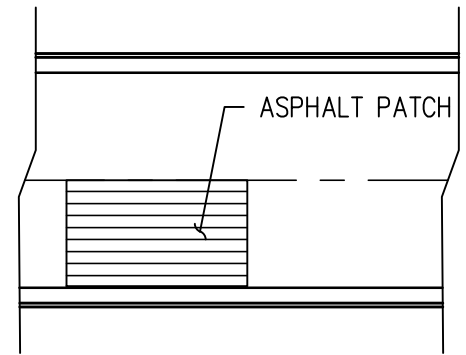
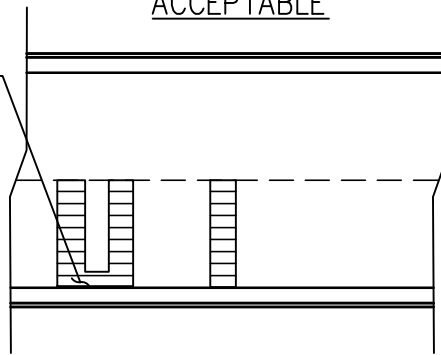
DATE: 04/2021

NOT
ACCEPTABLE

ACCEPTABLE

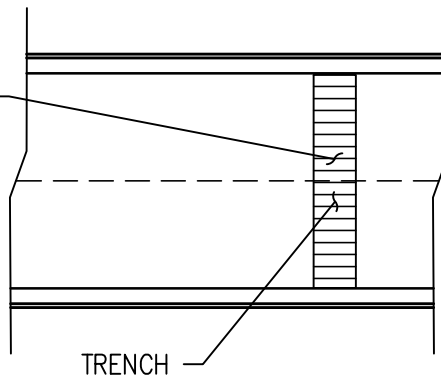
A. SERIES OF PATCHES

ASPHALT PATCH



B. TRANSVERSE PATCHES

NEW ASPHALT PATCH

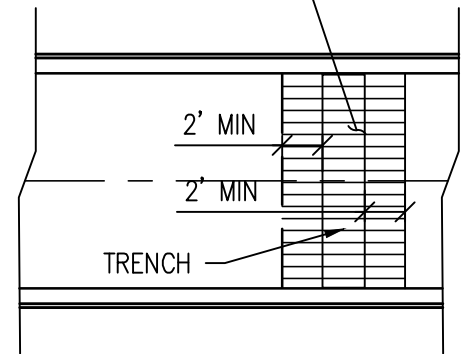


NEW ASPHALT PATCH

2' MIN

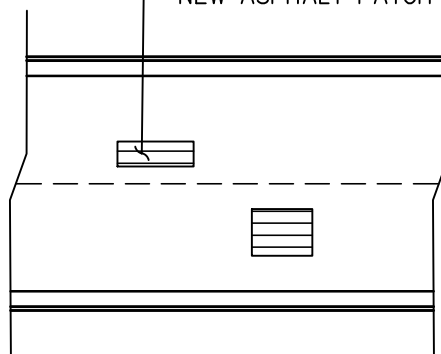
2' MIN

TRENCH

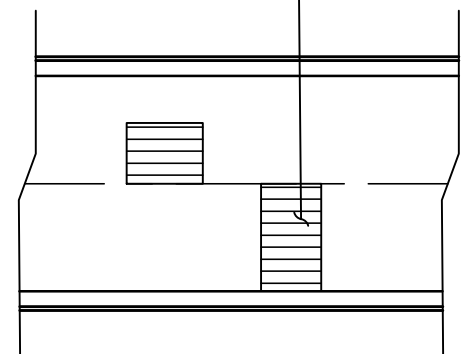


C. EXISTING WHEEL PATHS

NEW ASPHALT PATCH

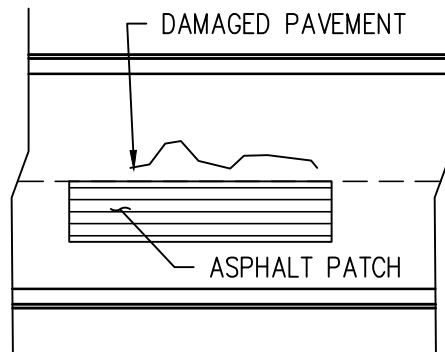


NEW ASPHALT PATCH



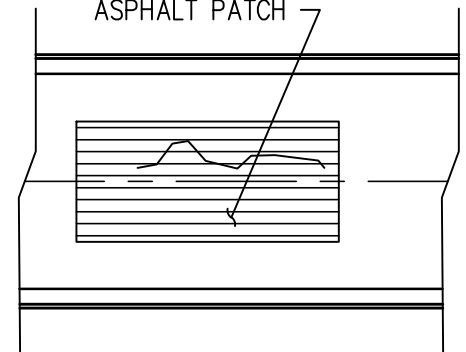
D. INCLUDE ADJACENT MINOR DAMAGE

DAMAGED PAVEMENT



ASPHALT PATCH

ASPHALT PATCH



SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

ASPHALT PATCH DETAIL (3 OF 4)

D3.23C

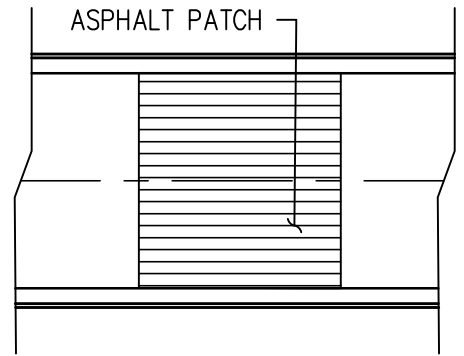
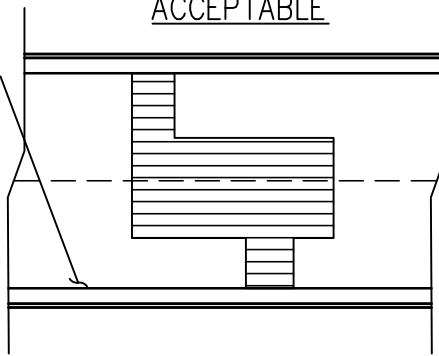
DATE: 04/2021

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ACCEPTABLE

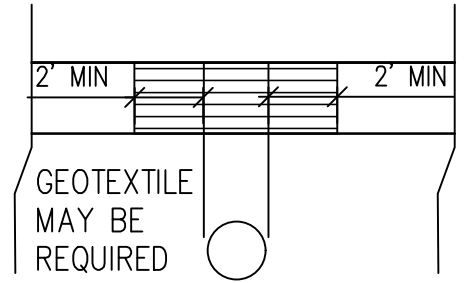
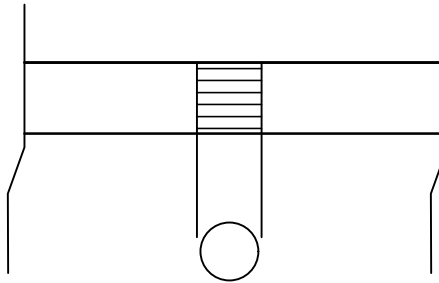
ACCEPTABLE

A. AVOID FREQUENT
CHANGES IN WIDTH

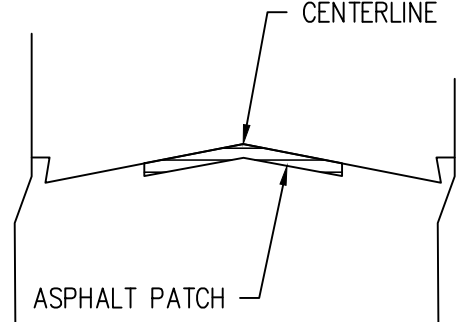
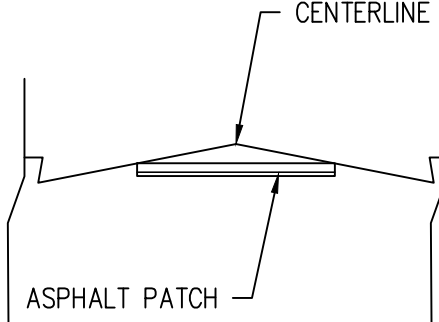
ASPHALT PATCH



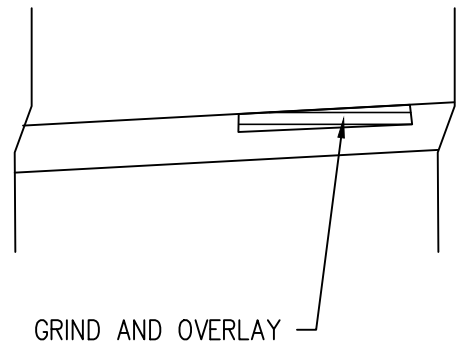
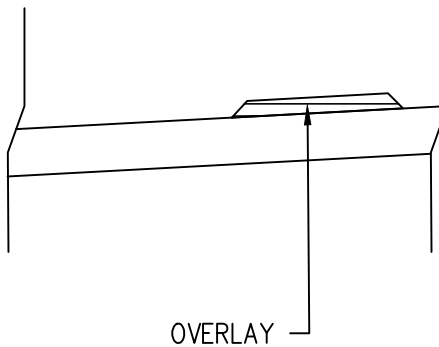
B. EXTEND THE
"SHOULDERS" OF
PAVEMENT



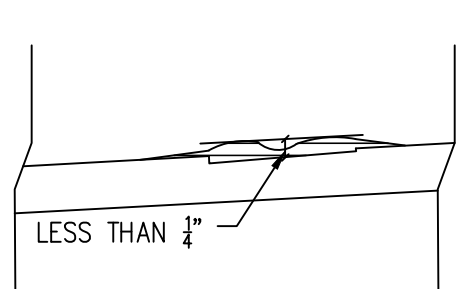
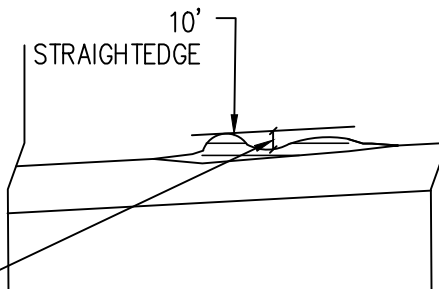
C. SMOOTH LONGITUDINAL
GRADE



D. DO NOT CREATE A
BUMP WITH OVERLAY



E. SURFACE TOLERANCES



SCALE: NTS

GREATER THAN 1/4"



TOWN OF MEAD STANDARD DESIGN CRITERIA

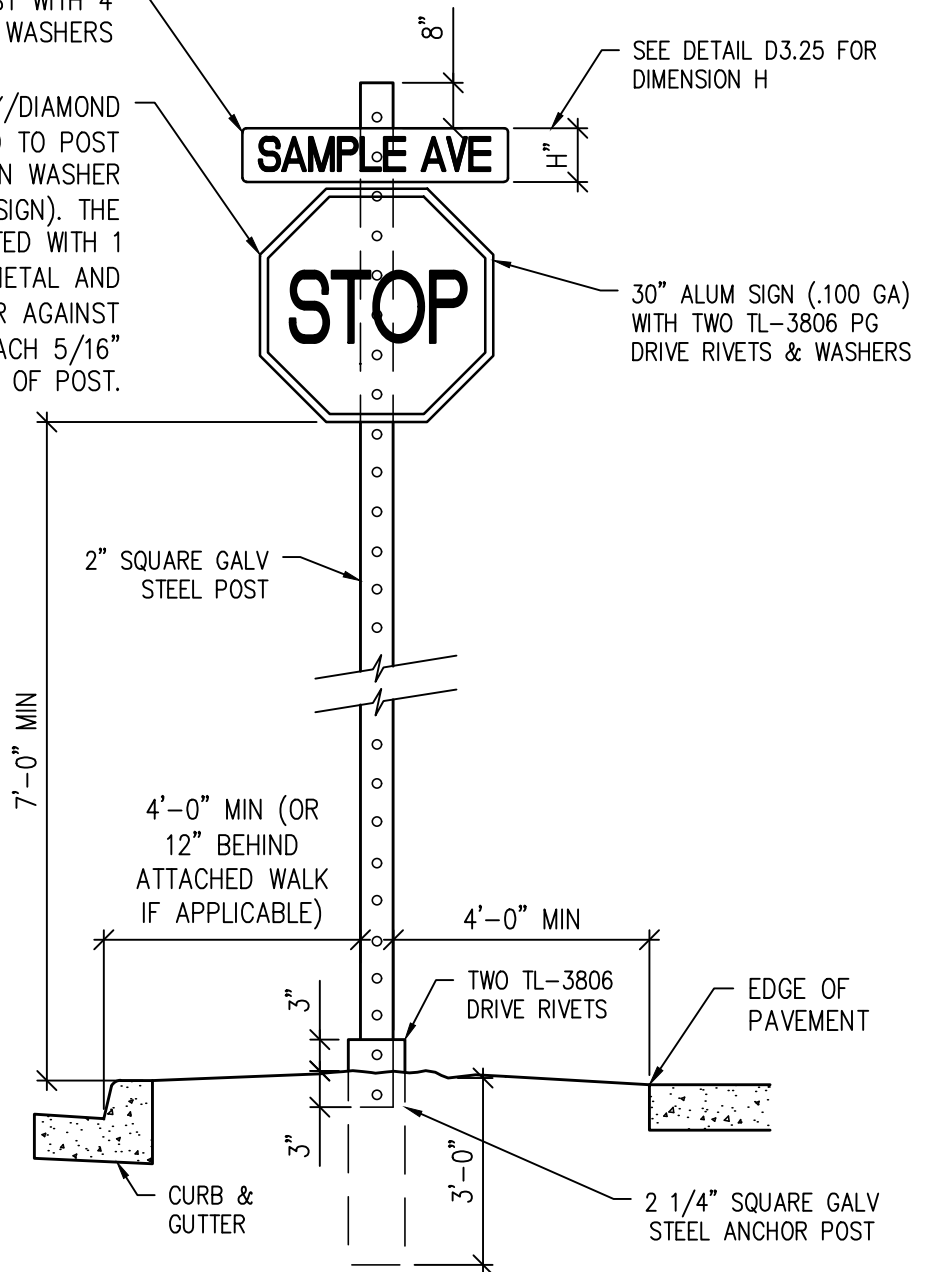
ASPHALT PATCH DETAIL (4 OF 4)

D3.23D

DATE: 04/2021

2 EACH H" BLADES MOUNTED TO POST WITH 4 EACH DRIVE RIVETS WITH NYLON WASHERS

R1-1 "STOP" SIGN 30" HIGH DENSITY/DIAMOND GRADE (SEE NOTE 9). SIGN MOUNTED TO POST WITH 1 EACH DRIVE RIVET WITH NYLON WASHER AGAINST SIGN FACE (ON TOP OF THE SIGN). THE BOTTOM OF THE SIGN SHALL BE MOUNTED WITH 1 EACH 5/16"x2-1/2" HEX BOLT WITH METAL AND FROM NYLON WASHERS (NYLON WASHER AGAINST SIGN FACE) AND SECURED WITH 1 EACH 5/16" HEX NUT ON THE BACK SIDE OF POST.



NOTE:

1. SIGNS SHALL CONFORM TO MUTCD AND CDOT STANDARDS FOR MATERIAL AND PLACEMENT.
2. CLASS 1 SIGNS SHALL BE 0.100 GAUGE ALUM.
3. SIGNS WITH ARROW MAY REQUIRE SPECIAL PLACEMENT OR ROTATION. COORDINATE WITH ENGINEER.
4. ATTACH SIGN PANELS TIGHTLY TO THE POST AND USE OVERSIZED WASHERS TO KEEP THE SIGN FROM BREAKING LOOSE FROM THE POST WHEN HIT BY A VEHICLE.
5. SIGN PANELS SHOULD BE MOUNTED A MINIMUM OF 7' ABOVE THE PAVEMENT OR GROUND.
6. SIGNS LARGER THAN 36" IN LENGTH OR WIDTH REQUIRE WIND BRACING AND SPECIAL POST DESIGN.
7. ANCHOR STUB AND POST ARE PERFORATED SQUARE STEEL TUBE.
8. ALL "NO PARKING" SIGNS SHALL BE INSTALLED AT 45° FROM FLOWLINE.
9. STOP SIGNS SHALL BE A MINIMUM 36" SIZE FOR ALL STREETS ABOVE A LOCAL RESIDENTIAL STREET CLASSIFICATION PER MUTCD REQUIREMENTS.

SCALE: NTS

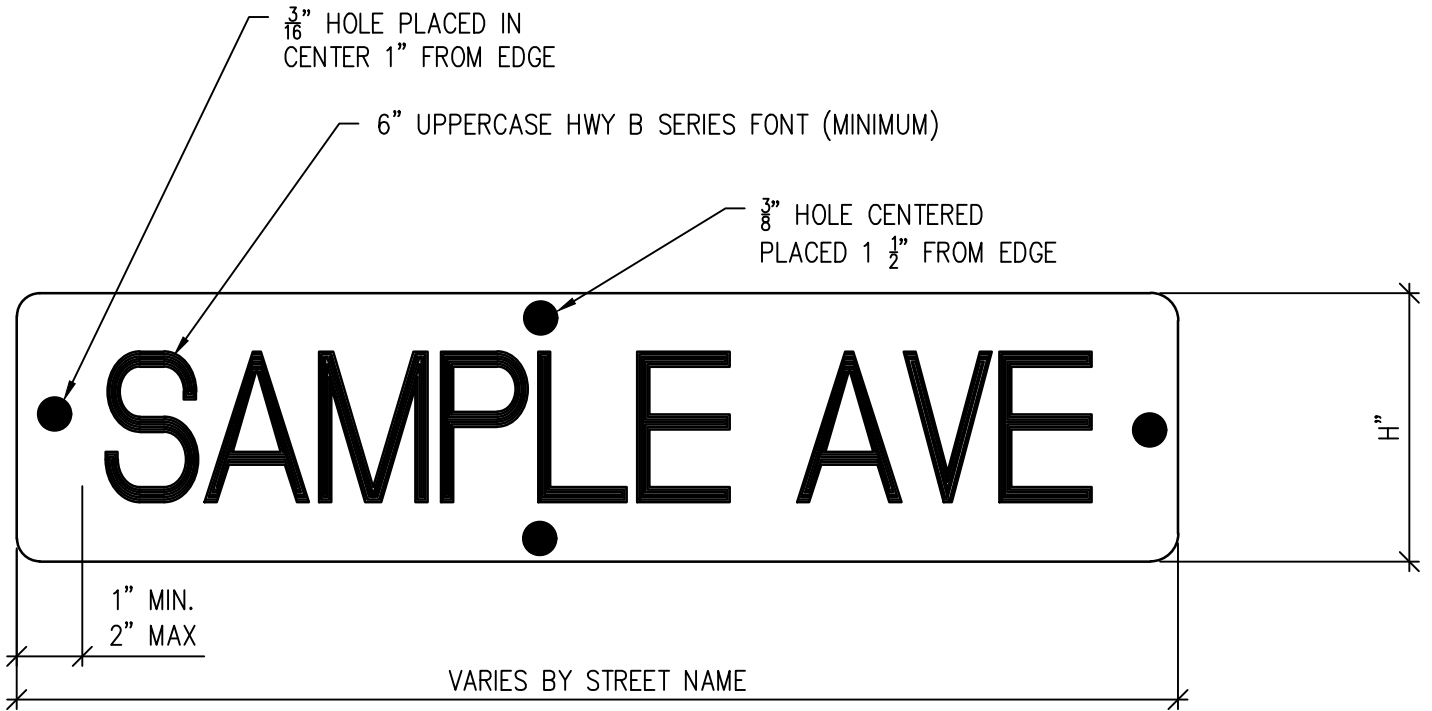


TOWN OF MEAD STANDARD DESIGN CRITERIA

SIGN POST DETAIL

D3.24

DATE: 04/2021



STREET CLASSIFICATION	H	LETTER SIZE
LOCAL-COLLECTOR	9"	6"
ARTERIAL	12"	8"

NOTE:

1. STREET NAMES AND SUFFIX MUST BE 6" MIN., CAPITAL WHITE LETTERS, FHWA SERIES "B" (PRIVATE STREETS SHALL HAVE GREEN LETTERS).
2. OVERALL SIGN LENGTH SHALL VARY BASED ON LENGTH OF STREET NAME.
3. ALL SIGN LETTERING AND GREEN BACKGROUND MATERIAL MUST BE AT LEAST DIAMOND GRADE SHEETING PER FHWA (PRIVATE STREET SIGNS SHALL HAVE WHITE BACKGROUNDS). NO SILK SCREENED SIGNS WILL BE PERMITTED.
4. STREET NUMBERS SHALL ALWAYS POINT TO HIGHER BLOCK NUMBER.
5. ALL STREET NAME SIGNS SHALL BE RETROREFLECTIVE.

SCALE: NTS

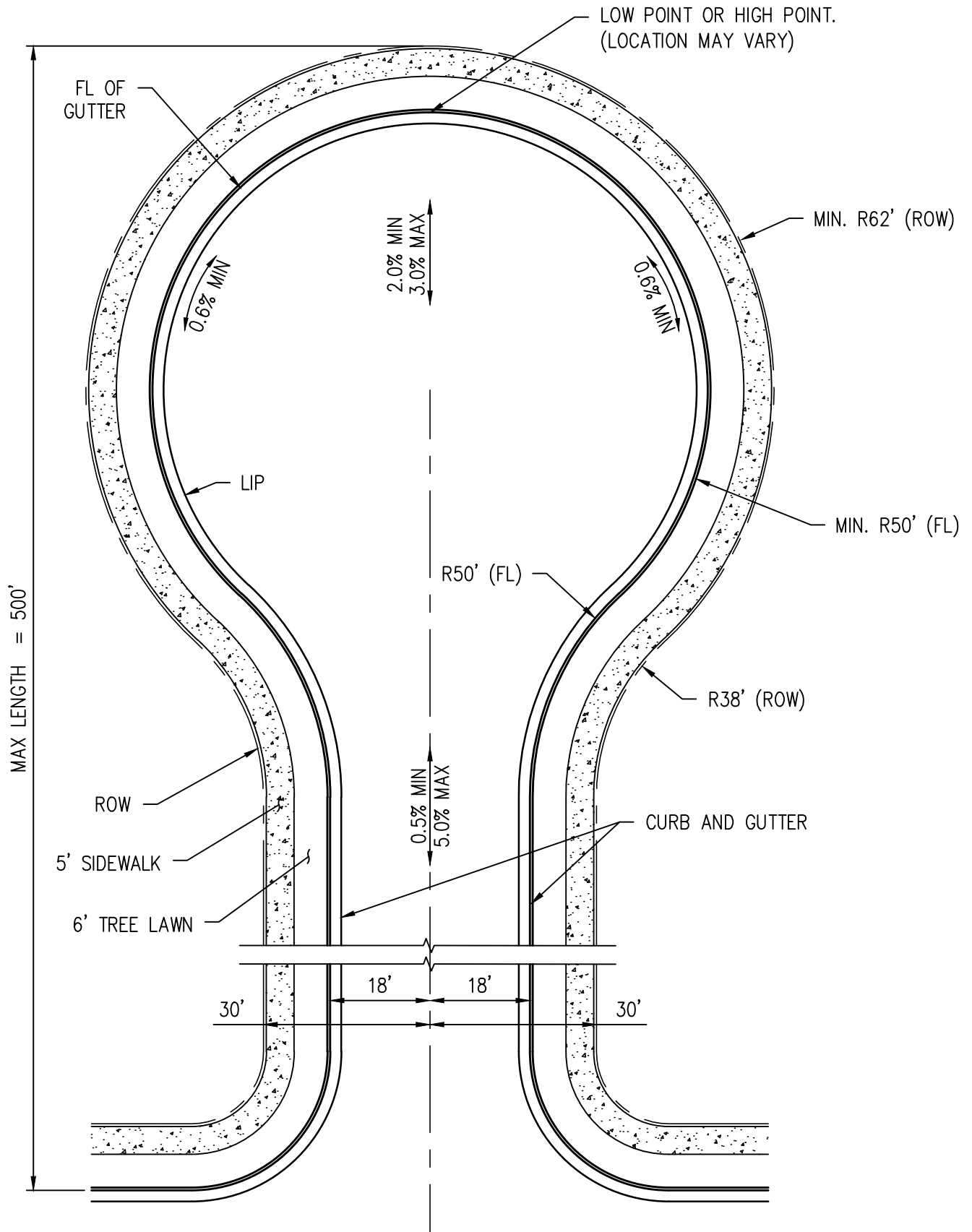


TOWN OF MEAD STANDARD DESIGN CRITERIA

STREET NAME SIGN

D3.25

DATE: 04/2021



SCALE: NTS

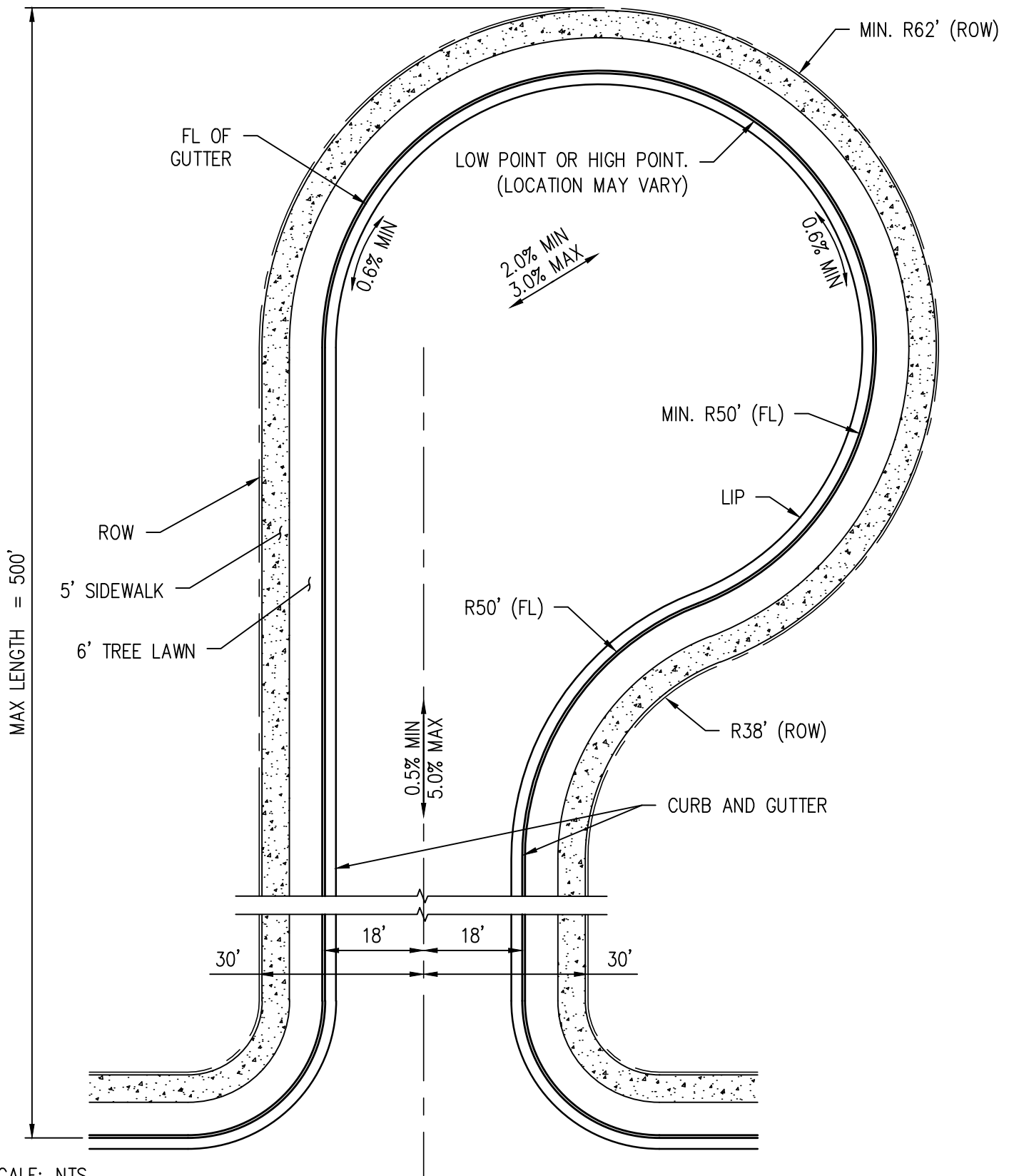


TOWN OF MEAD STANDARD DESIGN CRITERIA

LOCAL CUL-DE-SAC DETAIL

D3.26A

DATE: 04/2021



SCALE: NTS

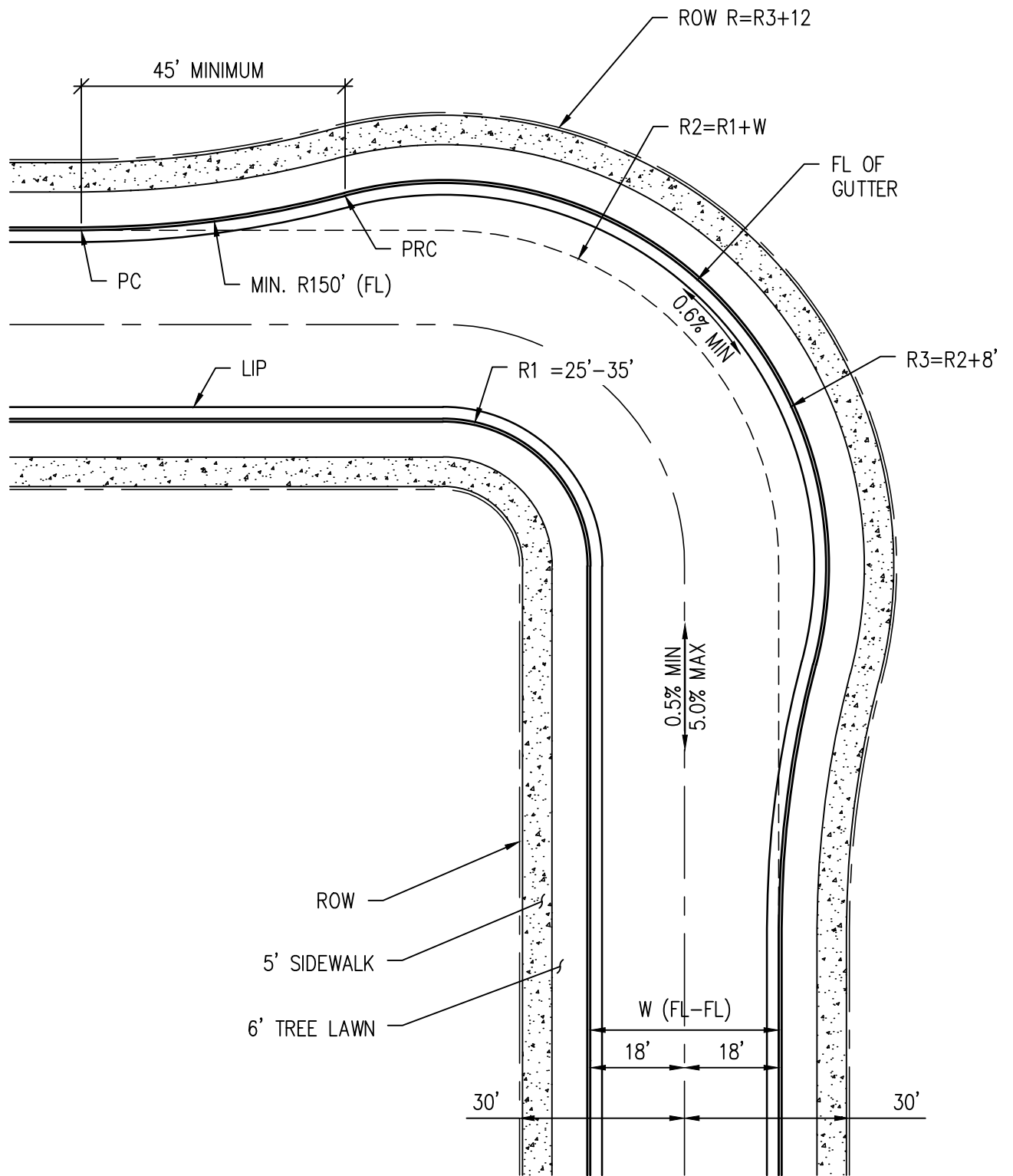


TOWN OF MEAD STANDARD DESIGN CRITERIA

LOCAL CUL-DE-SAC DETAIL (OFFSET)

D3.26B

DATE: 04/2021



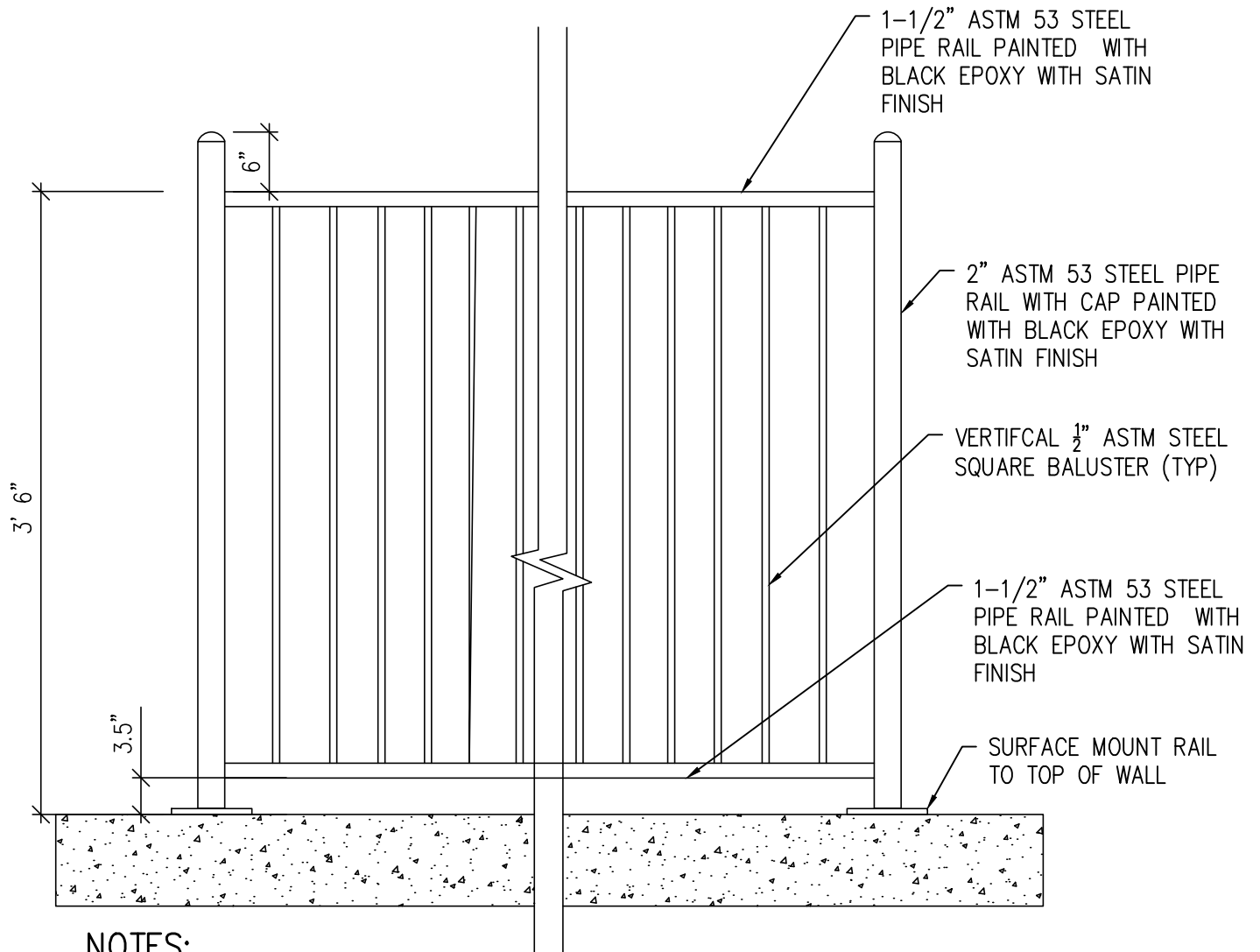
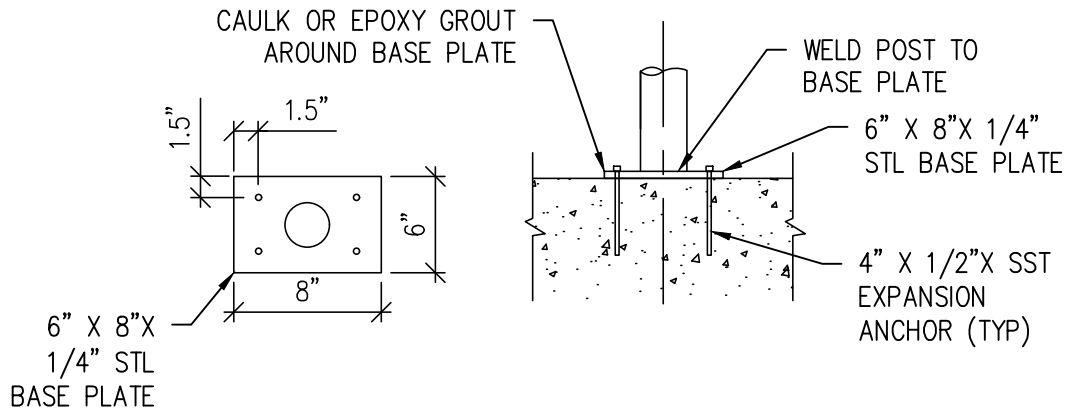
SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA
 WIDENING DETAIL FOR STREET KNUCKLE
 (LOCAL STREETS ONLY)

D3.27

DATE: 04/2021



NOTES:

1. HANDRAILS/GUARDRAILS AND ACCESSORIES TO BE GALVANIZED STEEL.
2. ALL HARDWARE SHALL BE GALVANIZED STEEL
3. ALL BRIDGES AND BOX CULVERTS SHALL INCLUDE RAILING OR GUARDRAIL PER CDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION (CDOT S&S).
4. GUARDRAIL SHALL BE DESIGNED TO INCLUDE ARCHITECTURAL FEATURES. FINAL DESIGN SHALL BE SUBMITTED TO TOWN ENGINEER FOR APPROVAL.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

GUARDRAIL

D3.28

DATE: 04/2021

TOWN OF MEAD GENERAL CONSTRUCTION NOTES – SANITARY

1. DISTRICT SHALL REFER TO THE TOWN OF MEAD IN THESE NOTES.
2. DISTRICT'S ACCEPTANCE OF THESE PLANS IS VALID FOR ONE YEAR.
3. ALL MATERIALS AND CONSTRUCTION SHALL CONFORM TO THE DISTRICT STANDARDS.
4. CONTRACTOR TO VERIFY LOCATIONS AND ELEVATIONS OF EXISTING UTILITIES PRIOR TO COMMENCING ANY CONSTRUCTION.
5. THE CONTRACTOR SHALL NOTIFY THE DISTRICT A MINIMUM OF 48 HOURS AND A MAXIMUM OF 96 HOURS PRIOR TO STARTING CONSTRUCTION OR PRIOR TO RESUMING CONSTRUCTION AFTER A BREAK.
6. SANITARY SEWER SHALL BE POLYVINYL CHLORIDE (PVC) PIPE, ASTM D3034, SDR-26, SDR-35, OR AS INDICATED ON THE PLANS.
7. ALL CONCRETE SHALL BE MINIMUM 4000 PSI AT 28 DAY STRENGTH.
8. MAINTAIN A MINIMUM OF 10 FEET HORIZONTAL SEPARATION OUTSIDE DIAMETER TO OUTSIDE DIAMETER BETWEEN WATER LINES AND ALL SEWER LINES AND MANHOLES.
9. ALL SEWER MAINS CROSSING WATER MAINS WITH LESS THAN 18 INCHES OF SEPARATION SHALL BE ENCASED IN CONCRETE.
10. RIM ELEVATIONS SHOWN ARE APPROXIMATE AND SHOULD NOT BE TAKEN AS FINAL. ALL MANHOLES SHALL BE FINAL ADJUSTED AFTER PAVING SUCH THAT THE RIM IS ¼ TO ½ INCH BELOW FINISHED ASPHALT. MANHOLES IN UNPAVED AREAS SHALL BE SET SO THAT THE RIM IS 0.5' ABOVE FINISHED GRADE. BURIED MANHOLES ALLOWED IN CULTIVATED FIELDS AS APPROVED BY TOWN ENGINEER. AS-BUILTS SHALL ALLOW FINAL NORTHING/EASTING AND RIM ELEVATION OF ALL BURIED MANHOLES.
11. INVERT (AS-BUILT) DATA SHALL BE COLLECTED BY A LICENSED SURVEYOR ON EACH PIPE INVERT IN A MANHOLE. CENTER OF MANHOLE SURVEYING IS NOT ACCEPTABLE FOR SLOPE CALCULATIONS. RECORD DRAWINGS (AS-BUILTS) MUST DEMONSTRATE CONFORMANCE TO DISTRICT STANDARDS.
12. THE CONTRACTOR SHALL HAVE A SET OF APPROVED PLANS ON SITE AT ALL TIMES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RECORDING ACTUAL RECORD DRAWING DIMENSIONS AND DISTANCES AS WELL AS SERVICE LOCATIONS ON THESE PLANS AND SUBMITTING THEM TO THE ENGINEER FOR PREPARATION OF RECORD DRAWINGS. THESE DRAWINGS SHALL BE KEPT CURRENT AT ALL TIMES.
13. BEFORE ANY CONSTRUCTION COMMENCES, A PLUG SHALL BE INSTALLED TO PREVENT DRAINAGE THROUGH THE NEW SEWER LINE FROM ENTERING THE EXISTING SEWER LINE. THIS PLUG WILL BE INSTALLED IN THE MANHOLE, WHICH CONNECTS NEW WORK WITH THE EXISTING AND MAY NOT BE REMOVED UNTIL CONDITIONAL ACCEPTANCE.
14. UNDERDRAINS, IF INSTALLED, ARE THE RESPONSIBILITY OF THE DEVELOPER. DISTRICT ASSUMES NO LIABILITY FOR ANY PORTION OF OR ANY DAMAGE CAUSED BY UNDERDRAINS. ABSOLUTELY NO PART OF AN UNDERDRAIN SYSTEM, INCLUDING CLEAN OUTS, WILL BE ALLOWED INSIDE OF SANITARY SEWER MANHOLES. ALL UNDERDRAINS SHALL BE INSTALLED BELOW THE SANITARY SEWER AND OFFSET TO THE SIDE. PIPE MATERIAL SHALL BE DIFFERENT COLOR THAN SANITARY SEWER.
15. NO SERVICE LATERALS SMALLER THAN 8 INCH IN DIAMETER SHALL ENTER MANHOLES.
16. SERVICE CROSSINGS OF CURB SHALL BE MARKED WITH A CUT "S" IN CURB FACE. PAINT IS NOT ACCEPTABLE. SERVICE SHALL BE EXTENDED INTO THE LOT A MINIMUM OF 10 FEET.
17. CONTRACTOR SHALL MARK THE END OF ALL SEWER SERVICES WITH A CARBONITE COMPOSITE UTILITY MARKER WITH MINIMUM OF FOUR FEET ABOVE GRADE, PAINTED GREEN
18. ALL PIPES SHALL HAVE SQUEEGEE (CDOT #8 BEDDING) UNLESS OTHERWISE SHOWN OR THE DISTRICT MAY APPROVE AN ALTERNATE BEDDING IN SPECIAL CASES.
19. PRIOR TO APPROVAL, ALL SANITARY SEWER PIPES SHALL BE PRESSURE-TESTED PER ASTM C924. ALL MANHOLES SHALL BE VACUUM-TESTED PER UNI-B-98.
20. PRIOR TO REMOVAL OF PLUGS AT MANHOLES, PIPE SHALL BE JET-CLEANED AND VACUUMED TO REMOVE DEBRIS AND VIDEOED. NOTICE SHALL BE GIVEN TO THE DISTRICT INSPECTOR ONE (1) WEEK PRIOR TO CLEANING. INSPECTOR MUST BE PRESENT DURING THE OPERATION. ONCE APPROVAL HAS BEEN GIVEN BY INSPECTOR, PLUGS MAY ONLY BE REMOVED AFTER INITIAL ACCEPTANCE BY THE DISTRICT.
21. THE FINAL RECORDED PLAT AND RECORDED ADDRESS PLAT SHALL BE PROVIDED TO THE DISTRICT FOR INITIAL ACCEPTANCE.
22. TWENTY (20) MONTHS AFTER CONSTRUCTION AND PRIOR TO THE EXPIRATION OF WARRANTY, THE DEVELOPER SHALL CAMERA/VIDEO THE SANITARY SEWER LINES AND PROVIDE A DVD TO THE DISTRICT FOR REVIEW.

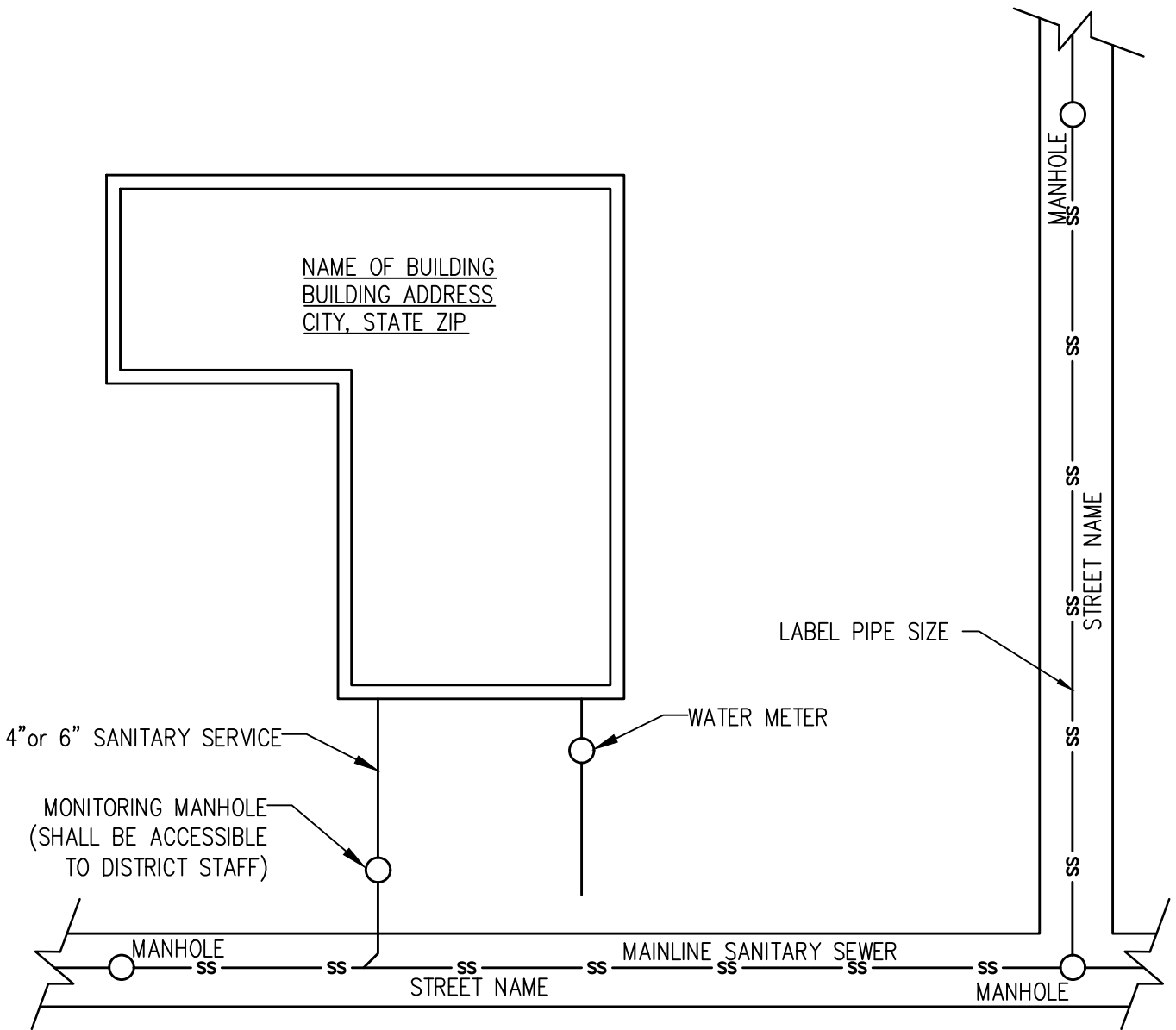


TOWN OF MEAD STANDARD DESIGN CRITERIA

GENERAL CONSTRUCTION NOTES

D4.01

DATE: 04/2021



NOTES:

1. COMMERCIAL AND RESIDENTIAL SANITARY SERVICE TO BE CONSTRUCTED IN A STRAIGHT THRU MONITORING MANHOLE, IF REQUIRED.
2. INDICATE SEWER SIZES (DIAMETERS).
3. INDICATE LOCATION OF SEWAGE FLOW METER, IF REQUIRED.
4. DETAIL OF MONITORING MANHOLE MUST BE SUBMITTED ON SEPARATE SHEET.

SCALE: NTS

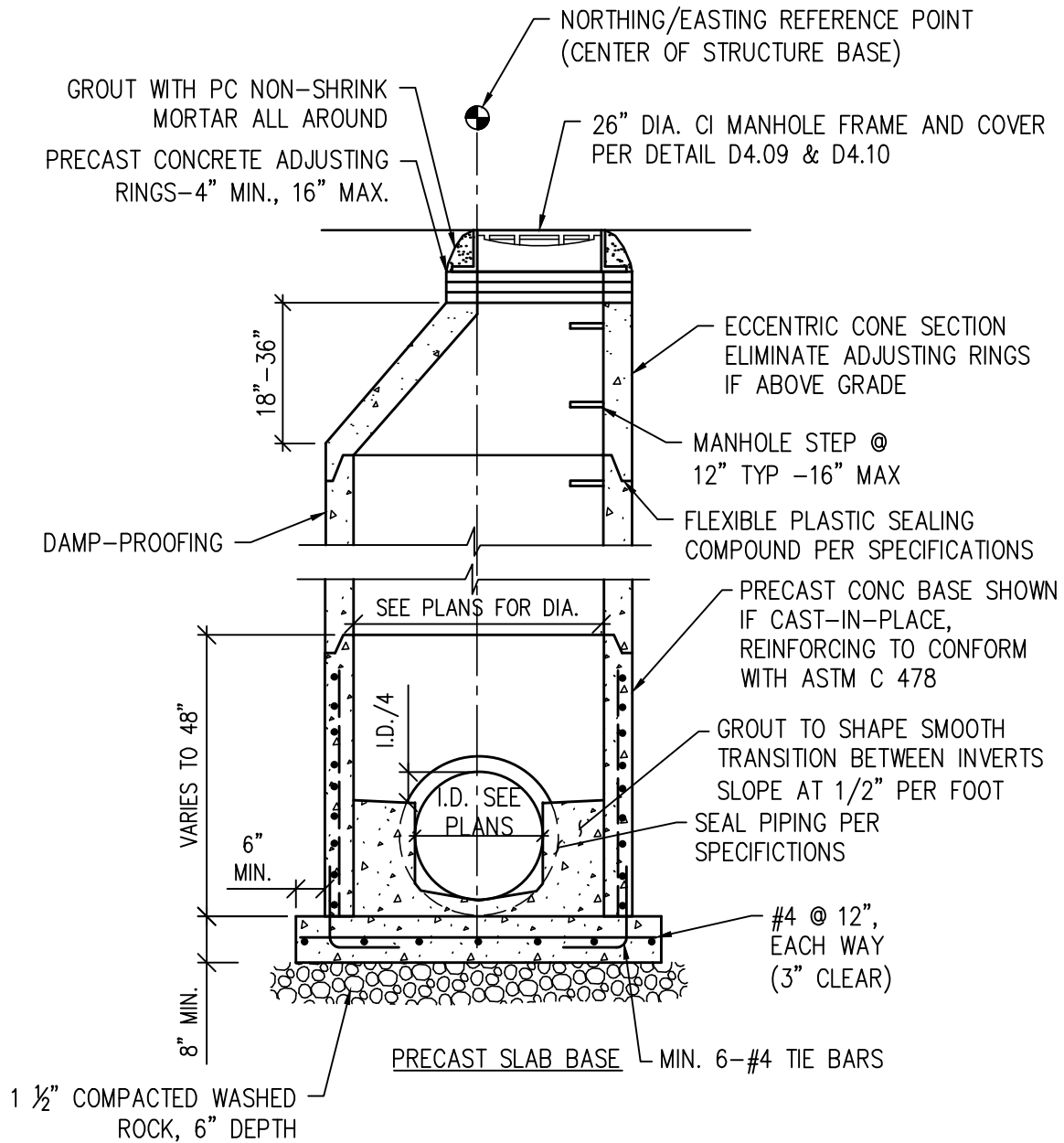


TOWN OF MEAD STANDARD DESIGN CRITERIA

EXAMPLE SITE PLAN

D4.02

DATE: 04/2021



NOTES:

1. SHAPING FOR SMOOTH MANHOLE INVERTS MUST BE DONE BY FORMING OR SHAPING BASE CONCRETE.
2. BLOCK-OUTS WHEN APPROVED SHALL EXTEND A MAX OF 6" PAST MANHOLE OD AND BE SATISFACTORILY PLUGGED AND SEALED.
3. CONCRETE MANHOLES MAY BE POURED IN PLACE ONLY WITH PRIOR APPROVAL.
4. ALL MORTAR SHALL BE MIXED WITH A TYPE II CEMENT.
5. BENCH MUST HAVE A BRUSHED, NON-SKID SURFACE.

SCALE: NTS

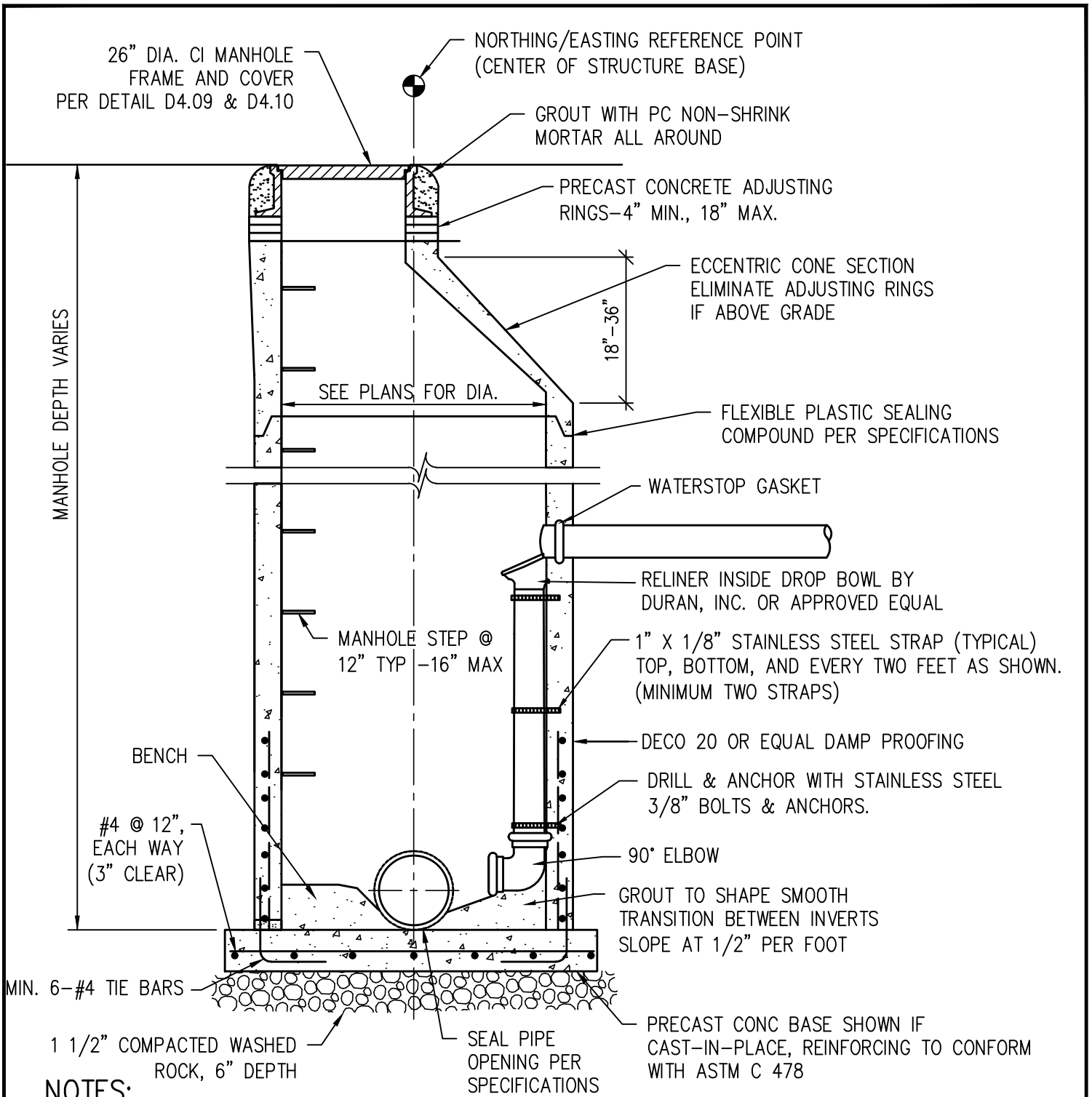


TOWN OF MEAD STANDARD DESIGN CRITERIA

STANDARD SANITARY MANHOLE

D4.03

DATE: 04/2021

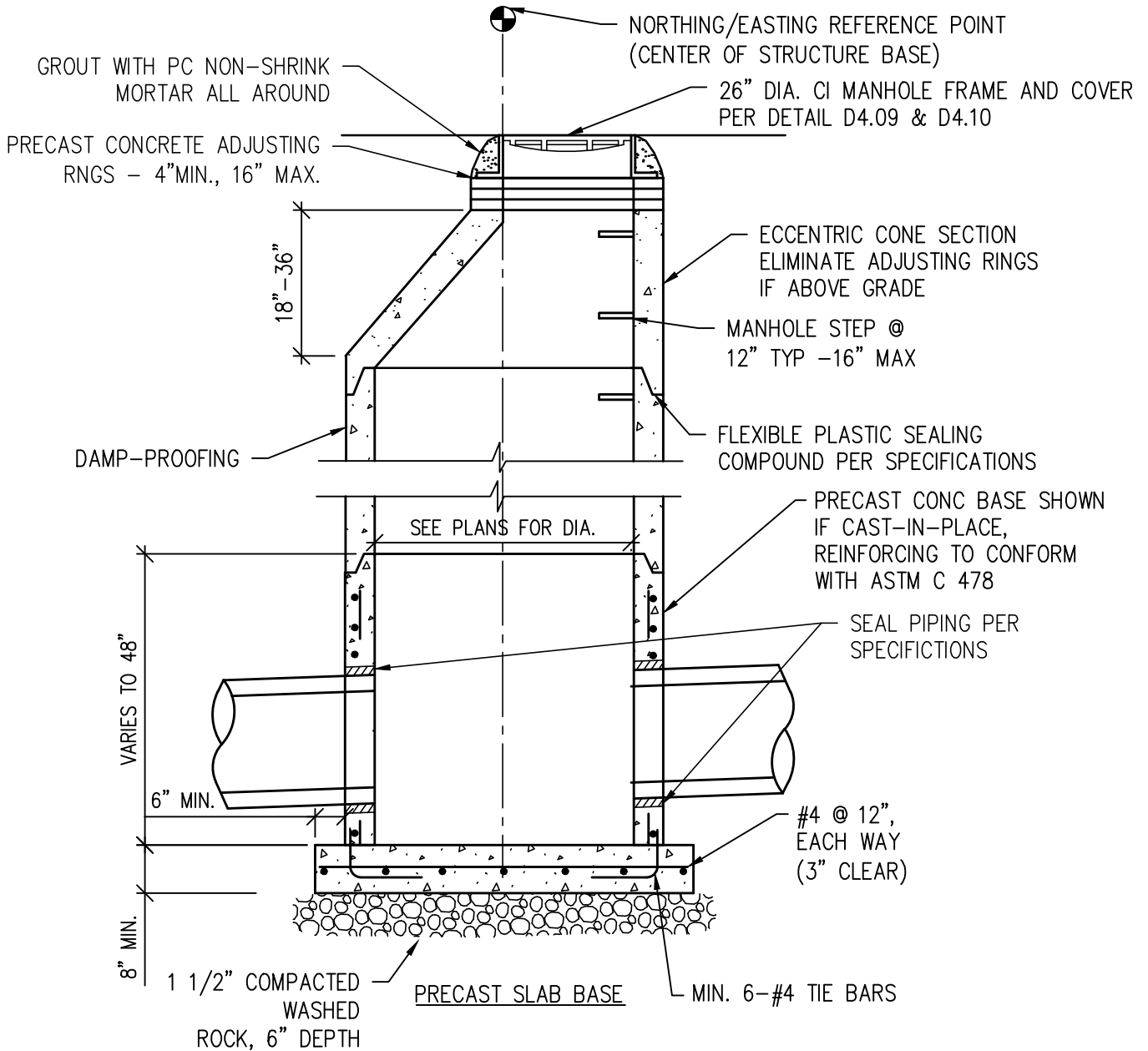


NOTES:

1. SHAPING FOR SMOOTH MANHOLE INVERTS MUST BE DONE BY FORMING OR SHAPING BASE CONCRETE.
2. BLOCK-OUTS WHEN APPROVED SHALL EXTEND A MAX OF 6" PAST MANHOLE OD AND BE SATISFACTORILY PLUGGED AND SEALED.
3. CONCRETE MANHOLES MAY BE POURED IN PLACE ONLY WITH PRIOR APPROVAL.
4. ALL MORTAR SHALL BE MIXED WITH A TYPE II CEMENT.
5. BENCH MUST HAVE A BRUSHED, NON-SKID SURFACE.

SCALE: NTS

	TOWN OF MEAD STANDARD DESIGN CRITERIA	D4.04
	SANITARY DROP MANHOLE	DATE: 04/2021



NOTES:

1. MANHOLES SHALL BE SEALED WATERTIGHT. NO GROUT ALLOWED. MANHOLE EXTERIORS SHALL BE DAMP-PROOFED.
2. DROP THROUGH MANHOLE TO BE EQUAL TO SLOPE OF SURROUNDING PIPE. FOR FLUME INSTALLATIONS, FLUME MUST BE SET LEVEL.
3. MONITORING MANHOLE TO BE LOCATED OUTSIDE OF PUBLIC RIGHT-OF-WAY, ON DISCHARGER'S PROPERTY. THE MANHOLE MUST BE SAFELY AND INDEPENDENTLY ACCESSIBLE FOR DISTRICT USE AT ALL TIMES.
4. FOR MANHOLE DEPTHS LESS THAN FOUR FEET FROM RIM TO TOP OF BENCH, VERTICAL MANHOLE BARRELS OR MINIMUM 30-INCH BY 30-INCH PRECAST BOX WITH PRECAST FLAT TOP SECTIONS ARE REQUIRED.
5. DESIGN AND LOCATION OF MONITORING MANHOLE SUBJECT TO DISTRICT APPROVAL.
6. THERE SHALL NOT BE ANY BENDS, DROP MANHOLES FLOW JUNCTIONS, CHANGES IN PIPE DIAMETER, ETC., WITHIN 25 PIPE DIAMETERS UPSTREAM OR DOWNSTREAM OF THE MANHOLE.

SCALE: NTS

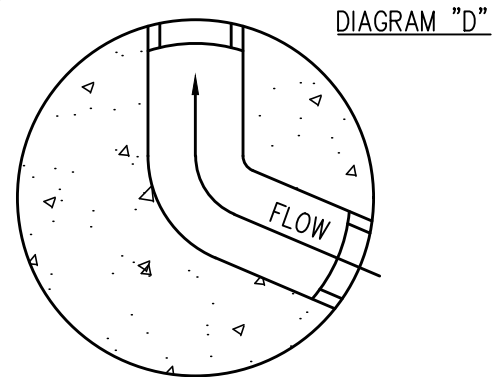
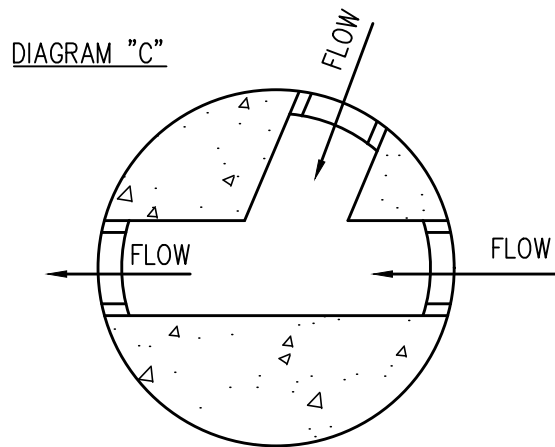
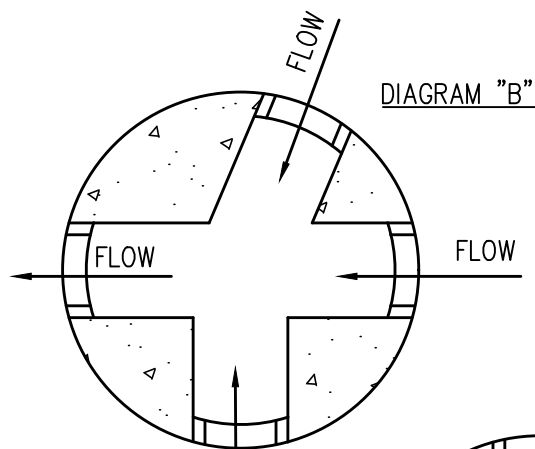
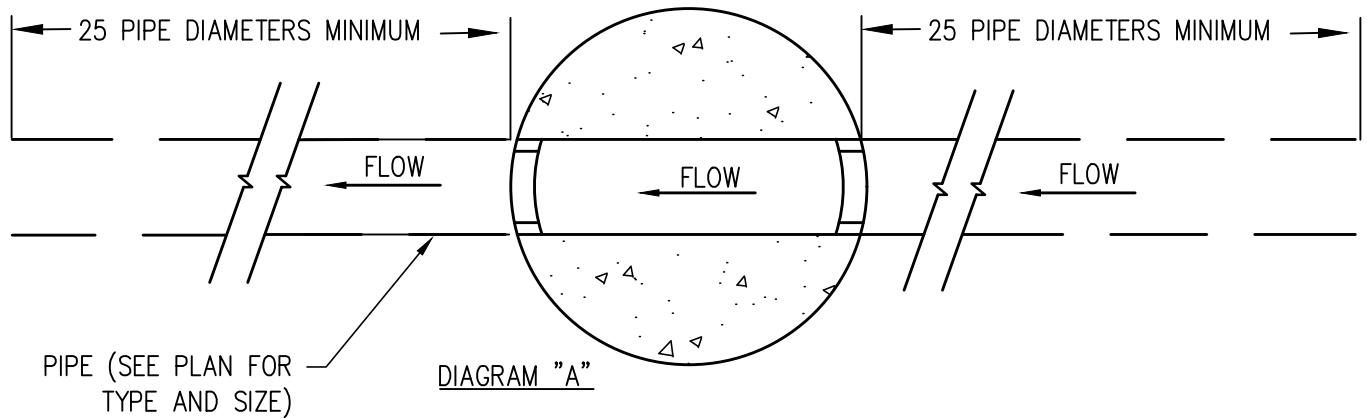


TOWN OF MEAD STANDARD DESIGN CRITERIA

MONITORING SANITARY MANHOLE

D4.05

DATE: 04/2021



NOTES:

1. DIAGRAM "A" IS COMPATIBLE FOR THE INSTALLATION OF A FLOWMETER OR FLUME IN THE INVERT.
2. DIAGRAMS "B", "C", "D" ARE NOT SUITABLE FOR THE INSTALLATION OF A FLOW MEASURING DEVICE DUE TO THE LOCATION OF THE SIDE SEWERS OR A BEND IN THE INVERT CHANNEL.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

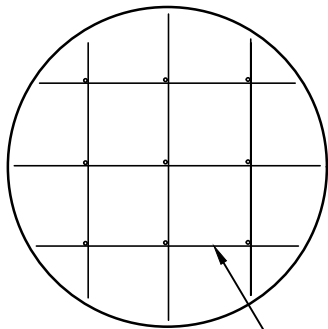
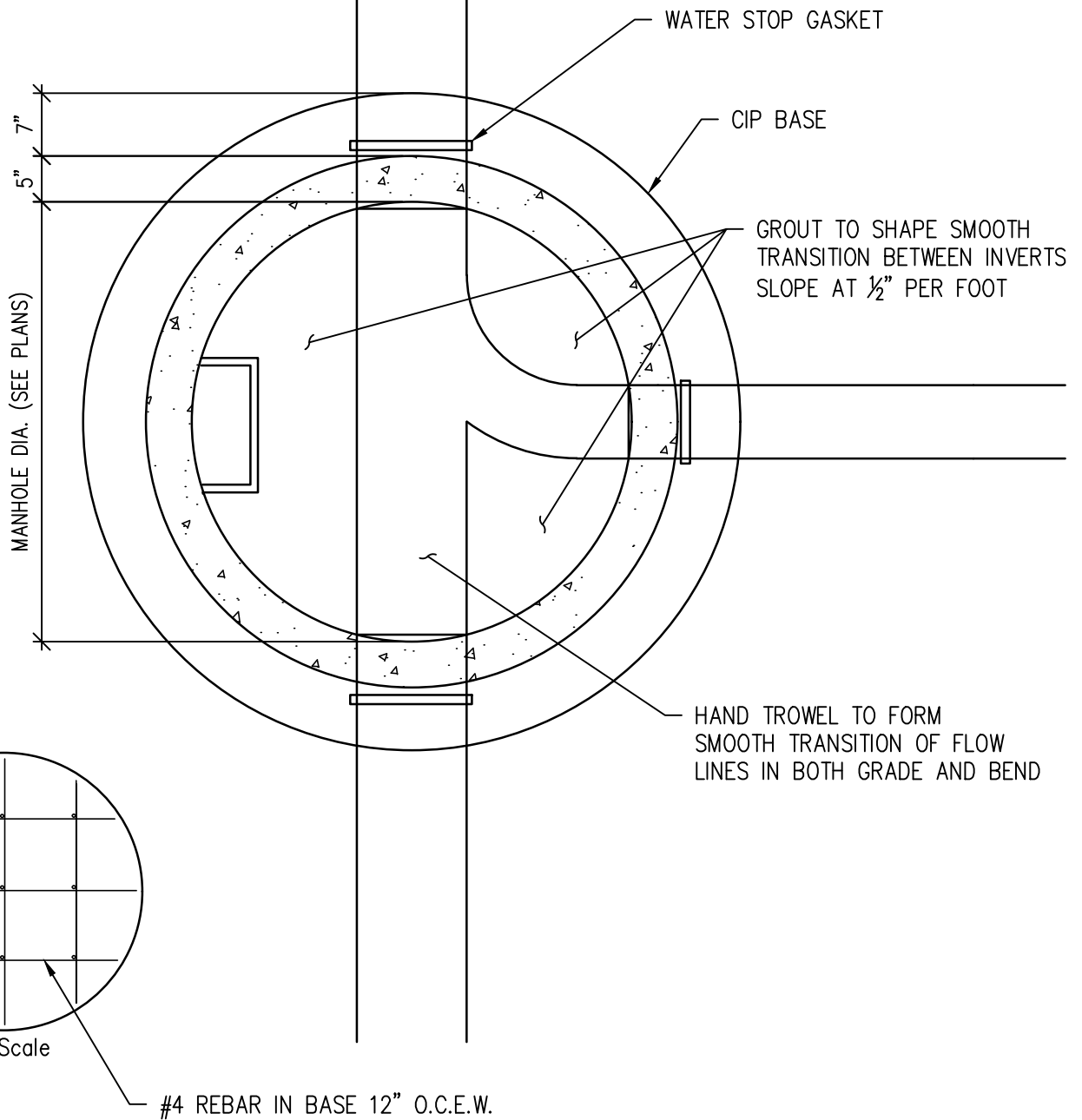
MONITORING SANITARY MANHOLE DIAGRAMS

D4.06

DATE: 04/2021

FLO

FLOW DIRECTION CHANGE
90 DEGREES, MAXIMUM.



No Scale

SCALE: NTS

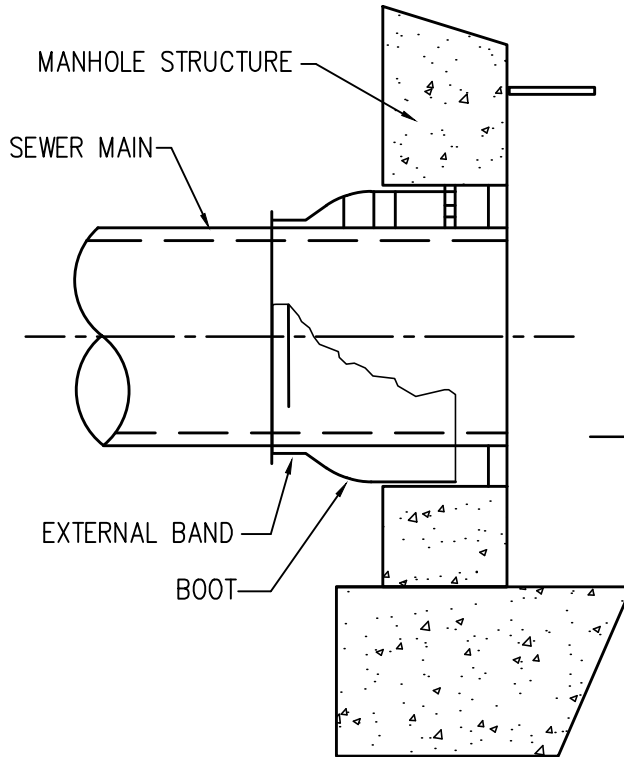
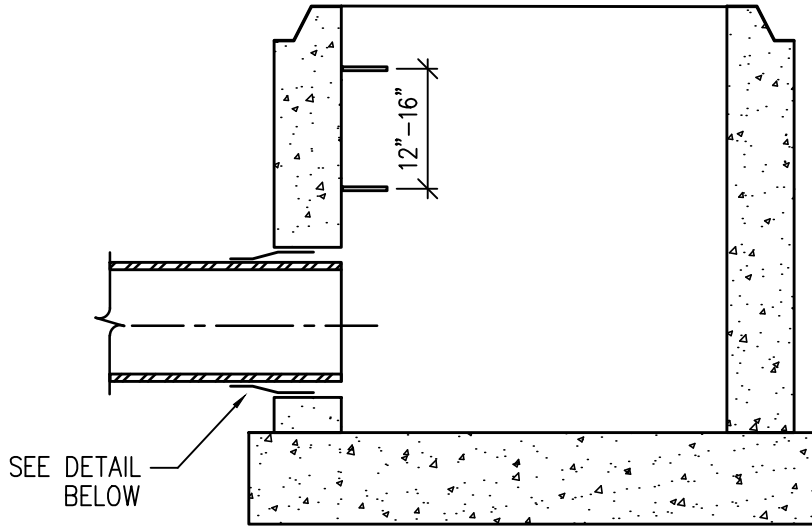


TOWN OF MEAD STANDARD DESIGN CRITERIA

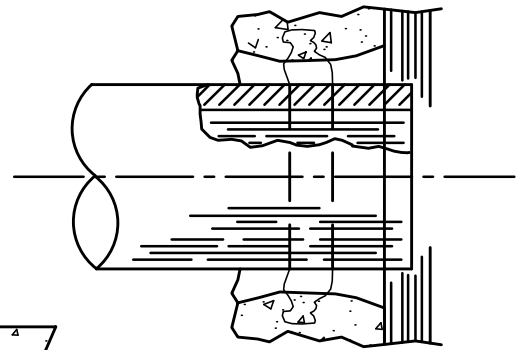
SANITARY MANHOLE BASE

D4.07

DATE: 04/2021



NOTE:
THIS DETAIL IS APPLICABLE FOR
ALL PIPE PENETRATIONS AT ALL
MANHOLES



A-LOK GASKET DETAIL

FLEXIBLE JOINT CONNECTION

SCALE: NTS



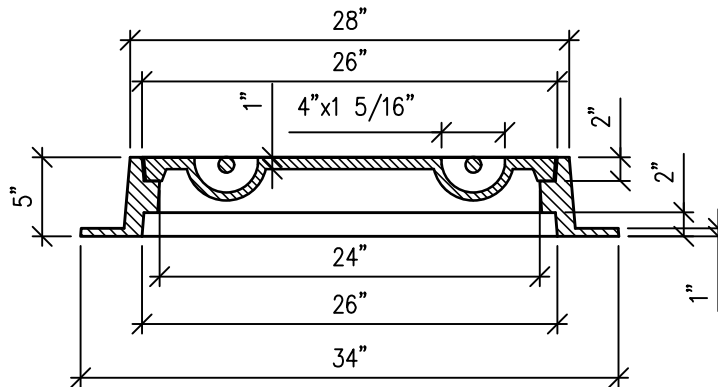
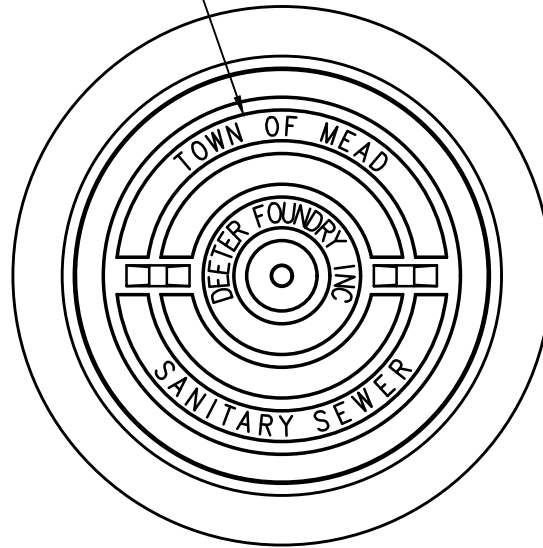
TOWN OF MEAD STANDARD DESIGN CRITERIA

FLEXIBLE JOINT PIPE PENETRATIONS

D4.08

DATE: 04/2021

1 1/2" LETTERS



NOTES:

1. RING AND COVER SHALL BE IRON (AS MANUFACTURED FOR CURRENT AWWA STANDARD).
2. SANITARY SEWER MANHOLE COVERS SHALL BE NONPERFORATED WITH "TOWN OF MEAD SANITARY SEWER" FORGED ON THE TOP OF THE LID AS SHOWN ABOVE.
3. COVER SHALL BE BOLTED (PER DETAIL D4.10), WATER RESISTANT IF LOCATED IN 100 YEAR FLOOD PLAIN, BACK YARDS, OPEN SPACE AND/OR DITCHES BELOW GROUND.
4. ALL MANHOLES SHALL BE EQUIVALENT TO DEETER MODEL NUMBER 1156.
5. MANHOLE LID AND RING SHALL BE FURNISHED WITH MACHINED HORIZONTAL BEARING SURFACES.

SCALE: NTS

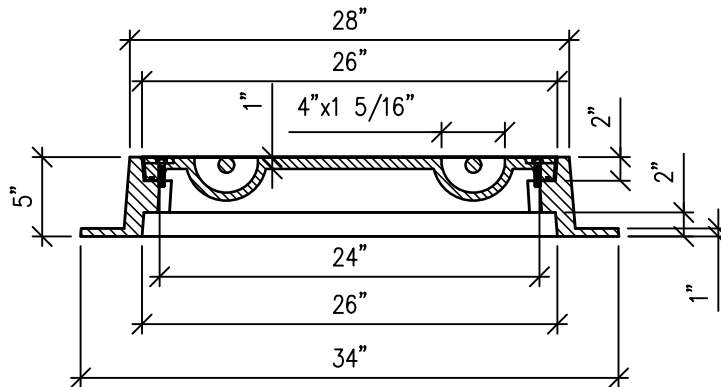
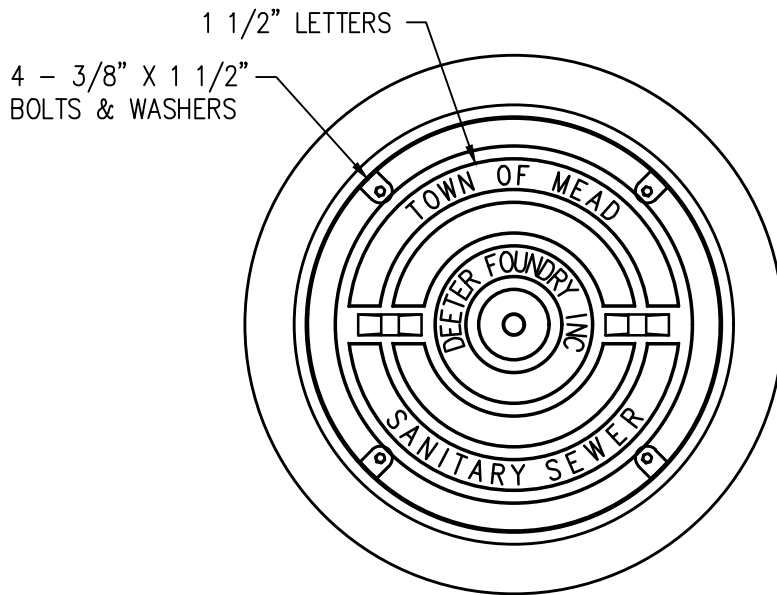


TOWN OF MEAD STANDARD DESIGN CRITERIA

MANHOLE RING AND COVER – NON-BOLTED

D4.09

DATE: 04/2021



NOTES:

1. RING AND COVER SHALL BE IRON (AS MANUFACTURED FOR CURRENT AWWA STANDARD).
2. SANITARY SEWER MANHOLE COVERS SHALL BE NONPERFORATED WITH "TOWN OF MEAD SANITARY SEWER" FORGED ON THE TOP OF THE LID AS SHOWN ABOVE.
3. COVER SHALL BE BOLTED, WATER RESISTANT IF LOCATED IN 100 YEAR FLOOD PLAIN, BACK YARDS, OPEN SPACE AND/OR DITCHES BELOW GROUND.
4. ALL MANHOLES SHALL BE EQUIVALENT TO DEETER MODEL NUMBER 1156.
5. MANHOLE LID AND RING SHALL BE FURNISHED WITH MACHINED HORIZONTAL BEARING SURFACES.
6. COVER IS BOLTED TO FRAME.
7. MANHOLE LID AND RING SHALL BE FURNISHED WITH GASKET.

SCALE: NTS

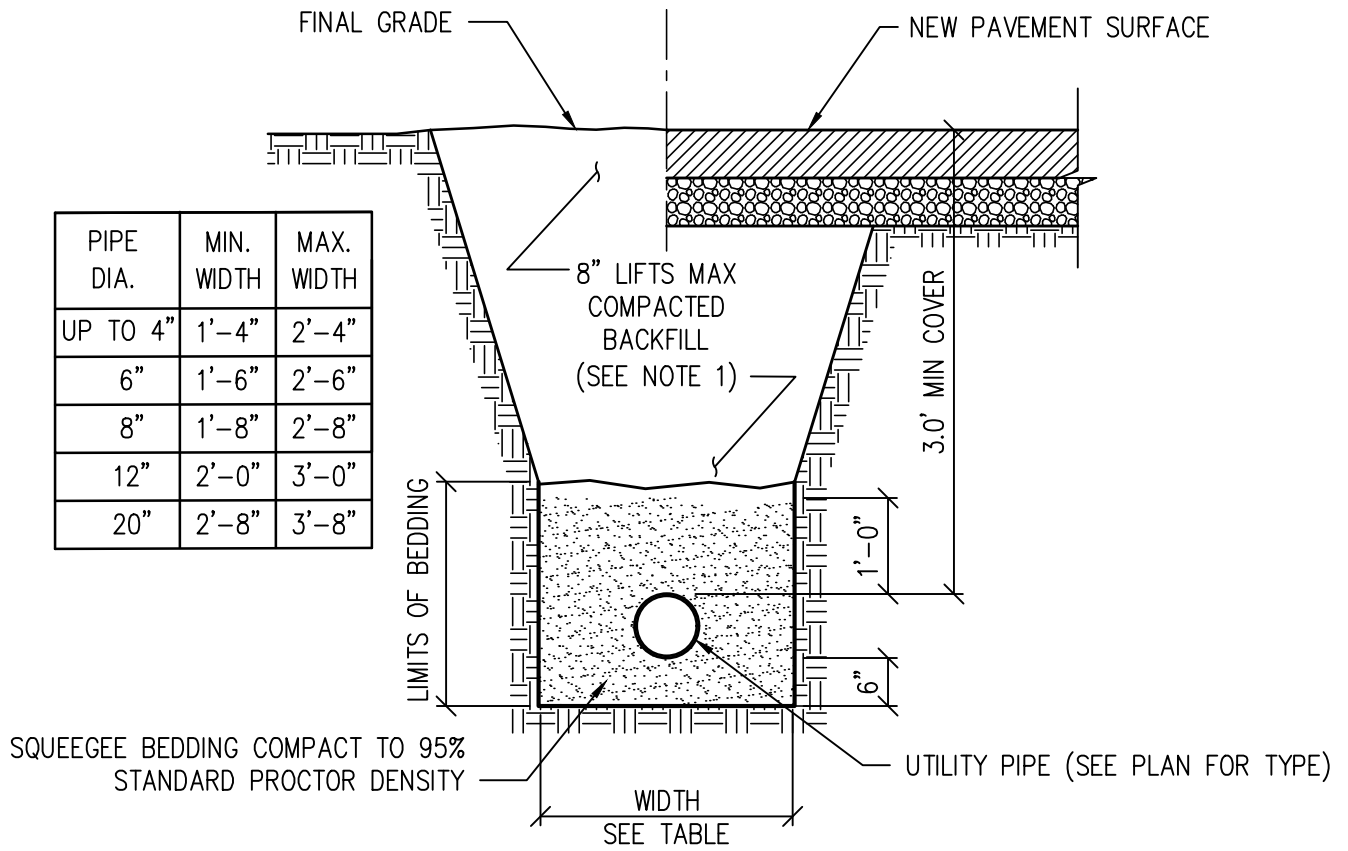


TOWN OF MEAD STANDARD DESIGN CRITERIA

MANHOLE RING AND COVER – BOLTED

D4.10

DATE: 04/2021



NOTES:

1. COMPACTED BACKFILL TO 90% STANDARD PROCTOR DENSITY IN NON-DRIVING SURFACES AND 98% UNDER PAVEMENT.
2. IF UNSTABLE MATERIALS ARE FOUND IN TRENCH BOTTOM, OVER EXCAVATE 12" BELOW STANDARD EMBEDMENT AND FILL WITH 3/4" CRUSHED ROCK, COMPACTED TO 95%.
3. SHOULD THE TRENCH BE EXCAVATED WIDER THAN ALLOWED A CONCRETE CRADLE SHALL BE PLACED WITH 2500 PSI CONCRETE FROM TRENCH BOTTOM TO PIPE SPRINGLINE.
4. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND THE PROTECTION OF OTHER UTILITIES IN ACCORDANCE WITH LOCAL STATE AND FEDERAL SAFETY REGULATIONS.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

PIPE TRENCHING

D4.11

DATE: 04/2021

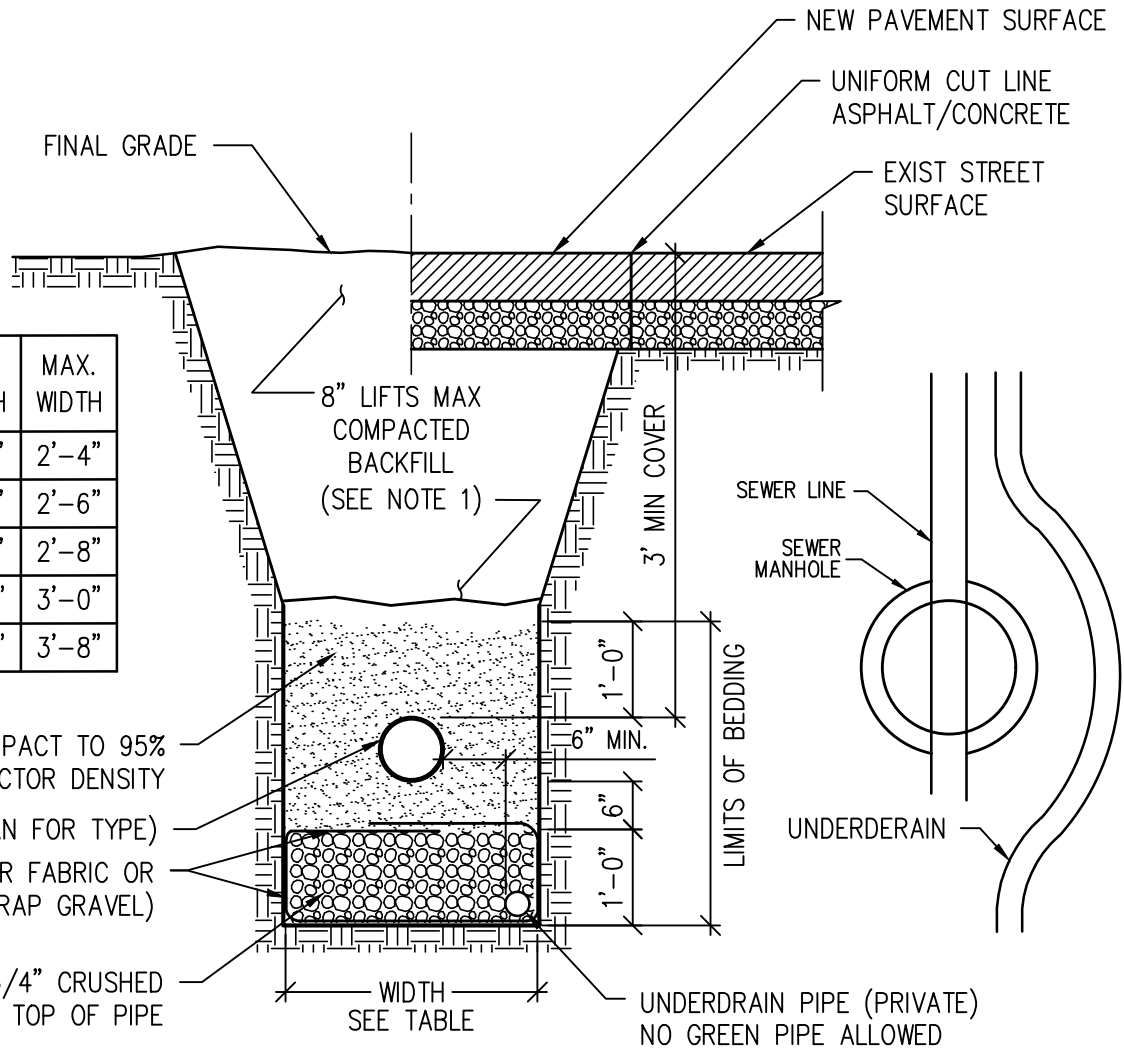
PIPE DIA.	MIN. WIDTH	MAX. WIDTH
UP TO 4"	1'-4"	2'-4"
6"	1'-6"	2'-6"
8"	1'-8"	2'-8"
12"	2'-0"	3'-0"
20"	2'-8"	3'-8"

SQUEEGEE BEDDING COMPACT TO 95% STANDARD PROCTOR DENSITY

UTILITY PIPE (SEE PLAN FOR TYPE)

MIRAFI 140N FILTER FABRIC OR APPROVED EQUAL (WRAP GRAVEL)

BEDDING 3/4" CRUSHED WASHED ROCK TO TOP OF PIPE



NOTES:

1. COMPACTED BACKFILL TO 90% STANDARD PROCTOR DENSITY IN NON-DRIVING SURFACES AND 98% IN STREET ROW.
2. SHOULD THE TRENCH BE EXCAVATED WIDER THAN ALLOWED, A CONCRETE CRADLE SHALL BE PLACED WITH 2500 PSI CONCRETE FROM TRENCH BOTTOM TO PIPE SPRINGLINE.
3. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND THE PROTECTION OF OTHER UTILITIES IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL SAFETY REGULATIONS.
4. DISTANCE BETWEEN UNDERDRAIN INVERT AND SEWER INVERT TO BE EQUAL TO THE DIAMETER OF THE DRAIN BELOW THE SEWER AND TO BE OFFSET TO SIDE.
5. MAINTAIN POSITIVE SLOPE OF UNDERDRAIN TO DAYLIGHT.
6. TOWN OF MEAD SHALL NOT ASSUME OWNERSHIP OF UNDERDRAINS AND WILL NOT BE RESPONSIBLE FOR MAINTENANCE.

SCALE: NTS



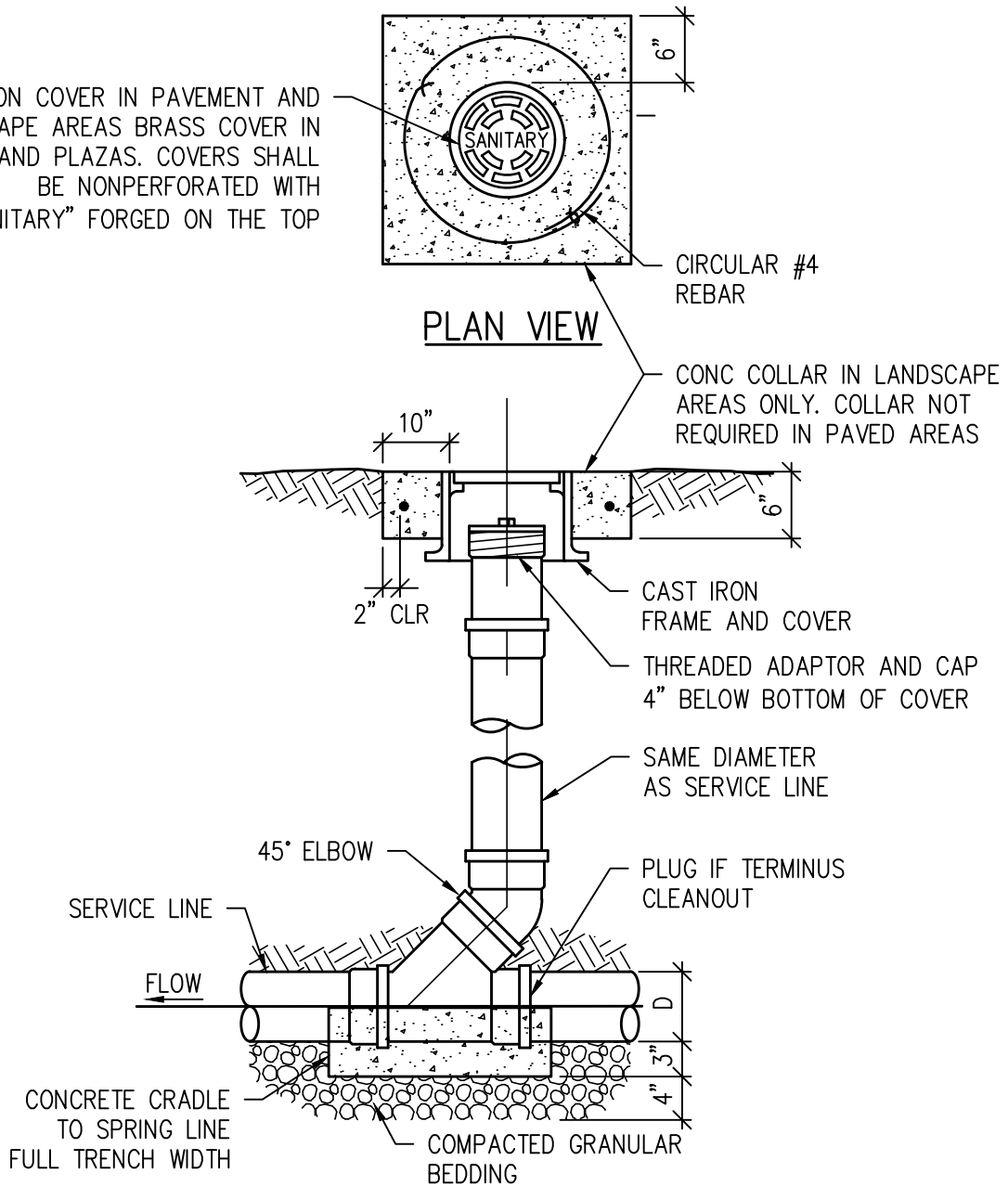
TOWN OF MEAD STANDARD DESIGN CRITERIA

PIPE TRENCHING WITH UNDERDRAIN SYSTEM

D4.12

DATE: 04/2021

CAST IRON COVER IN PAVEMENT AND LANDSCAPE AREAS BRASS COVER IN WALKS AND PLAZAS. COVERS SHALL BE NONPERFORATED WITH "SANITARY" FORGED ON THE TOP



NOTES:

1. CLEANOUT SHALL BE CONSTRUCTED SO THAT SURFACE LOAD WILL NOT BE TRANSFERRED TO MAIN.
2. SERVICE LINE CLEANOUT MAY BE INSTALLED APPROXIMATELY 5 FEET OUTSIDE THE BUILDING FOUNDATION.
3. A CLEANOUT IS REQUIRED ON ALL SERVICE LINES EVERY 100 FEET, AT EVERY "Y" OR AFTER A COMBINED TOTAL 135 DEGREES OF BEND.

SCALE: NTS

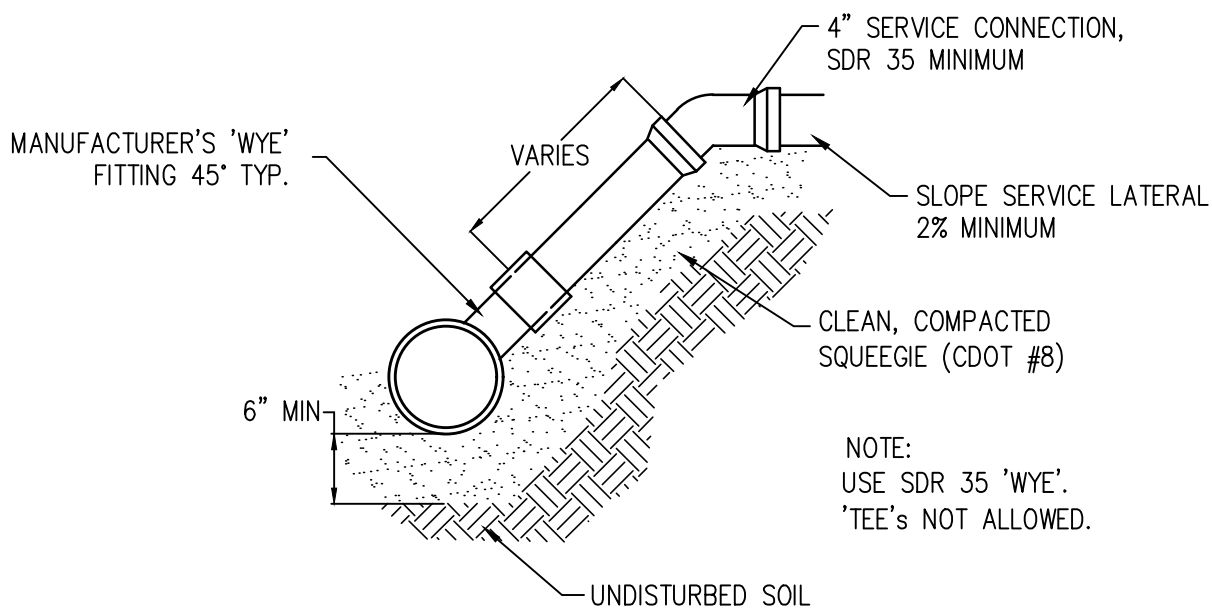
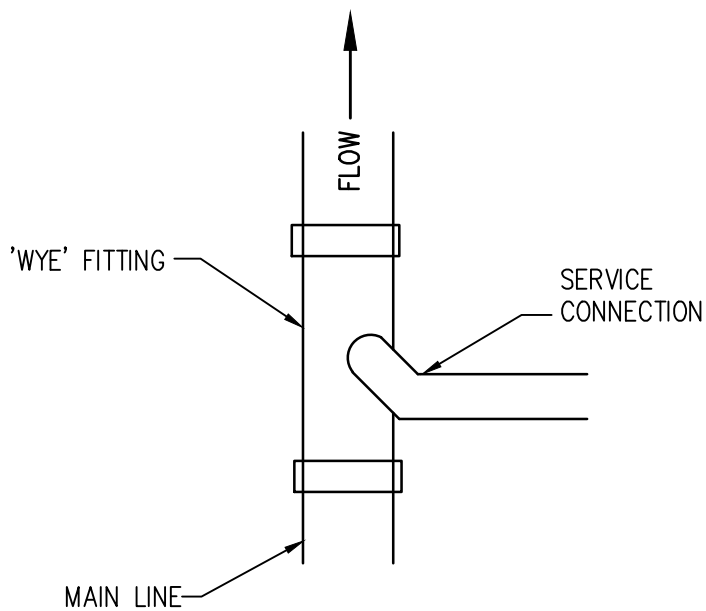


TOWN OF MEAD STANDARD DESIGN CRITERIA

SANITARY CLEANOUT

D4.13

DATE: 04/2021



NOTE:
USE SDR 35 'WYE'.
'TEE's NOT ALLOWED.

SCALE: NTS

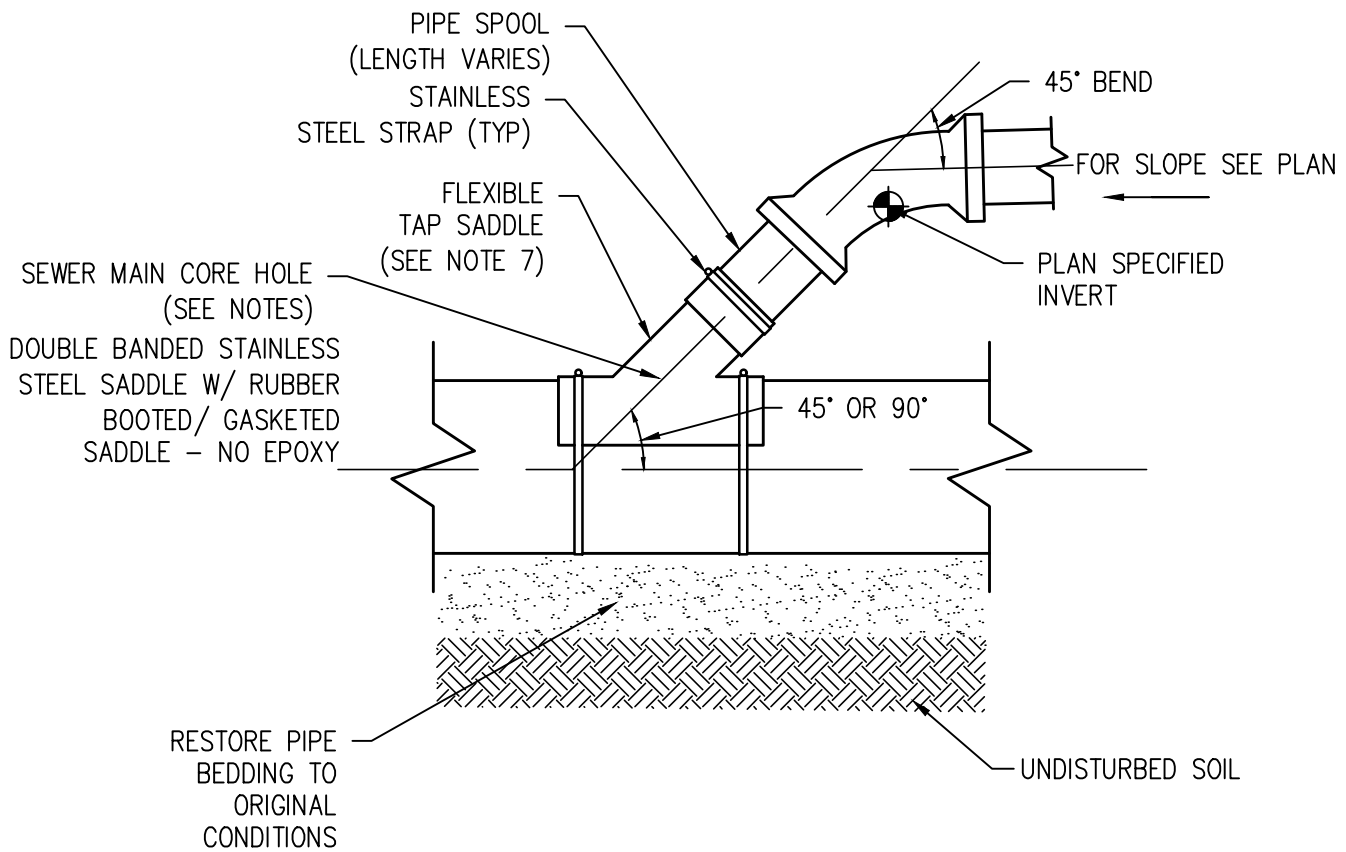


TOWN OF MEAD STANDARD DESIGN CRITERIA

TYPICAL SERVICE CONNECTION

D4.14

DATE: 04/2021



NOTE:

1. APPROVED TAPPING SADDLE TO BE USED FOR NEW SERVICES TO EXISTING MAINS SHALL BE TEES. PIPE PENETRATIONS SHALL BE MECHANICALLY DRILLED.
2. TAPHOLE MUST BE ABOVE THE SPRINGLINE.
3. 4" SEWER SERVICES SHALL HAVE A MINIMUM SLOPE OF 2.0%.
4. 6" SEWER SERVICES SHALL HAVE A MINIMUM SLOPE OF 1.0%.
5. SERVICES SHALL NOT BE CLOSER THAN 5 FT. FROM EACH OTHER ON THE MAIN.
6. AN INSERT A TEE MAY BE AN ACCEPTABLE SUBSTITUTION AS APPROVED BY THE TOWN ENGINEER.
7. REFERENCE SPECIFICATIONS FOR APPROVED TAP SADDLE MANUFACTURERS.

SCALE: NTS

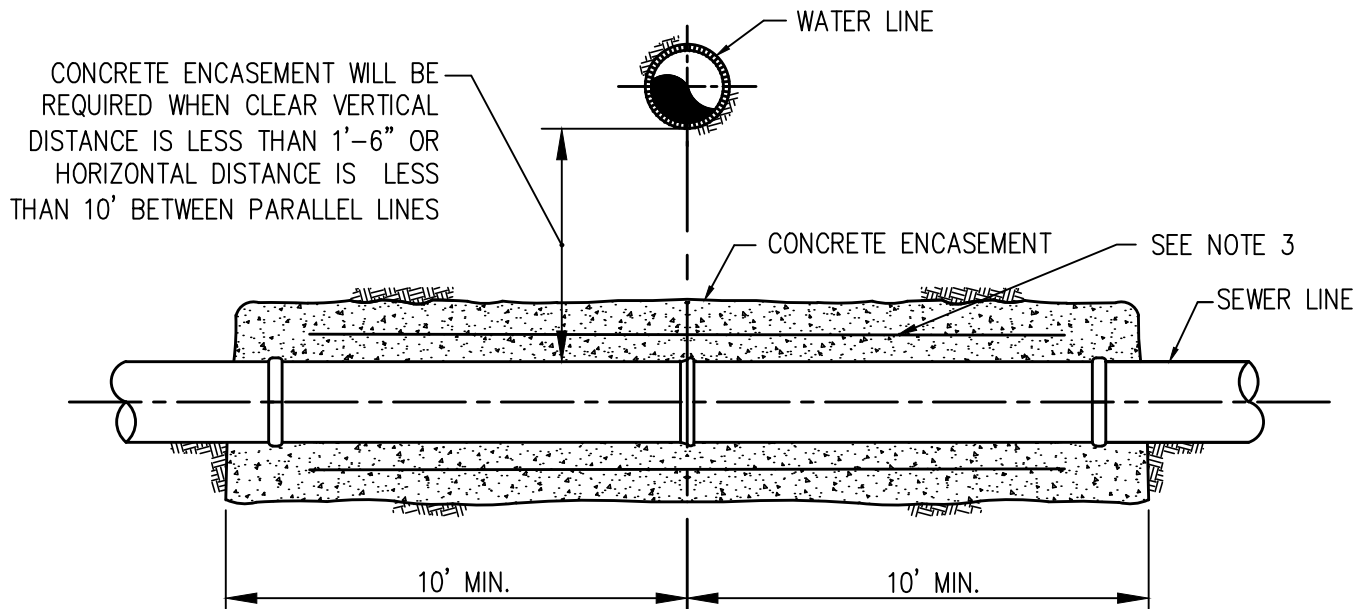


TOWN OF MEAD STANDARD DESIGN CRITERIA

TAPPING SADDLE

D4.15

DATE: 04/2021



NOTE:

1. CONCRETE ENCASEMENT REQUIRED IN ALL CASES WHERE SEWER LINE IS ABOVE WATER LINE.
2. MINIMUM WIDTH AND DEPTH ARE 12" + PIPE O.D.
3. INSTALL REBAR PER DETAIL D4.17.

SCALE: NTS

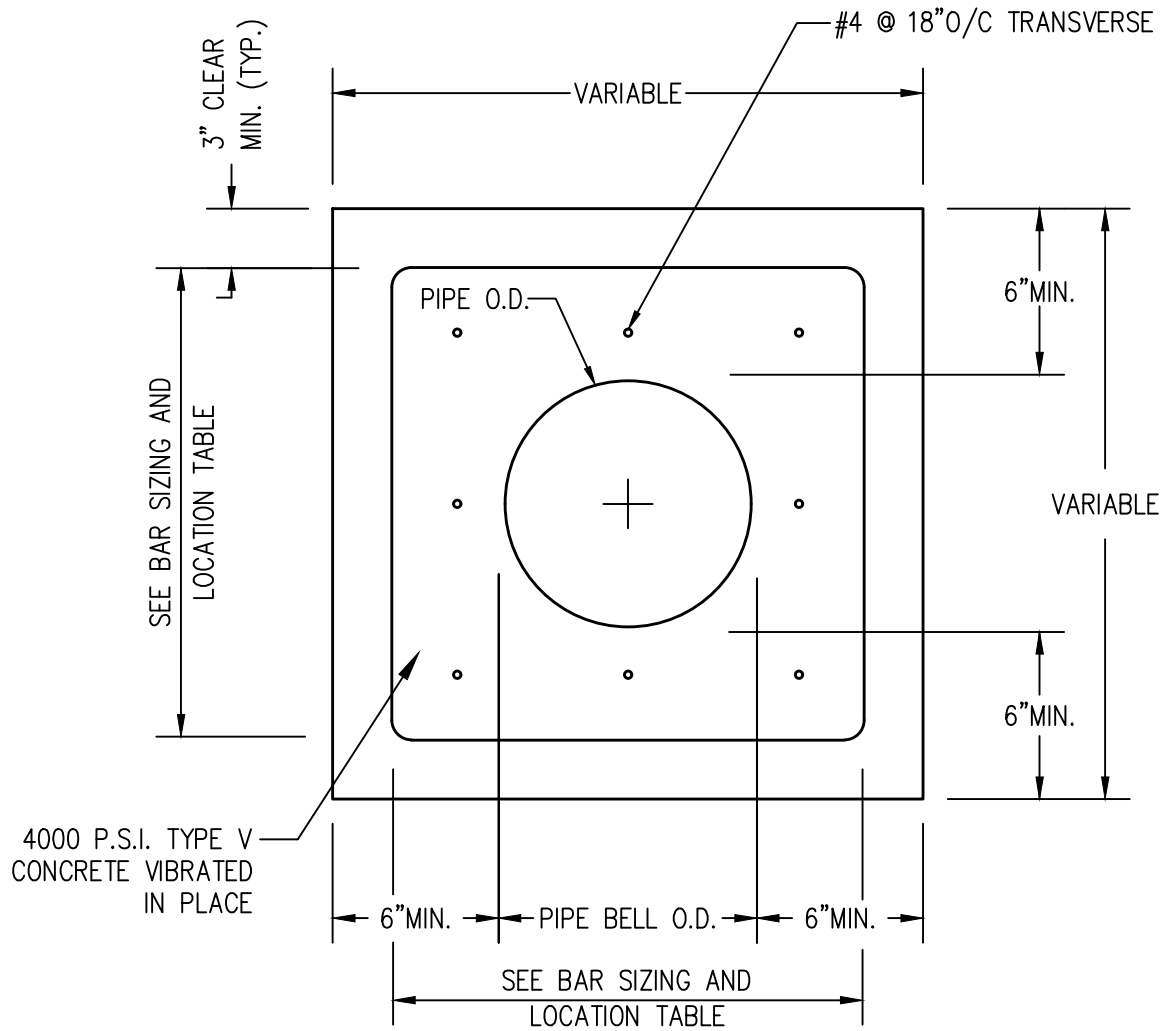


TOWN OF MEAD STANDARD DESIGN CRITERIA

PIPE ENCASEMENT

D4.16

DATE: 04/2021



PIPE I.D.	LONGITUDINAL BARS	LOCATION
6 IN.	4-#4 BARS	1 EACH CORNER
8 IN.	4-#4 BARS	1 EACH CORNER
10 IN.	8-#4 BARS	3 EACH SIDE
12 IN.	8-#4 BARS	3 EACH SIDE
15 IN.	8-#4 BARS	3 EACH SIDE
18 IN.	8-#4 BARS	3 EACH SIDE
21 IN.	12-#4 BARS	4 EACH SIDE
24 IN.	12-#4 BARS	4 EACH SIDE
27 IN.	12-#4 BARS	4 EACH SIDE
30 IN.	12-#4 BARS	4 EACH SIDE
33 IN.	12-#4 BARS	4 EACH SIDE
36 IN.	16-#4 BARS	5 EACH SIDE

SCALE: NTS

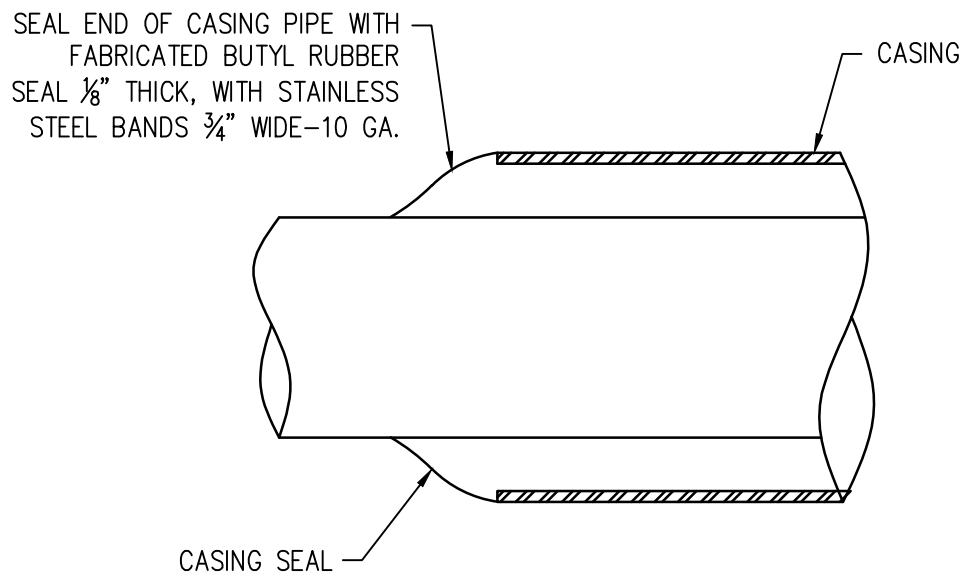
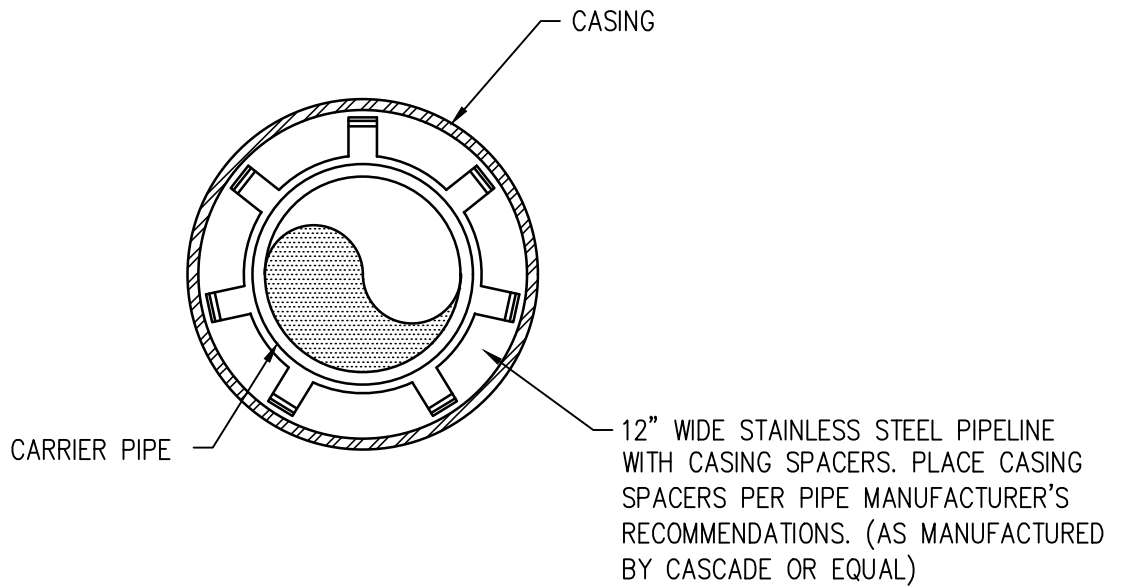


TOWN OF MEAD STANDARD DESIGN CRITERIA

PIPE ENCASEMENT SPECIFICATIONS

D4.17

DATE: 04/2021



SCALE: NTS

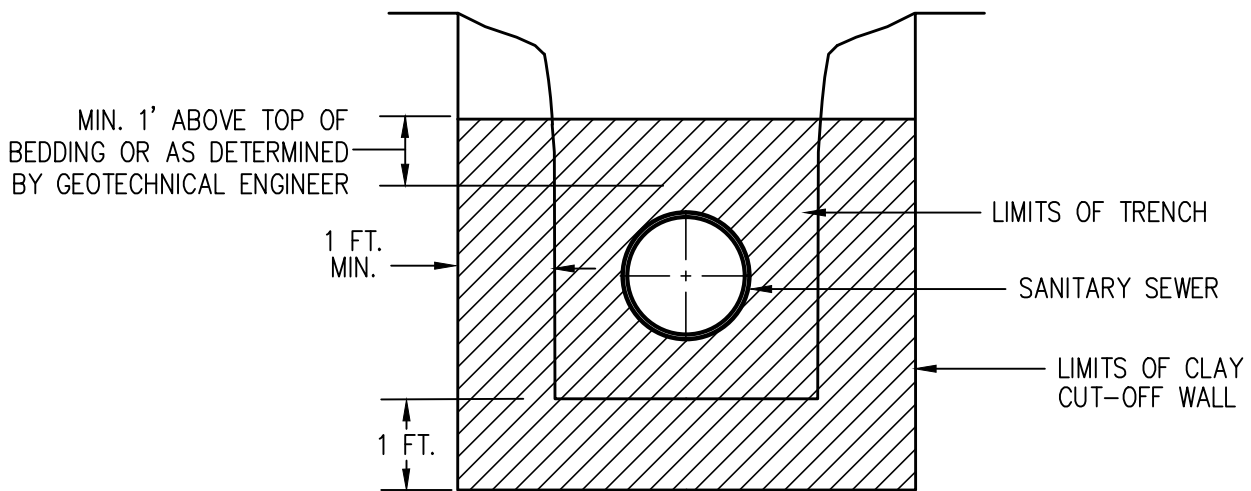
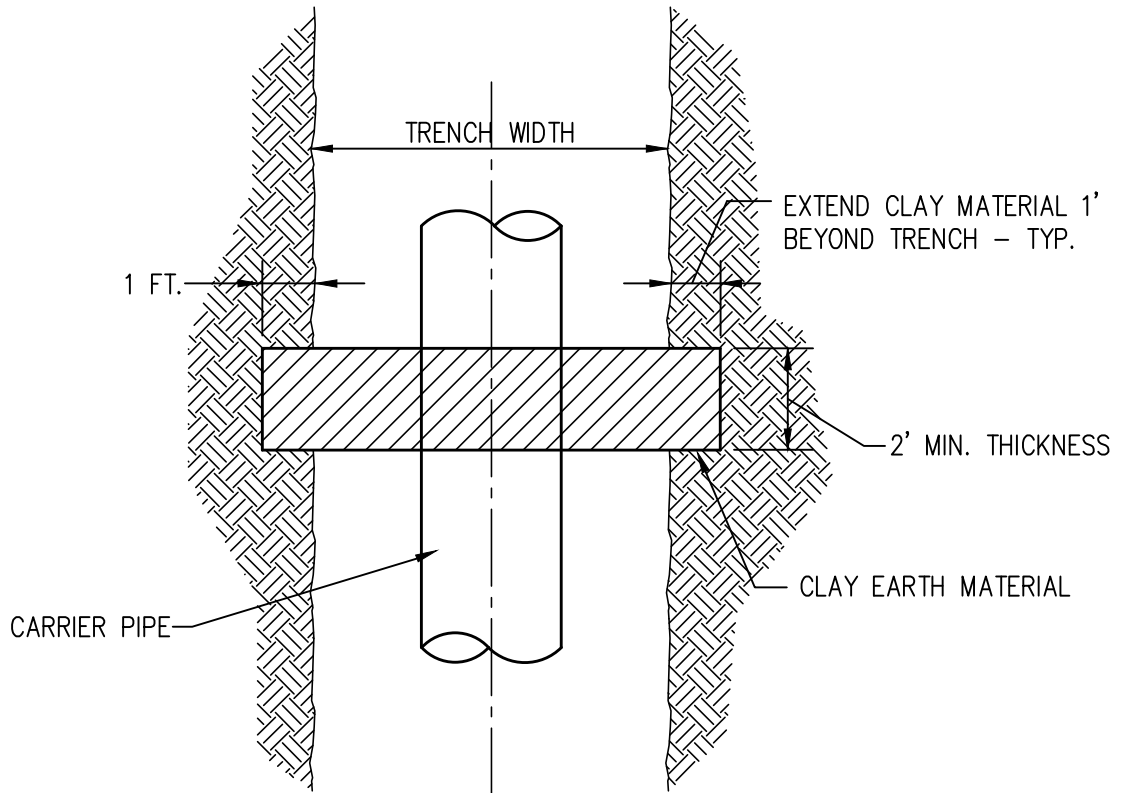


TOWN OF MEAD STANDARD DESIGN CRITERIA

STANDARD PIPE CASING

D4.18

DATE: 04/2021



NOTE:

1. CLAY WALL EXTENDS A MINIMUM OF 12 INCHES INTO UNDISTURBED SOIL ON EACH SIDE AND ON BOTTOM OF TRENCH.
2. CLAY MATERIAL TO BE CLASSIFIED AS CL, CH OR OH.
3. FLOWFILL MAY BE USED INSTEAD OF CLAY MATERIAL.

SCALE: NTS

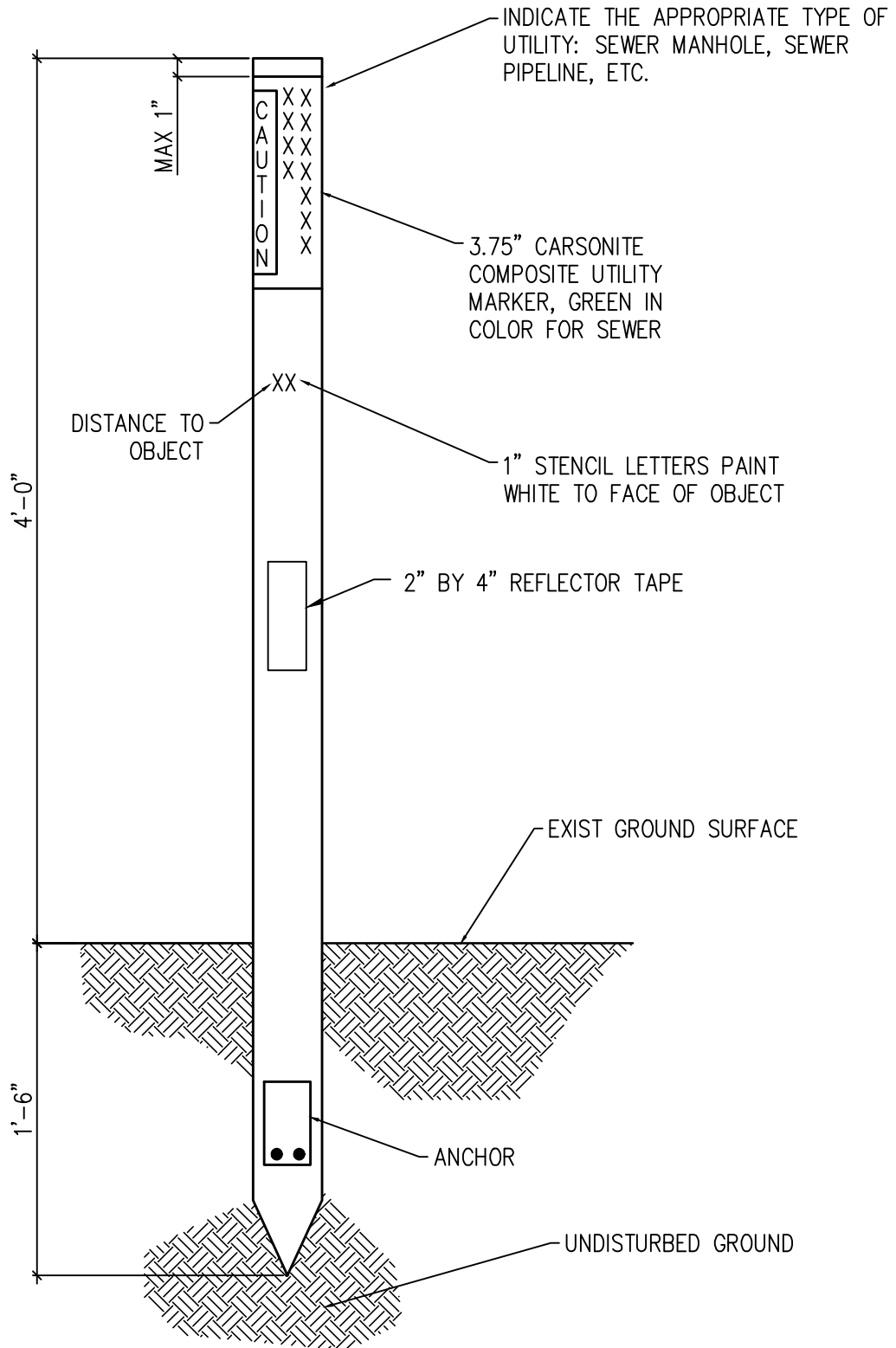


TOWN OF MEAD STANDARD DESIGN CRITERIA

CUT-OFF WALL

D4.19

DATE: 04/2021



SCALE: NTS

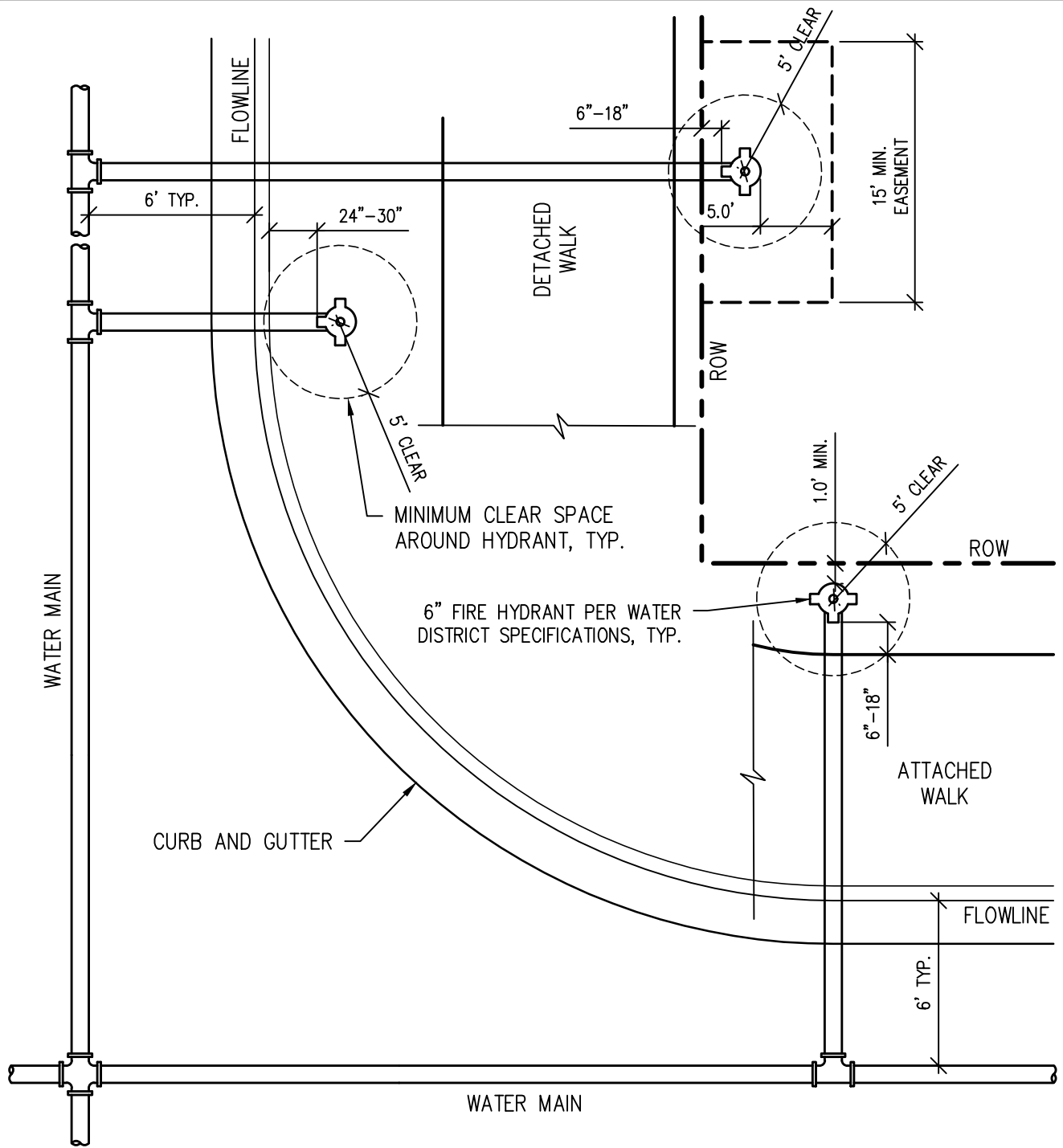


TOWN OF MEAD STANDARD DESIGN CRITERIA

SANITARY UTILITY MARKER POST

D4.20

DATE: 04/2021



NOTES:

1. HYDRANT TO BE SET AT CURB RETURN.
2. VALVES SHALL NOT BE LOCATED UNDER CURB AND GUTTER, OR CONCRETE PAN.
3. A 5.0' CLEAR DISTANCE MUST BE MAINTAINED AROUND HYDRANT.
4. ALL MEASUREMENTS ARE TO THE OUTSIDE OF PIPE.
5. AN EASEMENT IS REQUIRED FOR UTILITIES OUTSIDE OF RIGHT-OF-WAY. EASEMENT DIMENSIONS AS SHOWN ARE THE MINIMUM. EASEMENT DIMENSIONS SHALL MEET THE MINIMUM REQUIREMENTS OF THE APPROPRIATE WATER DISTRICT.

SCALE: NTS

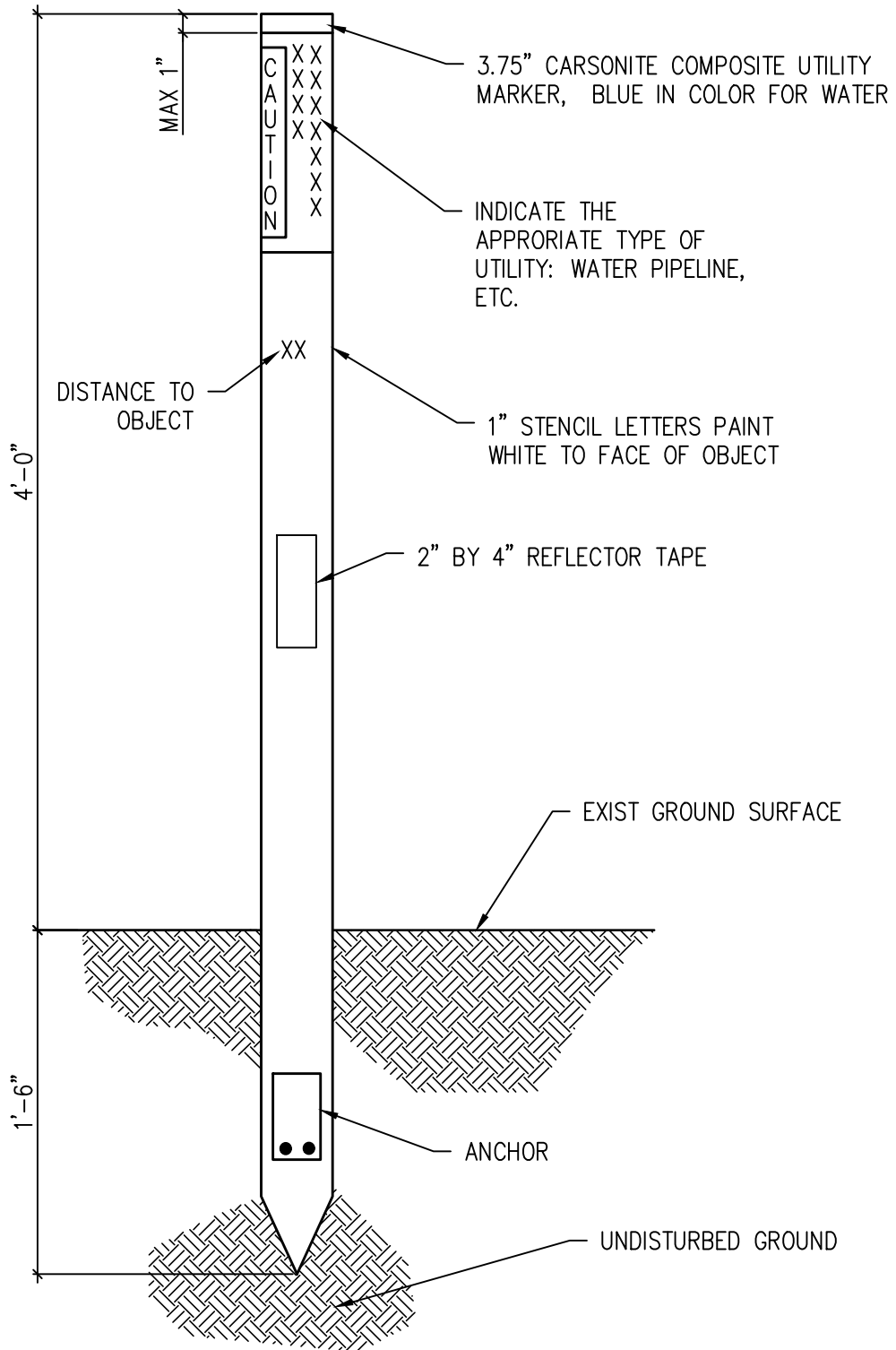


TOWN OF MEAD STANDARD DESIGN CRITERIA

FIRE HYDRANT PLACEMENT

D5.01

DATE: 04/2021



SCALE: NTS

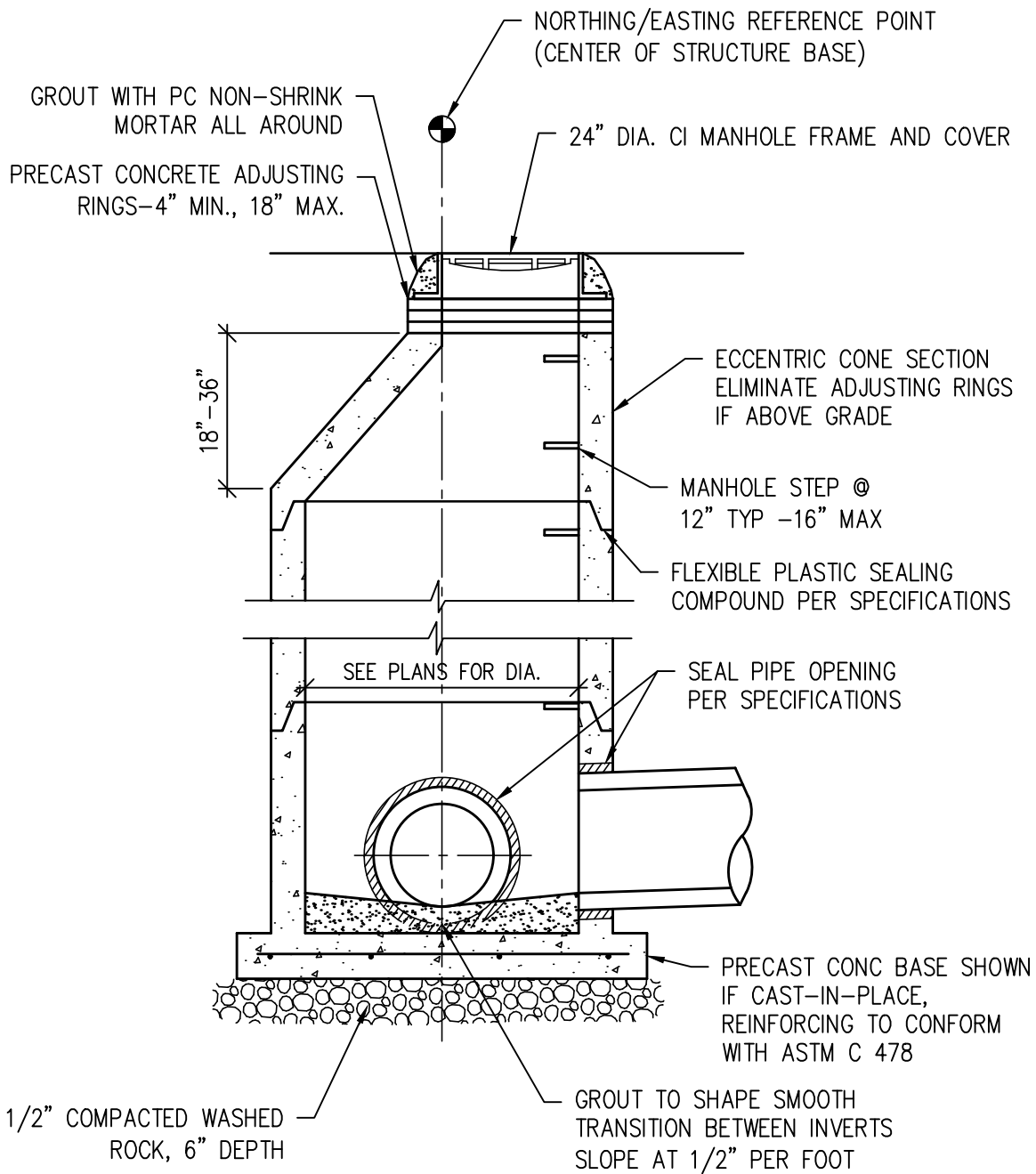


TOWN OF MEAD STANDARD DESIGN CRITERIA

WATER UTILITY MARKER POST

D5.02

DATE: 04/2021



NOTES:

1. SHAPING FOR SMOOTH MANHOLE INVERTS MUST BE DONE BY FORMING OR SHAPING BASE CONCRETE.
2. BLOCK-OUTS WHEN APPROVED SHALL EXTEND A MAX OF 6" PAST MANHOLE OD AND BE SATISFACTORILY PLUGGED AND SEALED.
3. CONCRETE MANHOLES MAY BE POURED IN PLACE ONLY WITH PRIOR APPROVAL.
4. ALL MORTAR SHALL BE MIXED WITH A TYPE II CEMENT.
5. BENCH MUST HAVE A BRUSHED, NON-SKID SURFACE.



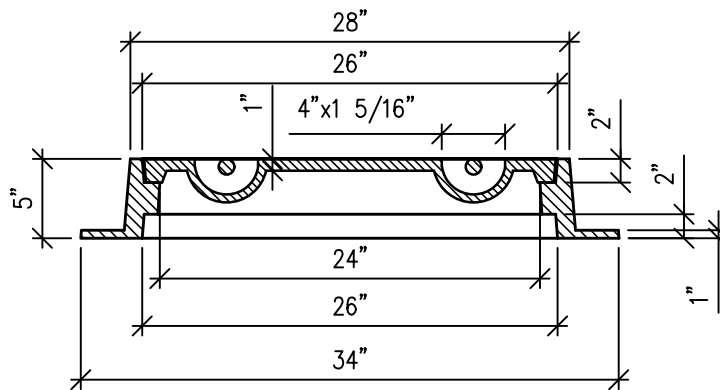
TOWN OF MEAD STANDARD DESIGN CRITERIA

STORM MANHOLE

D6.01A

DATE: 04/2021

1 1/2" LETTERS MIN



NOTES:

1. RING AND COVER SHALL BE IRON (AS MANUFACTURED FOR CURRENT AWWA STANDARD).
2. STORM SEWER MANHOLE COVERS SHALL BE NONPERFORATED WITH "DUMP NO WASTE! DRAINS TO WATERWAYS" AND "STORM SEWER" FORGED ON THE TOP OF THE LID AS SHOWN ABOVE.
3. ALL MANHOLES SHALL BE EQUIVALENT TO EAST JORDAN IRON WORKS MODEL 1480.
4. MANHOLE LID AND RING SHALL BE FURNISHED WITH MACHINED HORIZONTAL BEARING SURFACES.



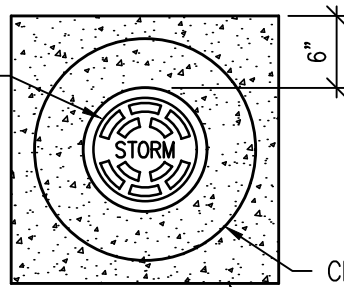
TOWN OF MEAD STANDARD DESIGN CRITERIA

STORM MANHOLE RING AND COVER

D6.01B

DATE: 04/2021

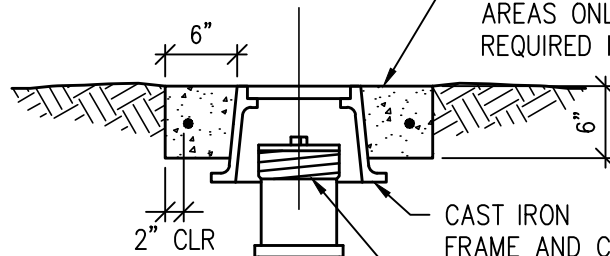
CAST IRON COVER IN PAVEMENT AND
LANDSCAPE AREAS
BRASS COVER IN WALKS AND PLAZAS.
COVERS SHALL BE NONPERFORATED WITH
"STORM" FORGED ON THE TOP



PLAN VIEW

CIRCULAR #4
REBAR

CONC COLLAR IN LANDSCAPE
AREAS ONLY. COLLAR NOT
REQUIRED IN PAVED AREAS.



CAST IRON
FRAME AND COVER

THREADED ADAPTOR AND CAP
4" BELOW BOTTOM OF COVER

SAME DIAMETER
AS SERVICE LINE

PLUG IF TERMINUS
CLEANOUT

SERVICE LINE

FLOW

CONCRETE CRADLE TO
SPRING LINE
FULL TRENCH WIDTH

GRANULAR
BEDDING

SCALE: NTS

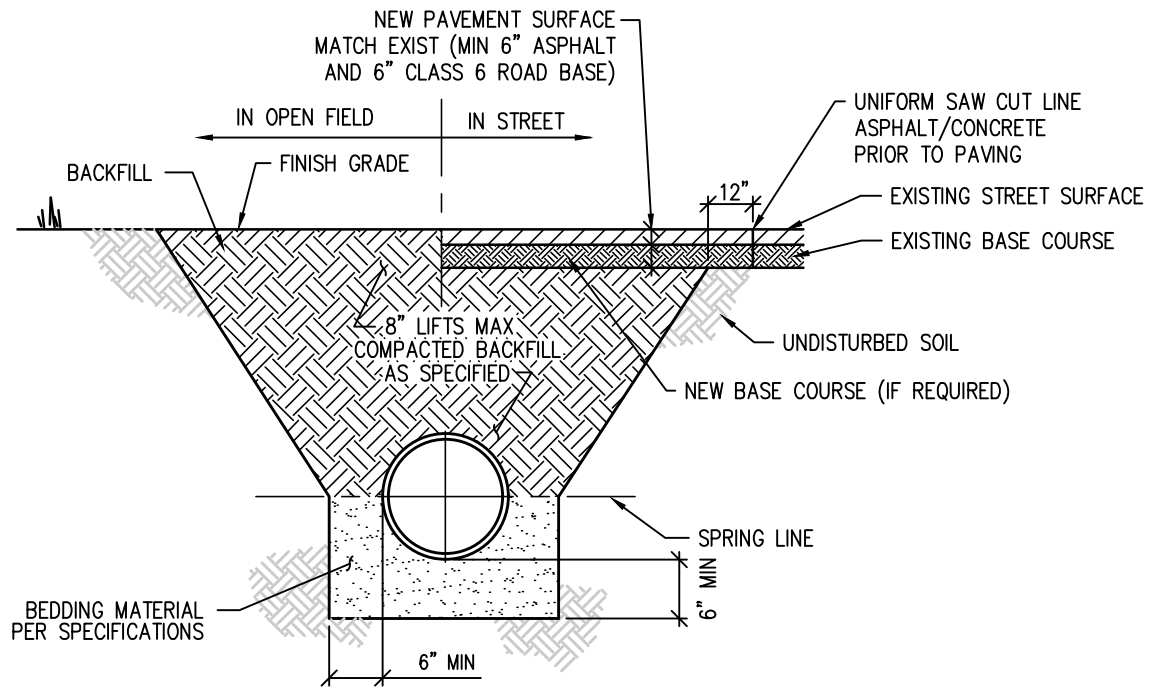


TOWN OF MEAD STANDARD DESIGN CRITERIA

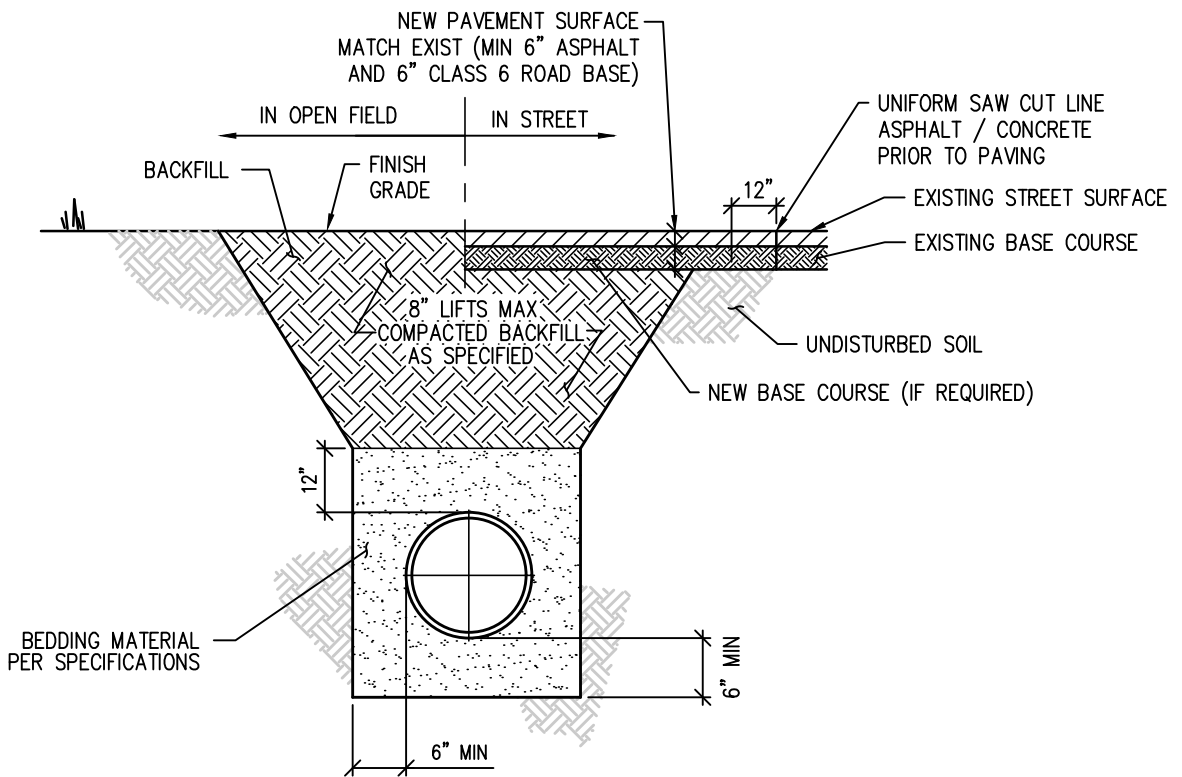
STORM CLEANOUT

D6.02

DATE: 04/2021



REINFORCED CONCRETE PIPE



CMP/PVC/HDPE PIPE (SEE PLANS FOR MATERIAL)

NOTES:

1. IF UNSTABLE MATERIALS ARE FOUND IN TRENCH, OVEREXCAVATED PER SPECIFICATIONS OR AS REQUIRED.
2. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKERS AND THE PROTECTION OF OTHER UTILITIES.

SCALE: NTS 3. MINIMUM COVER IS 18" BELOW FINISHED GRADE.

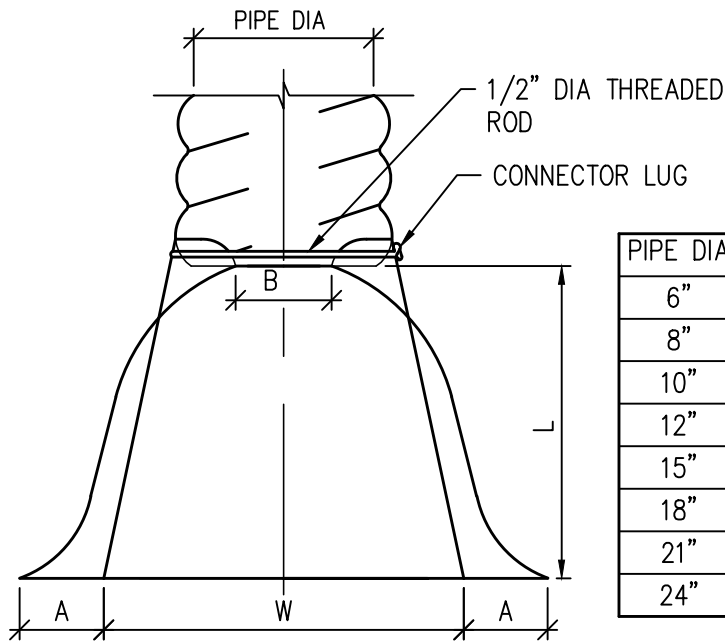


TOWN OF MEAD STANDARD DESIGN CRITERIA

STORM SEWER BEDDING DETAIL

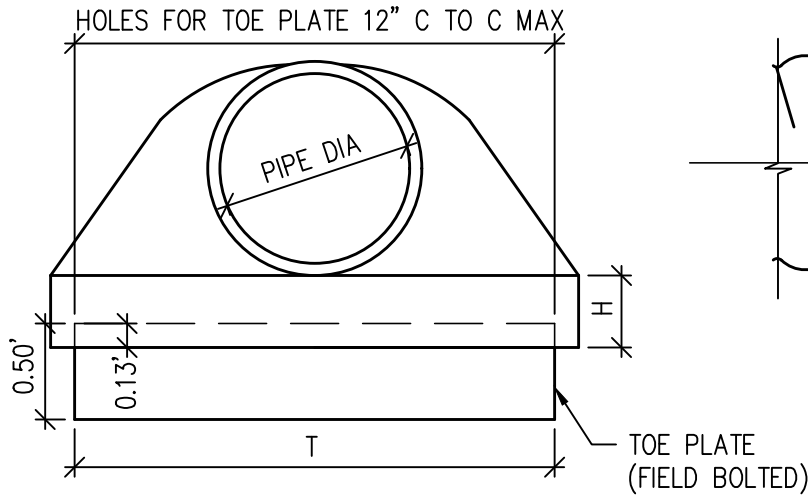
D6.03

DATE: 04/2021

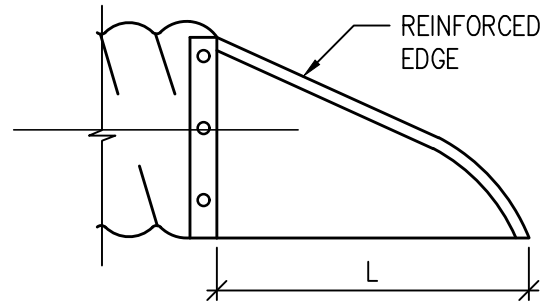


PLAN

PIPE DIA	GAUGE	A	B	H	L	W	T
6"	18	4"	1"	3"	8"	12"	20"
8"	18	5"	5"	4"	14"	16"	27"
10"	18	7"	6"	6"	14"	20"	35"
12"	16	6"	6"	6"	21"	24"	36"
15"	16	7"	8"	6"	26"	30"	44"
18"	16	8"	10"	6"	31"	36"	52"
21"	16	9"	12"	6"	36"	42"	60"
24"	16	10"	13"	6"	41"	48"	68"



ELEVATION



PROFILE

SCALE: NTS

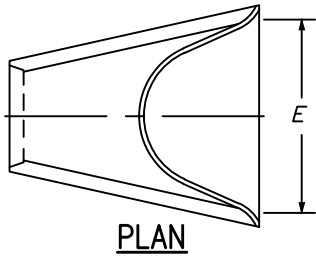


TOWN OF MEAD STANDARD DESIGN CRITERIA

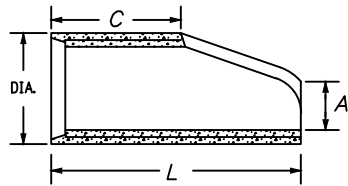
CMP TYPE 1 FLARED END SECTION

D6.04A

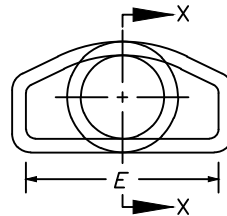
DATE: 04/2021



PIPE I.D.	DIMENSIONS			
	A	C	L	E
IN.				
18	10	48	78	36
24	10	48	78	48
30	14	36	96	60
36	18	36	96	72
42	24	36	96	78
48	28	24	96	84
54	30	36	96	90
60	36	36	96	96
72	34	20	96	108

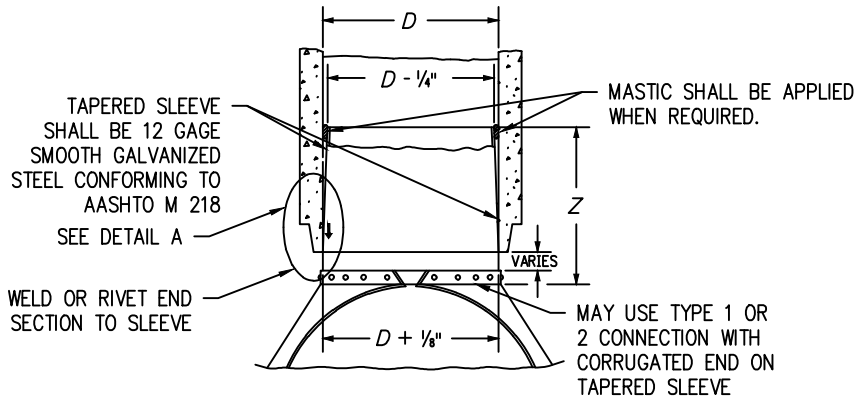


SECTION X-X



END VIEW

END SECTION FOR REINFORCED CONCRETE CIRCULAR PIPE



D	Z (MIN.)
IN.	
18 - 24	12
30 AND 36	16
42 AND LARGER	24

STEEL END SECTION FOR CONCRETE CIRCULAR PIPE
(ALTERNATIVE FOR CONCRETE END SECTION)

NOTES:

METAL END SECTION SHALL BE FIRMLY WEDGED INTO PIPE END BEFORE BACKFILLING

SCALE: NTS

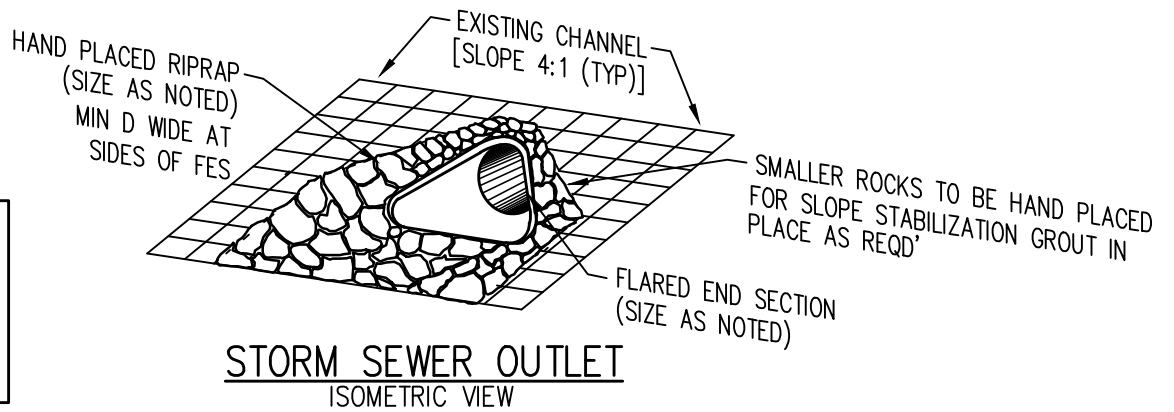
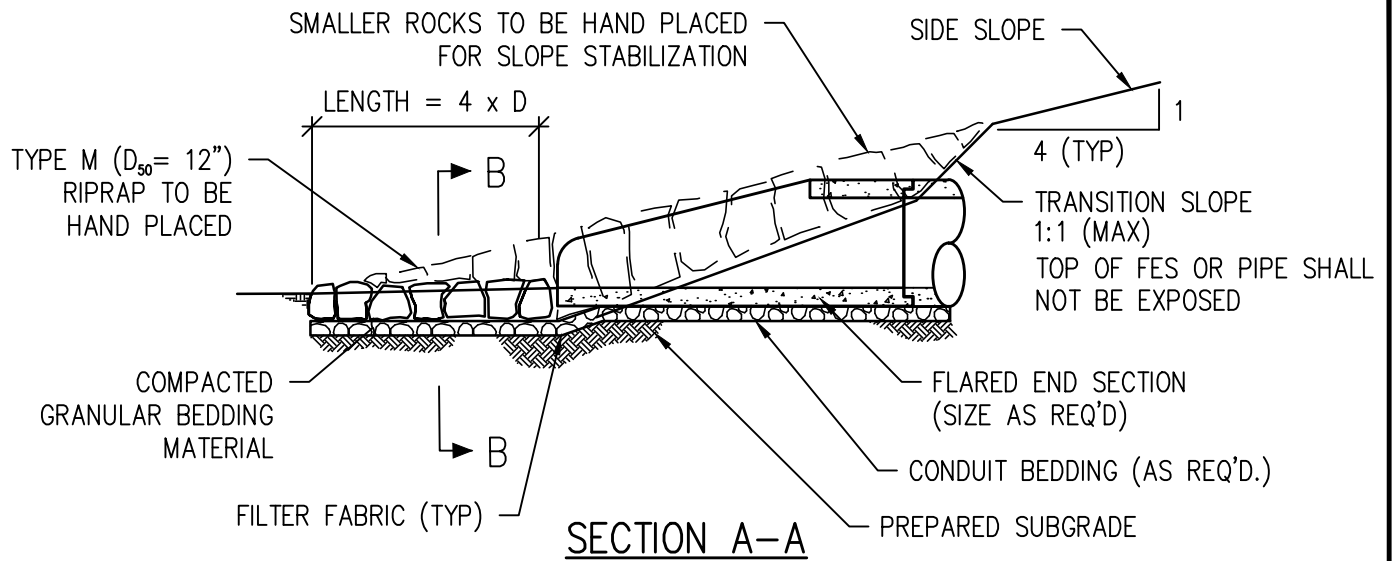


TOWN OF MEAD STANDARD DESIGN CRITERIA

RCP FLARED END SECTION

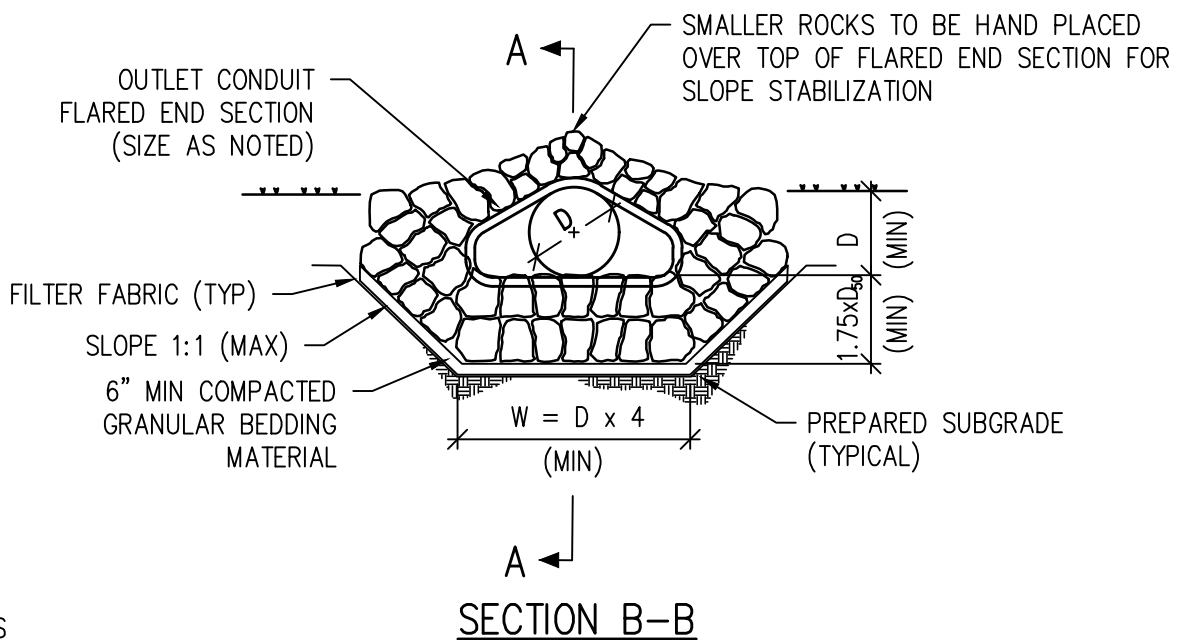
D6.04B

DATE: 04/2021



RIPRAP SIZING

TYPE VL	D50=6"
TYPE L	D50=9"
TYPE M	D50=12"
TYPE H	D50=18"
TYPE VH	D50=24"



SCALE: NTS

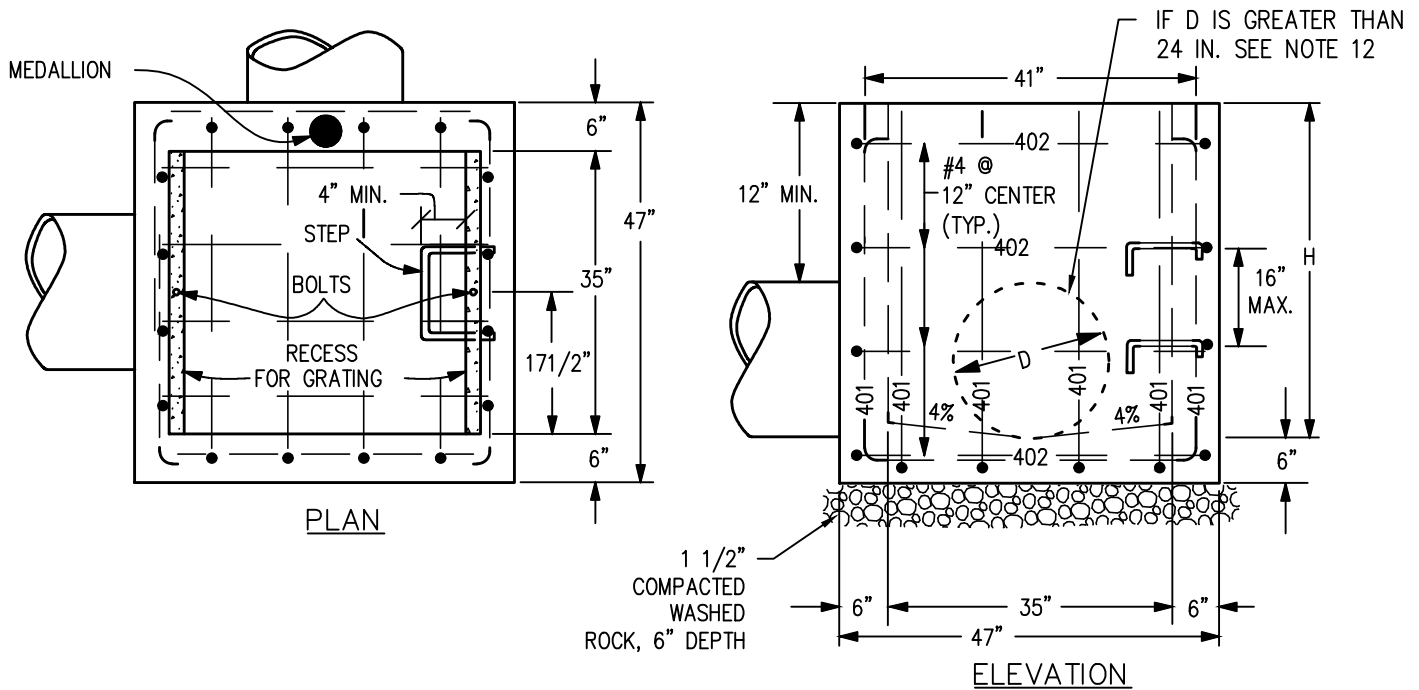


TOWN OF MEAD STANDARD DESIGN CRITERIA

RIP RAP FLARED END SECTION

D6.05

DATE: 04/2021



NOTES:

1. INLET TYPE C IS NOT HS-20 RATED AND SHALL NOT BE PLACED IN PAVED ROADWAYS. THIS INLET SHALL BE USED ONLY OUTSIDE PAVED ROADWAYS.
2. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
3. REINFORCING BARS SHALL BE EPOXY COATED AND DEFORMED #4, AND SHALL HAVE A MINIMUM 2 IN. CLEARANCE. CUT OR BEND AROUND PIPES AS REQUIRED.
4. CONCRETE SLOPE AND DITCH PAVING SHALL BE IN ACCORDANCE WITH CDOT SECTION 507. REINFORCEMENT FOR CONCRETE SLOPE PAVING SHALL BE 6 X 6 - W1.4 X W1.4 OR 6 X 6 - W2.1 X W2.1.
5. STRUCTURAL STEEL FOR GRATES AND GRATE INSTALLATION HARDWARE SHALL BE GALVANIZED, AND SHALL BE IN ACCORDANCE WITH CDOT SUBSECTION 712.06.
6. THE STANDARD INLET GRATES SHALL BE USED ON ALL TYPE C INLETS UNLESS CLOSE MESH GRATES ARE SPECIFIED ON THE PLANS.
7. CLOSE MESH GRATES ARE RECOMMENDED WHERE FOOT TRAFFIC OR BICYCLE ROUTES ARE IN CLOSE PROXIMITY TO GRATE. THIS GRATE IS NOT ADA COMPLIANT OR BICYCLE FRIENDLY AND SHALL NOT BE PLACED DIRECTLY IN SIDEWALKS, CROSSWALKS OR BIKE PATHS.
8. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO OR GREATER THAN 3 FT. - 6 IN., AND SHALL CONFORM TO AASHTO M 199.
9. ALL INLETS SHALL HAVE A 4 IN. DIA. METAL MEDALLION WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE ON IT. THE MEDALLION SHALL HAVE A FISH SYMBOL WITH A BLUE BACKGROUND. IT SHALL BE FIRMLY ATTACHED TO THE TOP OF THE INLET WITH A PERMANENT FASTENER.
10. SEE PLANS FOR SIZE AND LOCATION OF PIPE.
11. FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDOT DETAIL M-604-10
12. ALL CONNECTED PIPES WITH A DIAMETER (D) GREATER THAN 24" AND/OR ENTERING AT AN ANGLE GREATER THAN 80° A CUSTOM CONC BOX MUST BE CONSTRUCTED. CONTRACTOR TO COORDINATE BOX DIMENSIONS AND SPECS WITH MANUFACTURER.

SCALE: NTS

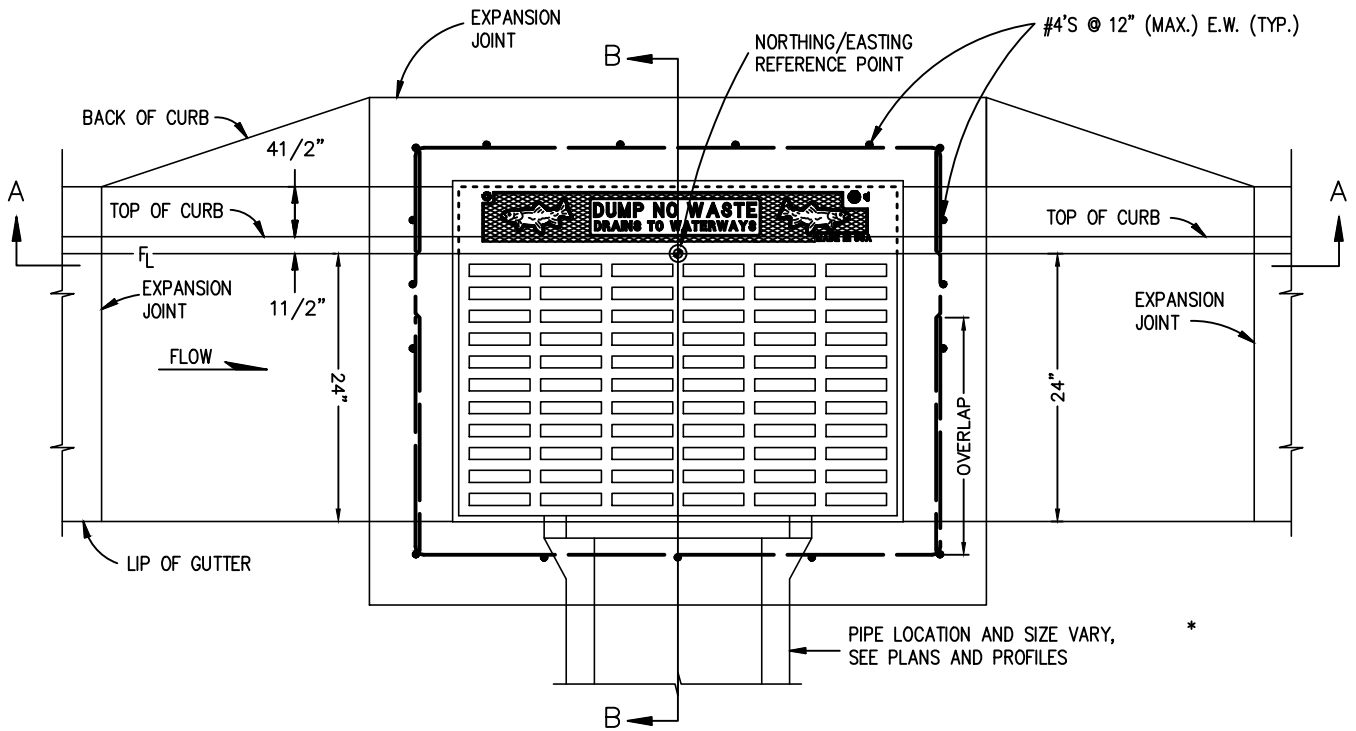


TOWN OF MEAD STANDARD DESIGN CRITERIA

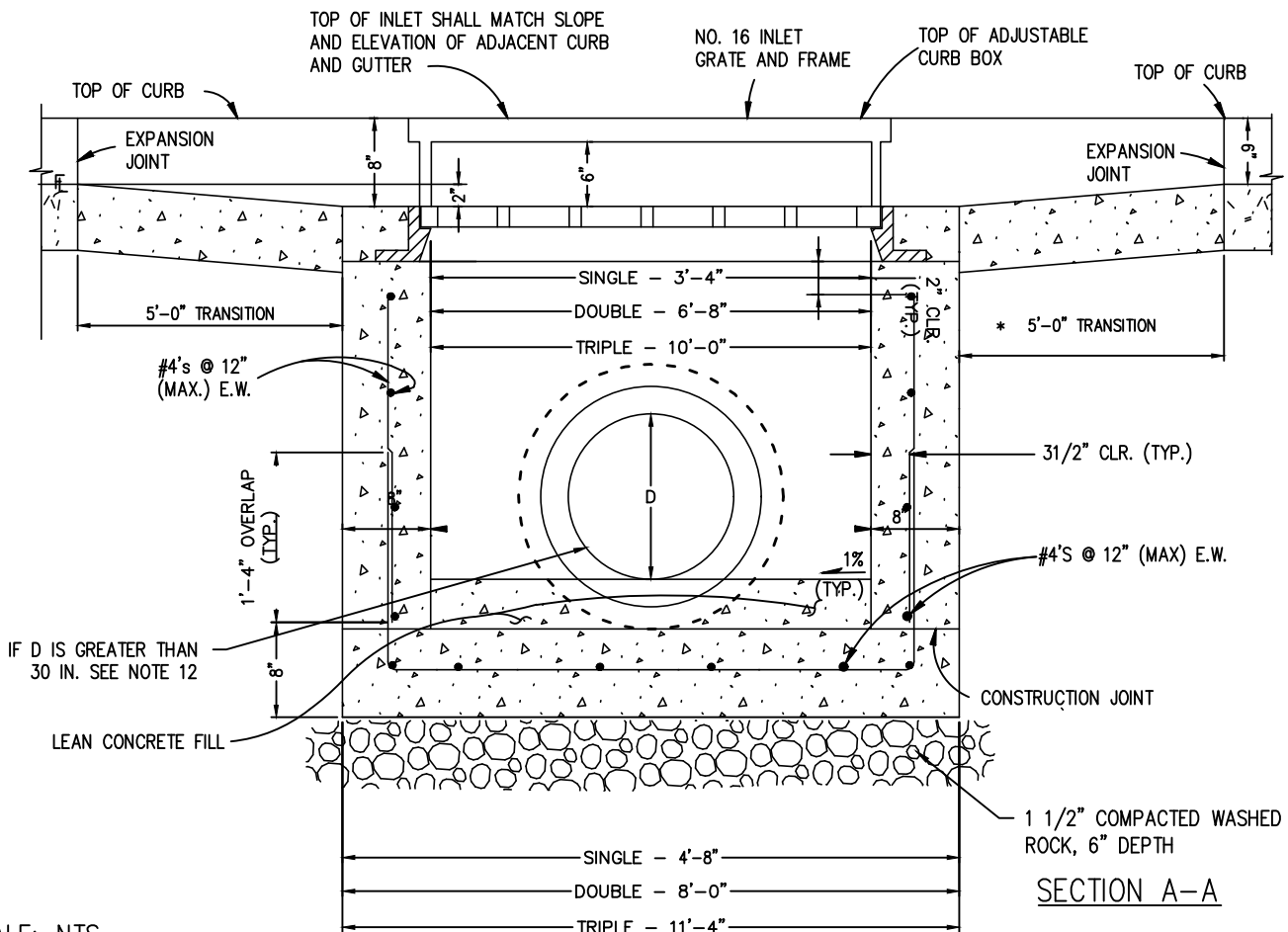
TYPE C INLET

D6.06

DATE: 04/2021



PLAN VIEW



SCALE: NTS



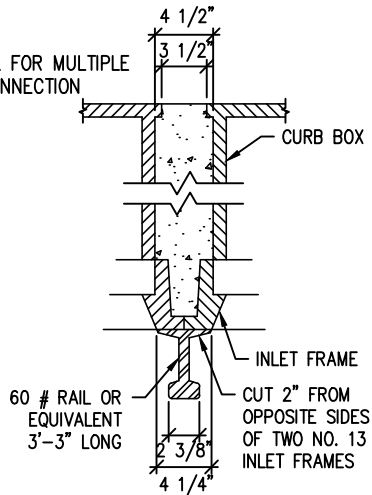
TOWN OF MEAD STANDARD DESIGN CRITERIA

COMBINATION INLET (1 OF 2)

D6.07A

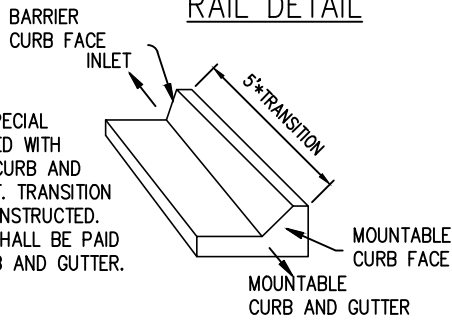
DATE: 04/2021

NOTE:
USE RAIL FOR MULTIPLE
INLET CONNECTION

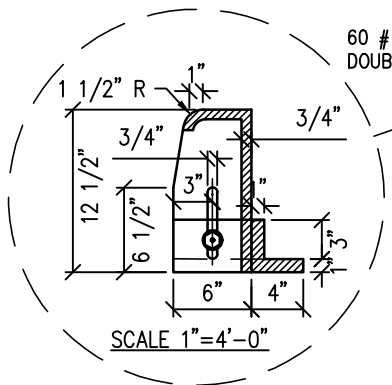


RAIL DETAIL

WHEN THE SPECIAL
INLET IS USED WITH
MOUNTABLE CURB AND
GUTTER, 5 FT. TRANSITION
SHALL BE CONSTRUCTED.
TRANSITION SHALL BE PAID
FOR AS CURB AND GUTTER.



**TRANSITION
CURB**



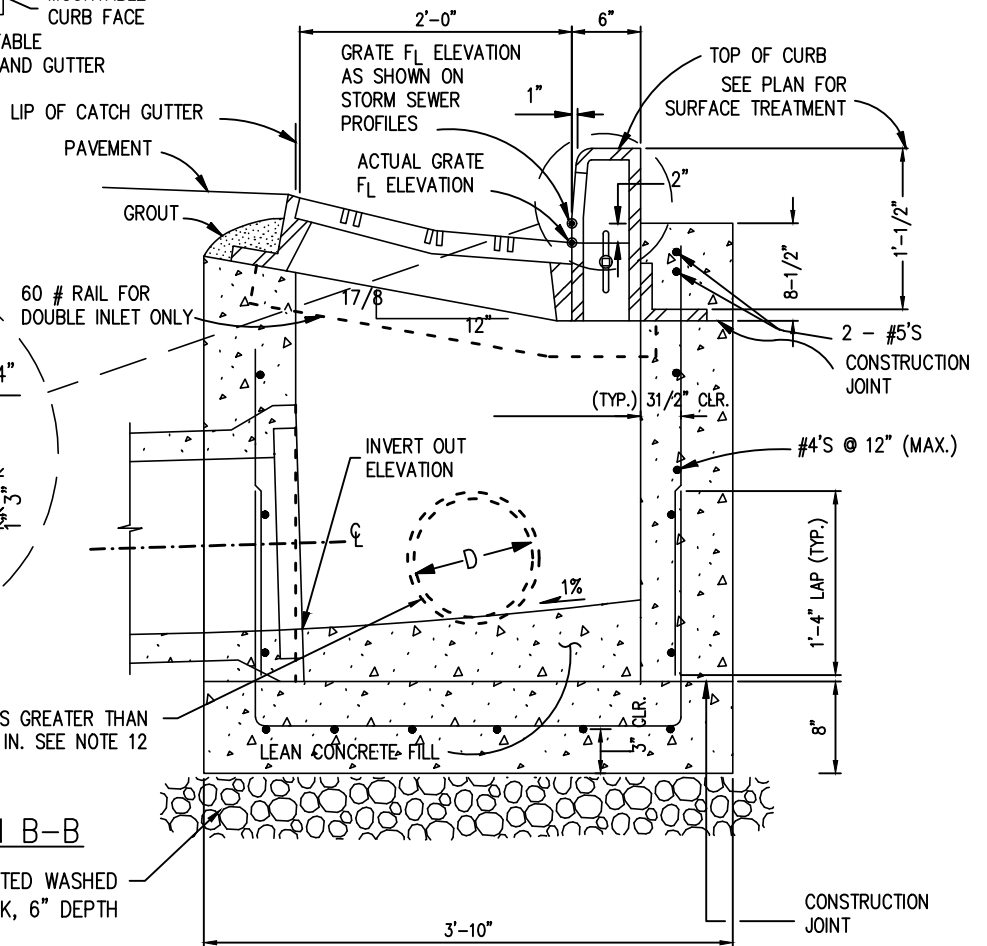
IF D IS GREATER THAN
18 IN. SEE NOTE 12

SECTION B-B

1 1/2" COMPACTED WASHED
ROCK, 6" DEPTH

NOTES:

1. ALL CASTING SHALL CONFORM TO ASTM A-48(C1 35b) WITH A MINIMUM STRENGTH OF 35 ksi.
2. ALL CASTINGS SHALL BE HEAVY DUTY, AND CAPABLE OF WITHSTANDING AASHTO H20 LOADING.
3. FLOOR SLOPE MAY BE POURED MONOLITHIC WITH BASE.
4. ALL REINFORCING STEEL SHALL BE ASTM, A-615, GRADE 60 DEFORMED BARS. DIAMETER OF BEND MEASURED ON THE INSIDE OF THE BAR SHALL BE A MINIMUM OF 6 BAR DIAMETER.
5. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS APPLICABLE TO THE PROJECT.
6. CONCRETE SHALL HAVE A 28 DAY STRENGTH OF 4000 PSI.
7. SUBGRADE SHALL HAVE A GRADATION EQUAL TO CLASS B BEDDING COMPACTED TO 100% MAXIMUM DRY DENSITY, AASHTO T-99.
8. NO FORMWORK SHALL REMAIN INSIDE STRUCTURE WHEN COMPLETE.
9. INLET WALLS SHALL BE FORMED BOTH INSIDE AND OUTSIDE. CASTING OF SIDEWALLS AGAINST EARTH IS NOT PERMITTED.
10. LEAN CONCRETE FILL TO BE $f' = 2000$ PSI.
11. ALL CONNECTED PIPES WITH A DIAMETER (D) GREATER THAN 30" FRONT AND 18" SIDE AND/OR ENTERING AT AN ANGLE GREATER THAN 80° A CUSTOM CONC BOX MUST BE CONSTRUCTED. CONTRACTOR TO COORDINATE BOX DIMENSIONS AND SPECS WITH MANUFACTURER.



SCALE: NTS

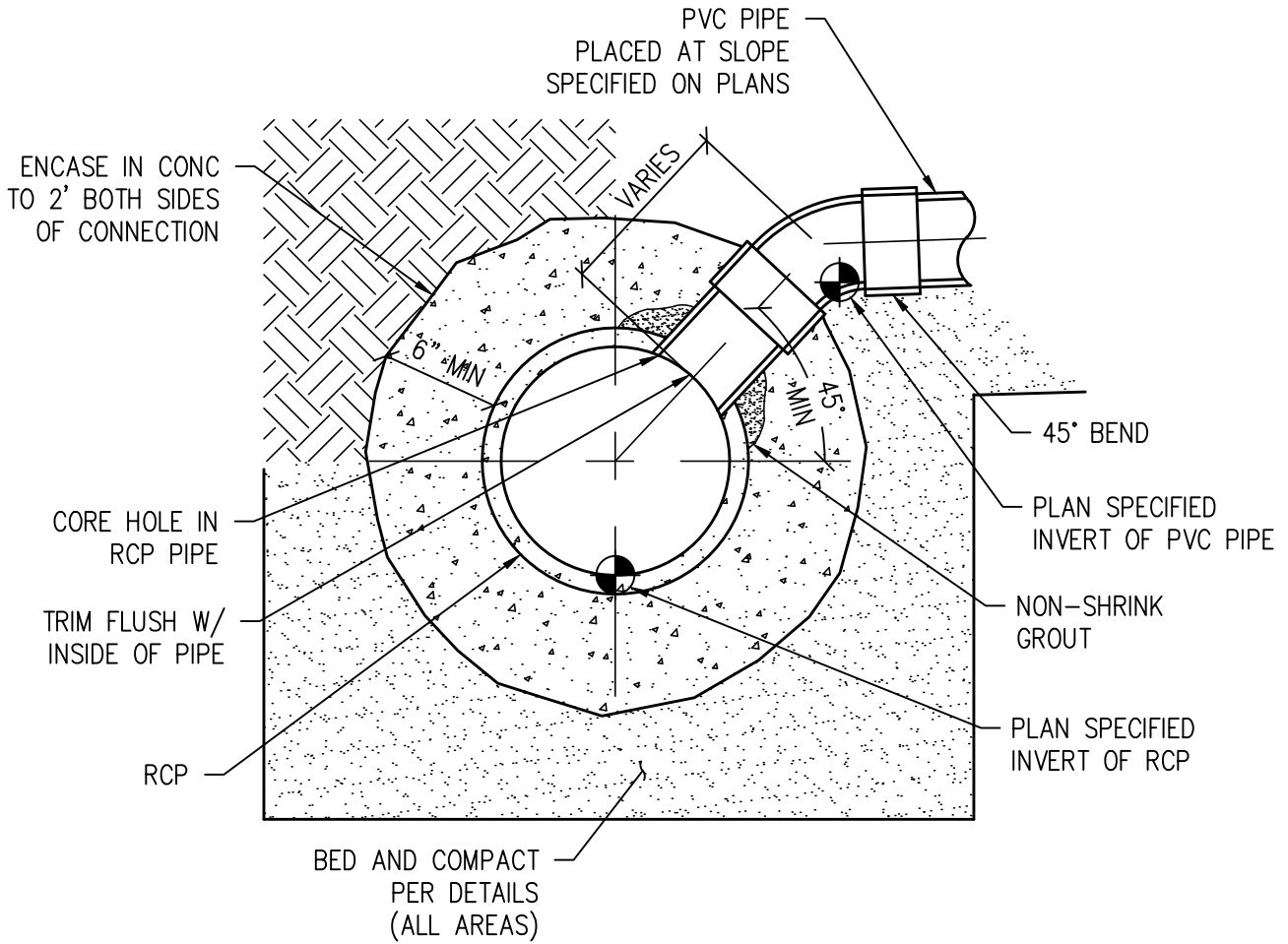


TOWN OF MEAD STANDARD DESIGN CRITERIA

COMBINATION INLET (2 OF 2)

D6.07B

DATE: 04/2021



SCALE: NTS

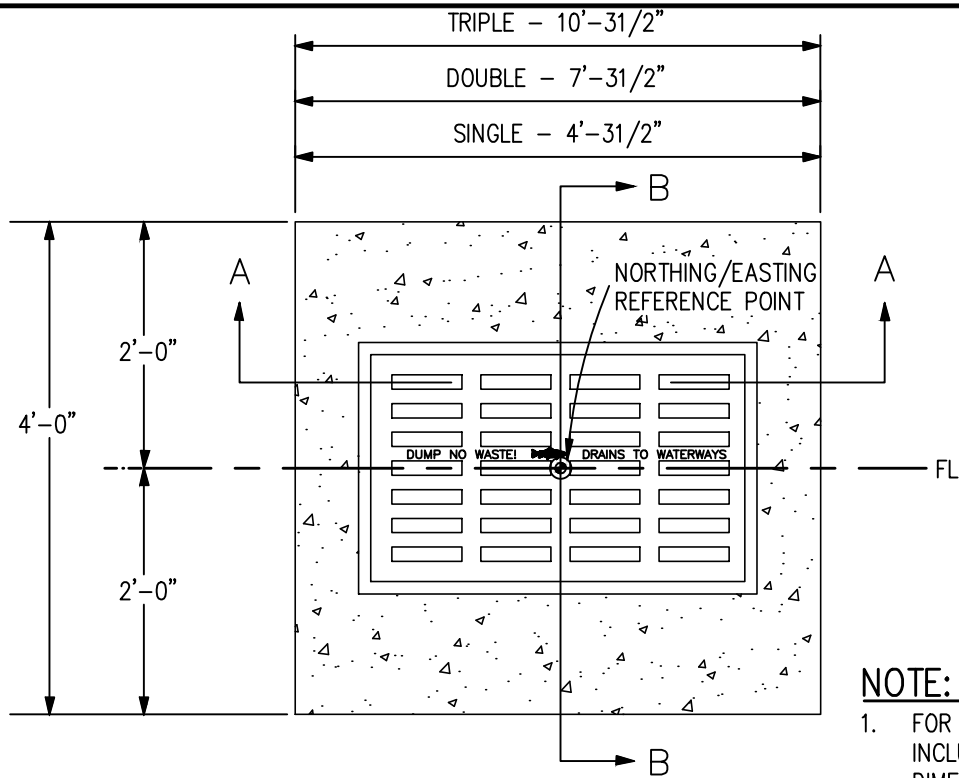


TOWN OF MEAD STANDARD DESIGN CRITERIA

DIRECT CONNECTION RCP TO PVC CONNECTION

D6.08

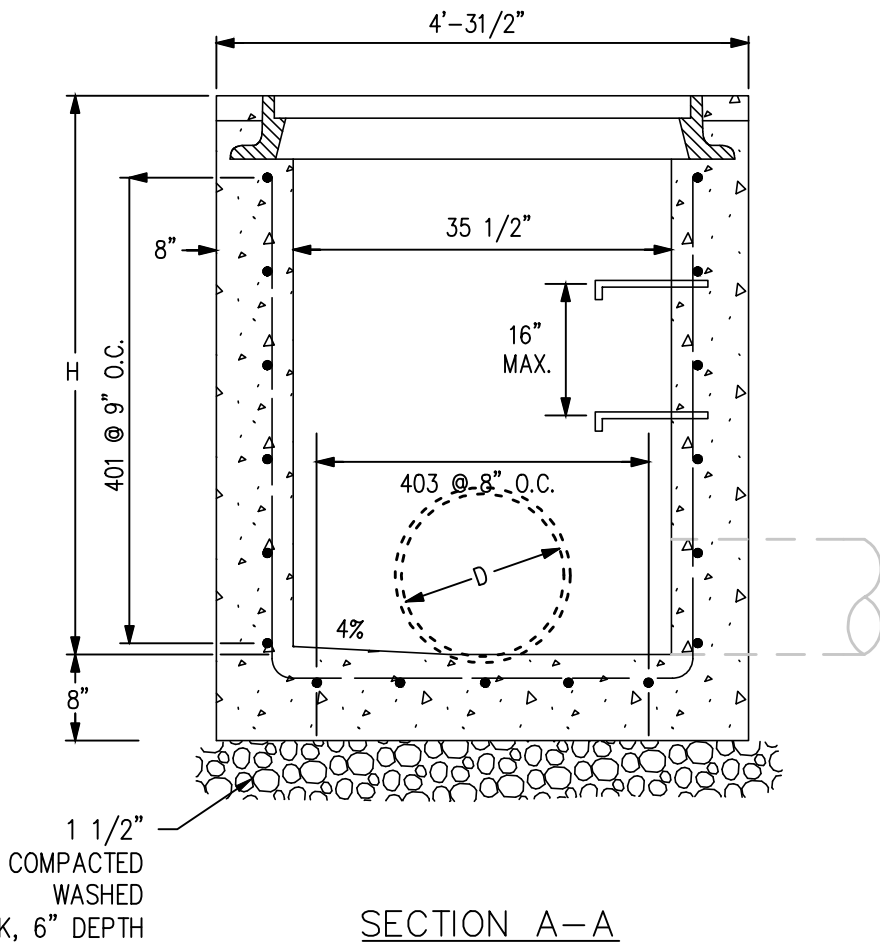
DATE: 04/2021



PLAN VIEW

NOTE:

1. FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDOT DETAILS



SECTION A-A

SCALE: NTS

ROCK, 6" DEPTH

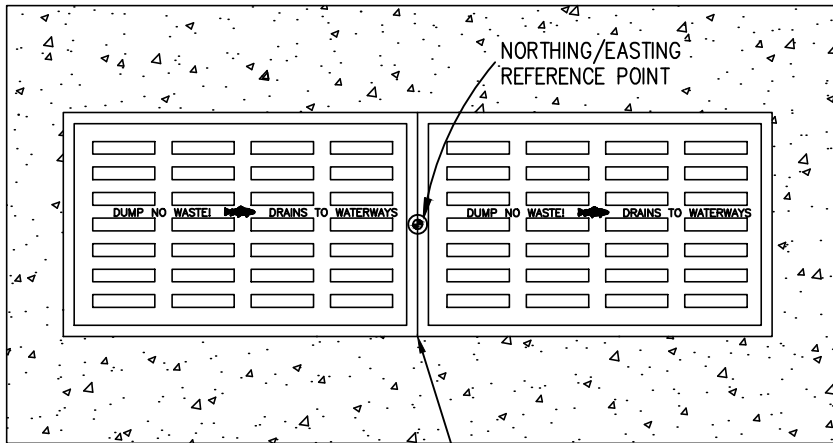


TOWN OF MEAD STANDARD DESIGN CRITERIA

VALLEY INLET (CDOT TYPE 13) (1 OF 2)

D6.09A

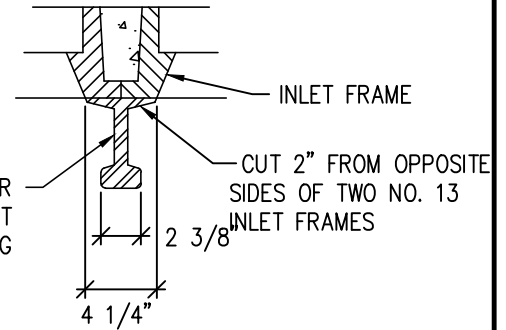
DATE: 04/2021



PLAN VIEW

USE RAIL FOR MULTIPLE INLET CONNECTION

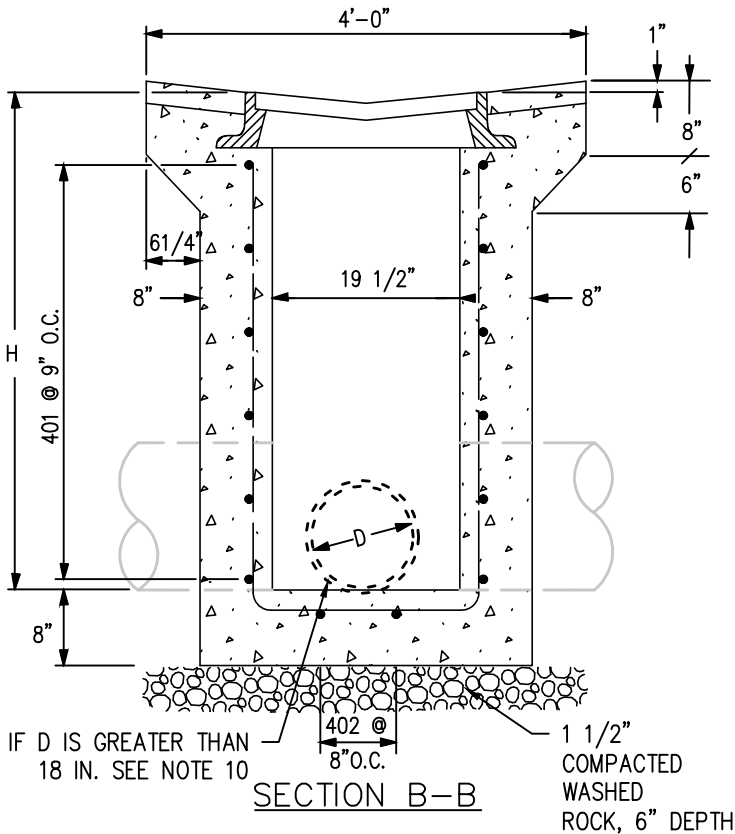
60 # RAIL OR EQUIVALENT
3'-3" LONG



RAIL DETAIL

NOTES:

1. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
2. CAST-IN-PLACE CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES.
3. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4 IN.
4. REINFORCING BARS SHALL BE DEFORMED #4 AND SHALL HAVE A 2 IN. MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
5. STEPS SHALL BE PROVIDED WHEN INLET DIMENSION "H" IS EQUAL TO OR GREATER THAN 3 FT.-6 IN. AND SHALL CONFORM TO AASHTO M 199.
6. ALL GRATES AND FRAMES SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.06. GRATES AND FRAMES SHALL BE DESIGNED TO WITHSTAND HS 20 LOADING.
7. STATION POINT IS AT THE CENTER OF THE INLET.
8. GRATE SHALL HAVE "DUMP NO WASTE DRAINS TO STREAM" MESSAGE CAST ON SURFACE.
9. FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDOT DETAIL M-604-13
10. ALL CONNECTED PIPES WITH A DIAMETER (D) GREATER THAN 30" FRONT AND 18" SIDE AND/OR ENTERING AT AN ANGLE GREATER THAN 80° A CUSTOM CONC BOX MUST BE CONSTRUCTED. CONTRACTOR TO COORDINATE BOX DIMENSIONS AND SPECS WITH MANUFACTURER.
11. FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDOT DETAILS



SECTION B-B

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

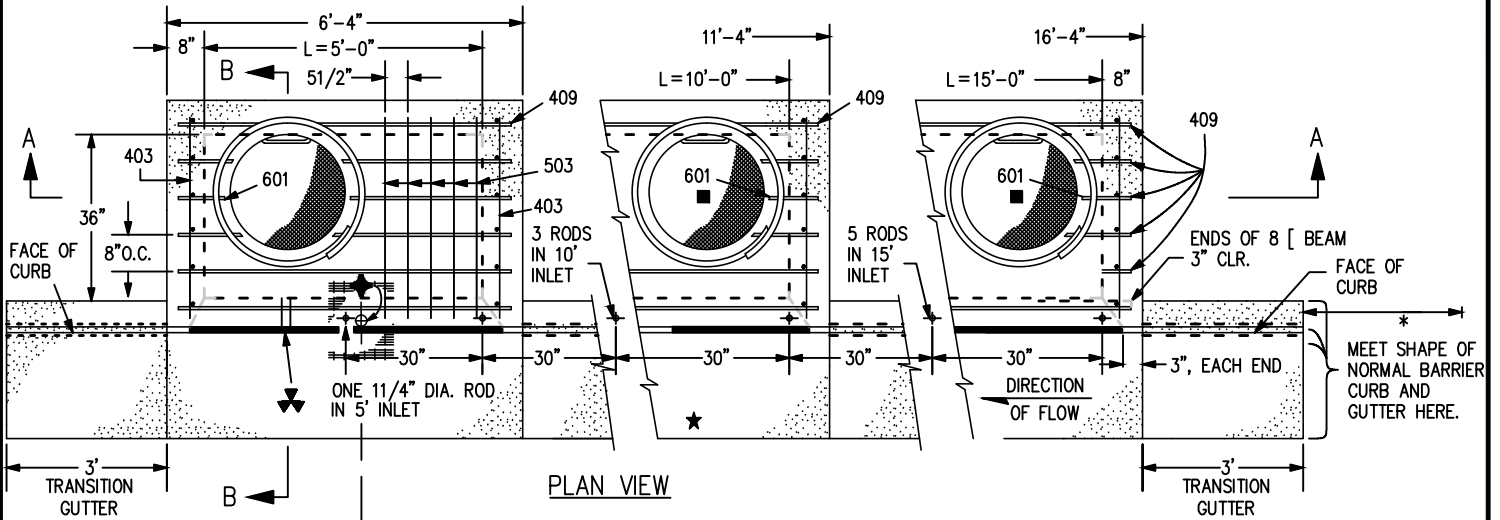
VALLEY INLET (CDOT TYPE 13) (2 OF 2)

D6.09B

DATE: 04/2021

★ FOR LENGTH (L) 10 FT. OR MORE, PROVIDE MAINTENANCE ACCESS AT BOTH ENDS WITH AN ADDITIONAL MANHOLE RING AND COVER. CUT REINFORCEMENT BAR ACCORDINGLY.

◆ NORTHING/EASTING REFERENCE POINT AT MIDPOINT OF INLET ALONG FLOWLINE



NOTES:

1. CONCRETE SHALL BE CLASS B. INLET MAY BE CAST-IN-PLACE OR PRECAST.
2. CONCRETE WALLS SHALL BE FORMED ON BOTH SIDES AND SHALL BE 8 IN. THICK.
3. INLET STEPS SHALL BE IN CONFORMANCE WITH AASHTO M 199.
4. CURB FACE ASSEMBLY SHALL BE GALVANIZED AFTER WELDING. 5. EXPOSED CONCRETE CORNERS SHALL BE CHAMFERED 3/4 IN. CURB AND GUTTER CORNERS SHALL BE FINISHED TO MATCH THE EXISTING CURB AND GUTTER BEYOND THE TRANSITION GUTTER.
6. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE A 2 IN. MINIMUM CLEARANCE. ALL REINFORCING BARS SHALL BE EPOXY COATED.
7. DIMENSIONS AND WEIGHTS OF TYPICAL MANHOLE RING AND COVER ARE NOMINAL.
8. MATERIAL FOR MANHOLE RINGS AND COVERS SHALL BE GRAY OR DUCTILE CAST IRON IN ACCORDANCE WITH SUBSECTION 712.06.
9. SINCE PIPE ENTRIES INTO THE INLET ARE VARIABLE, THE DIMENSIONS SHOWN ARE TYPICAL. ACTUAL DIMENSIONS AND QUANTITIES FOR CONCRETE AND REINFORCEMENT SHALL BE AS REQUIRED IN THE WORK. QUANTITIES INCLUDE VOLUMES OCCUPIED BY PIPES.
10. STRUCTURAL STEEL SHALL BE GALVANIZED AND SHALL BE IN ACCORDANCE WITH SUBSECTION 712.06.
11. ALL MANHOLE COVERS SHALL BE CAST WITH A "NO DUMPING DRAINS TO STREAM" MESSAGE AND A FISH SYMBOL. THE SURFACE OF THE MANHOLE COVER SHALL HAVE A NON-SLIP PATTERN.
12. FOR FULL DETAIL INCLUDING BAR LIST AND DIMENSION TABLE, SEE CDOT DETAIL M-604-12 SHEETS 1 AND 2

SCALE: NTS



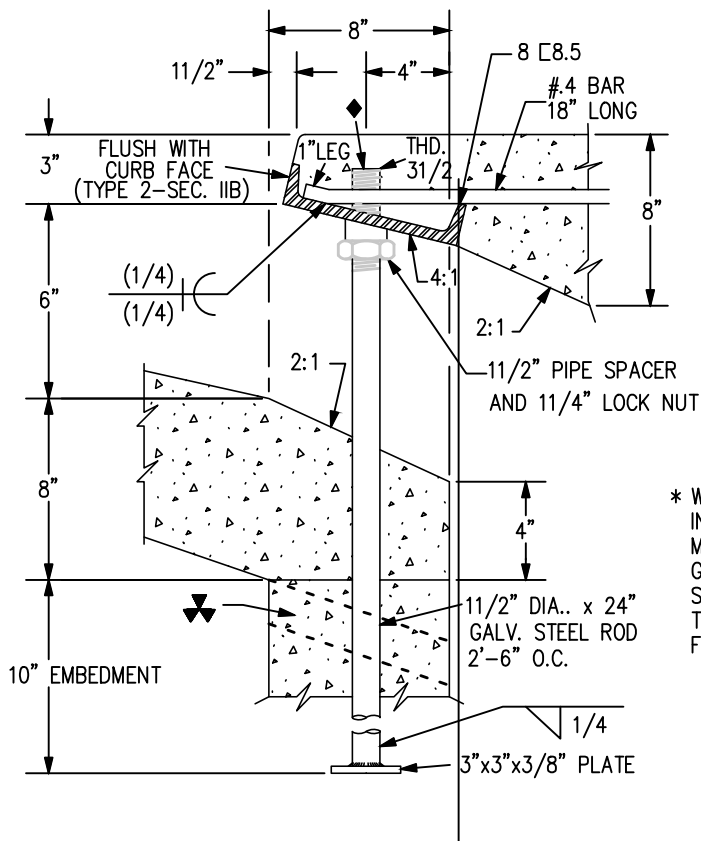
TOWN OF MEAD STANDARD DESIGN CRITERIA

TYPE R CURB INLET (1 OF 3)

D6.10A

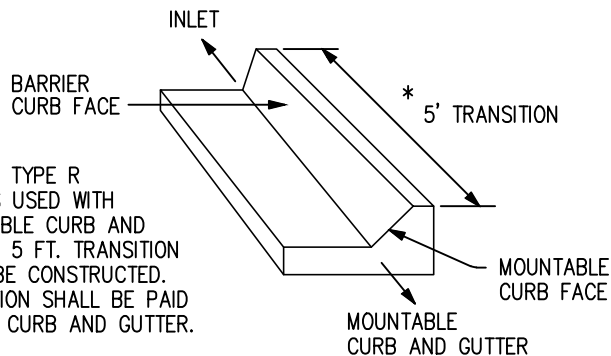
DATE: 04/2021

SEE CHANNEL LAYOUT ON SHEET 2.



NOTE:

- FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDOT DETAILS

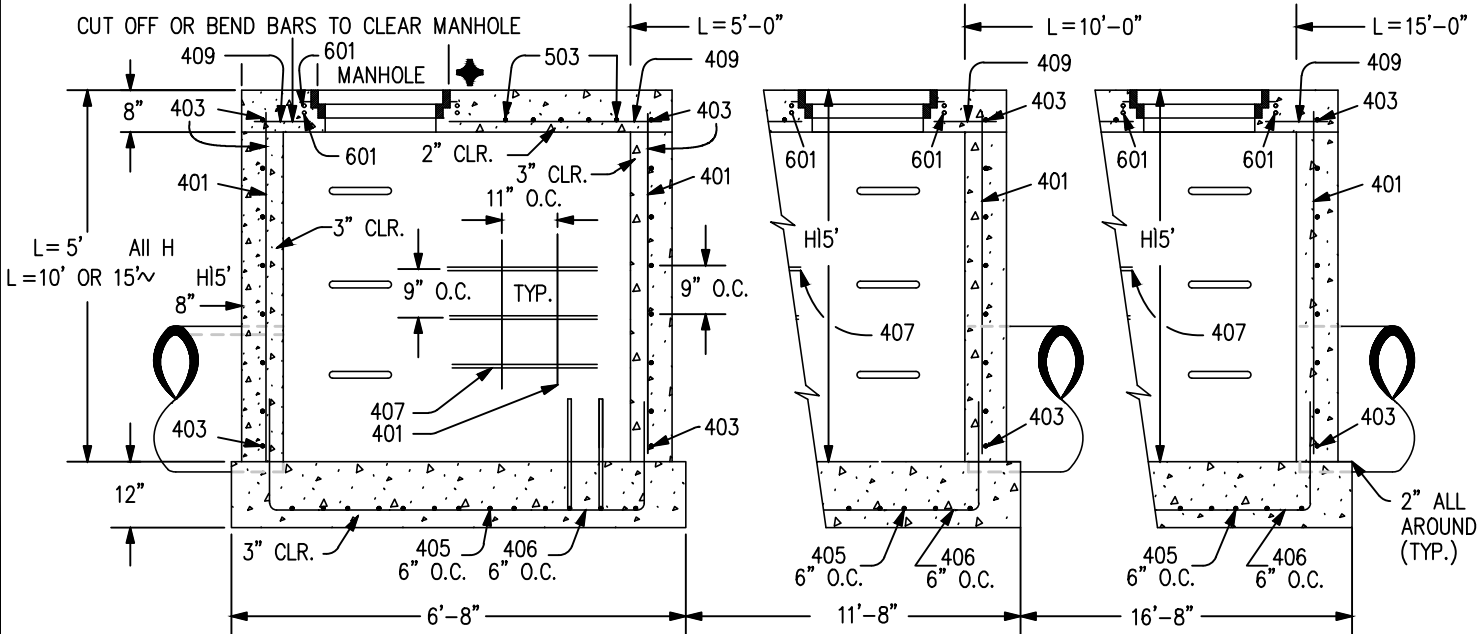


* WHEN A TYPE R INLET IS USED WITH MOUNTABLE CURB AND GUTTER, 5 FT. TRANSITION SHALL BE CONSTRUCTED. TRANSITION SHALL BE PAID FOR AS CURB AND GUTTER.

TRANSITION CURB

CURB FACE ASSEMBLY

◆ PLACE ENTIRE ASSEMBLY BEFORE POURING CONCRETE.



SECTION A-A

SCALE: NTS



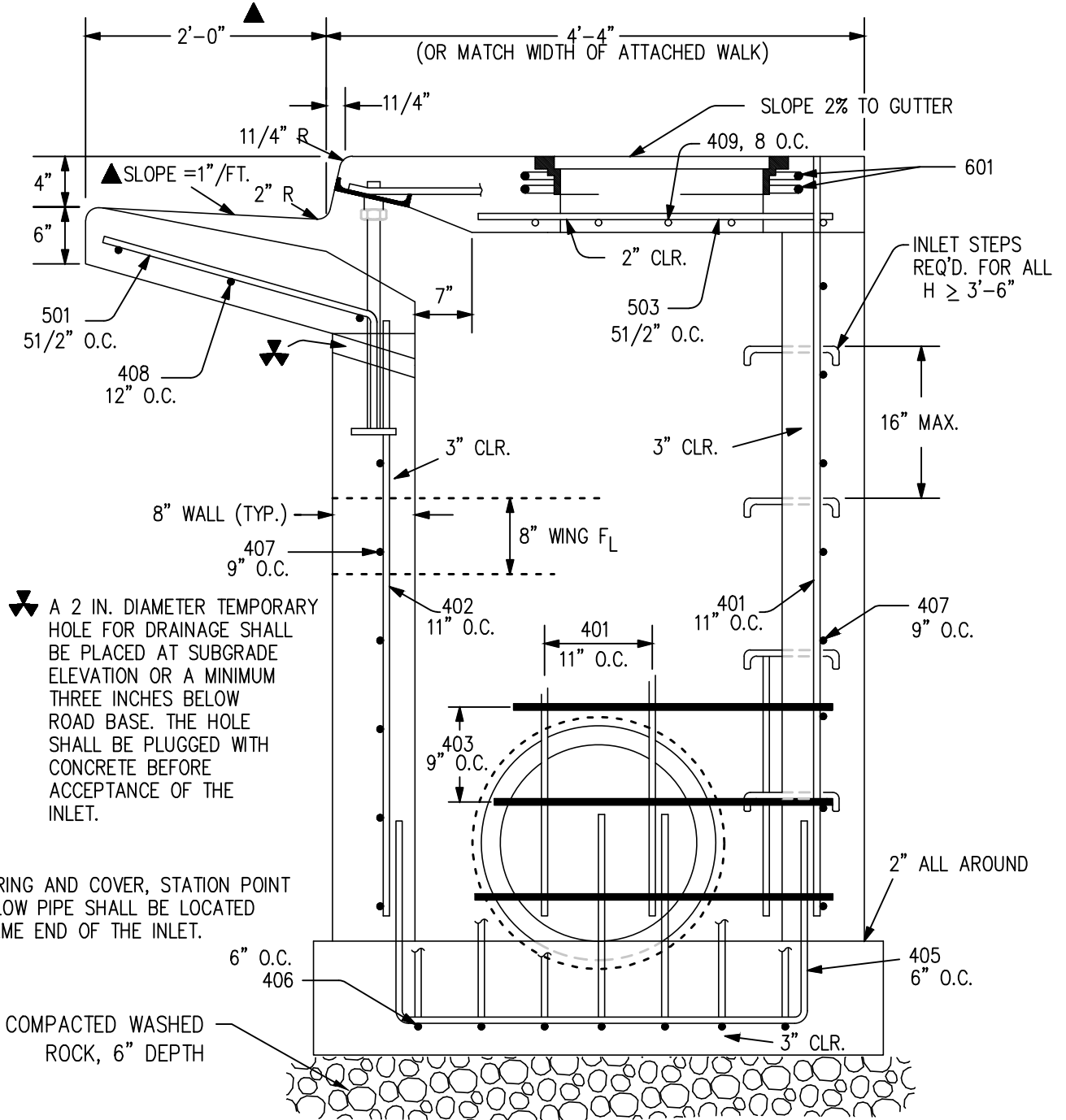
TOWN OF MEAD STANDARD DESIGN CRITERIA

TYPE R CURB INLET (2 OF 3)

D6.10B

DATE: 04/2021

▲ - FOR A 1'-0" PAN SLOPE 2" PER FT.



▼ A 2 IN. DIAMETER TEMPORARY HOLE FOR DRAINAGE SHALL BE PLACED AT SUBGRADE ELEVATION OR A MINIMUM THREE INCHES BELOW ROAD BASE. THE HOLE SHALL BE PLUGGED WITH CONCRETE BEFORE ACCEPTANCE OF THE INLET.

NOTE:
MANHOLE RING AND COVER, STATION POINT AND OUTFLOW PIPE SHALL BE LOCATED AT THE SAME END OF THE INLET.

1 1/2" COMPACTED WASHED ROCK, 6" DEPTH

NOTE:
1. FOR FULL DETAIL INCLUDING BAR LIST, DIMENSIONS AND QTY. TABLE, SEE CDOT DETAILS

SECTION B-B - END VIEW

SCALE: NTS

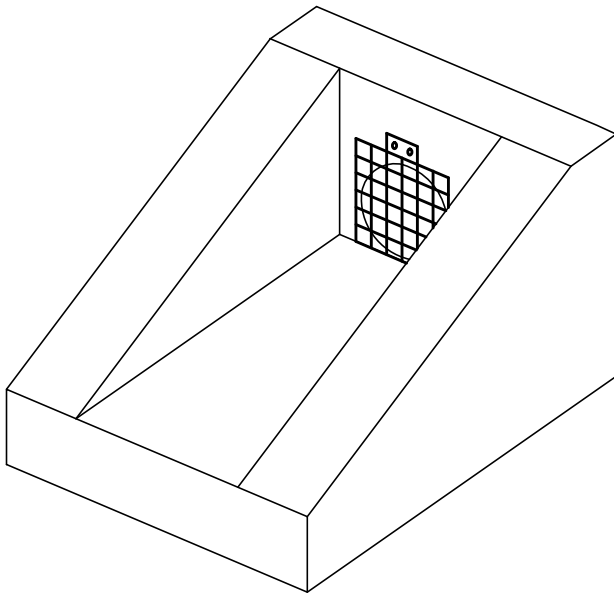


TOWN OF MEAD STANDARD DESIGN CRITERIA

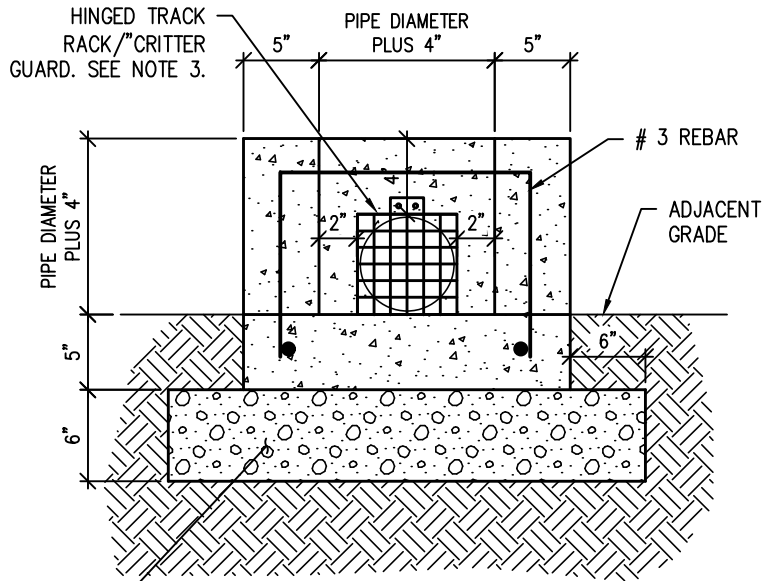
TYPE R CURB INLET (3 OF 3)

D6.10C

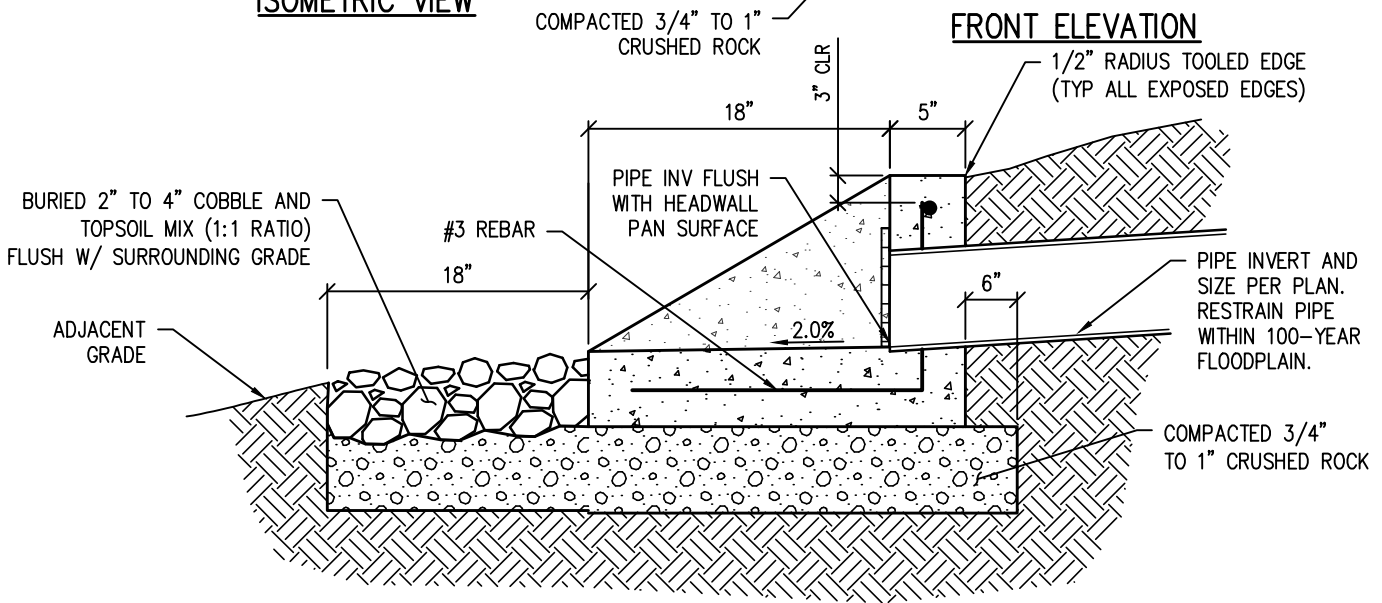
DATE: 04/2021



ISOMETRIC VIEW



FRONT ELEVATION



NOTES:

1. ALL CONCRETE AND BEDDING PER SPECIFICATIONS
2. INSTALL REMOVABLE, GALVANIZED STEEL, HINGED TRASH RACK WITH 2" MAX OPENINGS.
3. TRASH GUARD TO BE APPROVED BY TOWN

SCALE: NTS

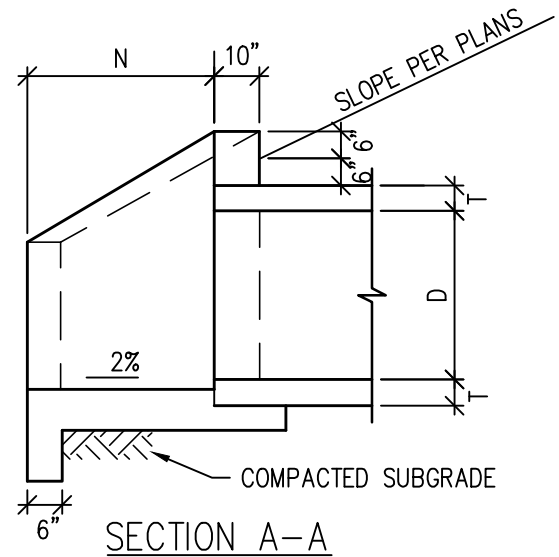
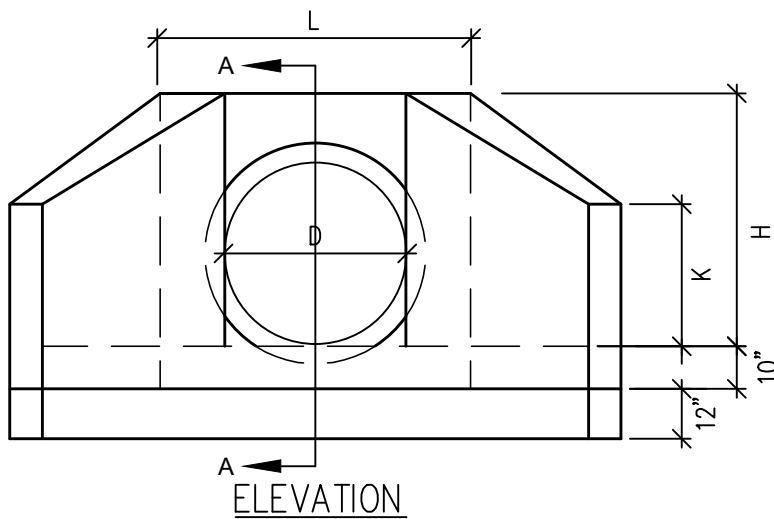
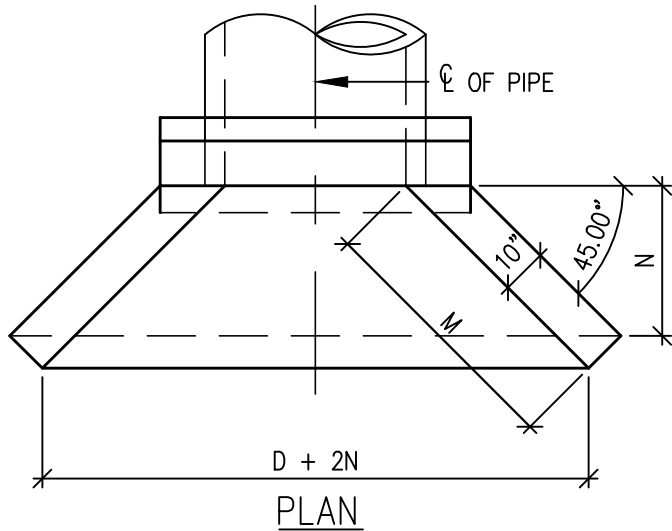


TOWN OF MEAD STANDARD DESIGN CRITERIA

SMALL PIPE HEADWALL

D6.11

DATE: 04/2021



NOTES:

1. CONCRETE SHALL BE CLASS B. CAST-IN-PLACE CONCRETE SHALL CONFORM TO ASTM C478
2. CAST-IN-PLACE CONCRETE WALL EDGES SHALL BE CHAMFERED 3/4".
3. ALL WALLS AND BASE SHALL BE REINFORCED WITH #4'S @ 12" OC EACH WAY. REINFORCING BARS SHALL BE DEFORMED AND SHALL HAVE 3" MINIMUM CLEARANCE FROM FACE OF CONCRETE.
4. DIMENSIONS AND MATERIAL REQUIREMENTS VARY DEPENDING ON APPLICATION. FOR COMPLETE DETAILS, MEASUREMENTS, MATERIALS LIST, AND OTHER FACTORS REFER TO THE CURRENT CDOT M&S STANDARDS.

DIMENSIONS							
D	AREA SQ FT	T	H	K	L	M	N
15"	1.23	2 1/4"	2'-5 1/4"	1'-5"	3'-7"	1'-9"	1'-3"
18"	1.77	2 1/2"	2'-8 1/2"	1'-7"	3'-10"	2'-1 1/2"	1'-6"
24"	3.14	3"	3'-3"	1'-10 1/2"	4'-4"	2'-10"	2'-0"
30"	4.91	3 1/2"	3'-9 1/2"	2'-2"	4'-10"	3'-6 1/2"	2'-6"
36"	7.07	4"	4'-4"	2'-5 1/2"	5'-4"	4'-3"	3'-0"
42"	9.62	4 1/2"	4'-10 1/2"	2'-9"	5'-10"	4'-1 1/2"	3'-6"

SCALE: NTS

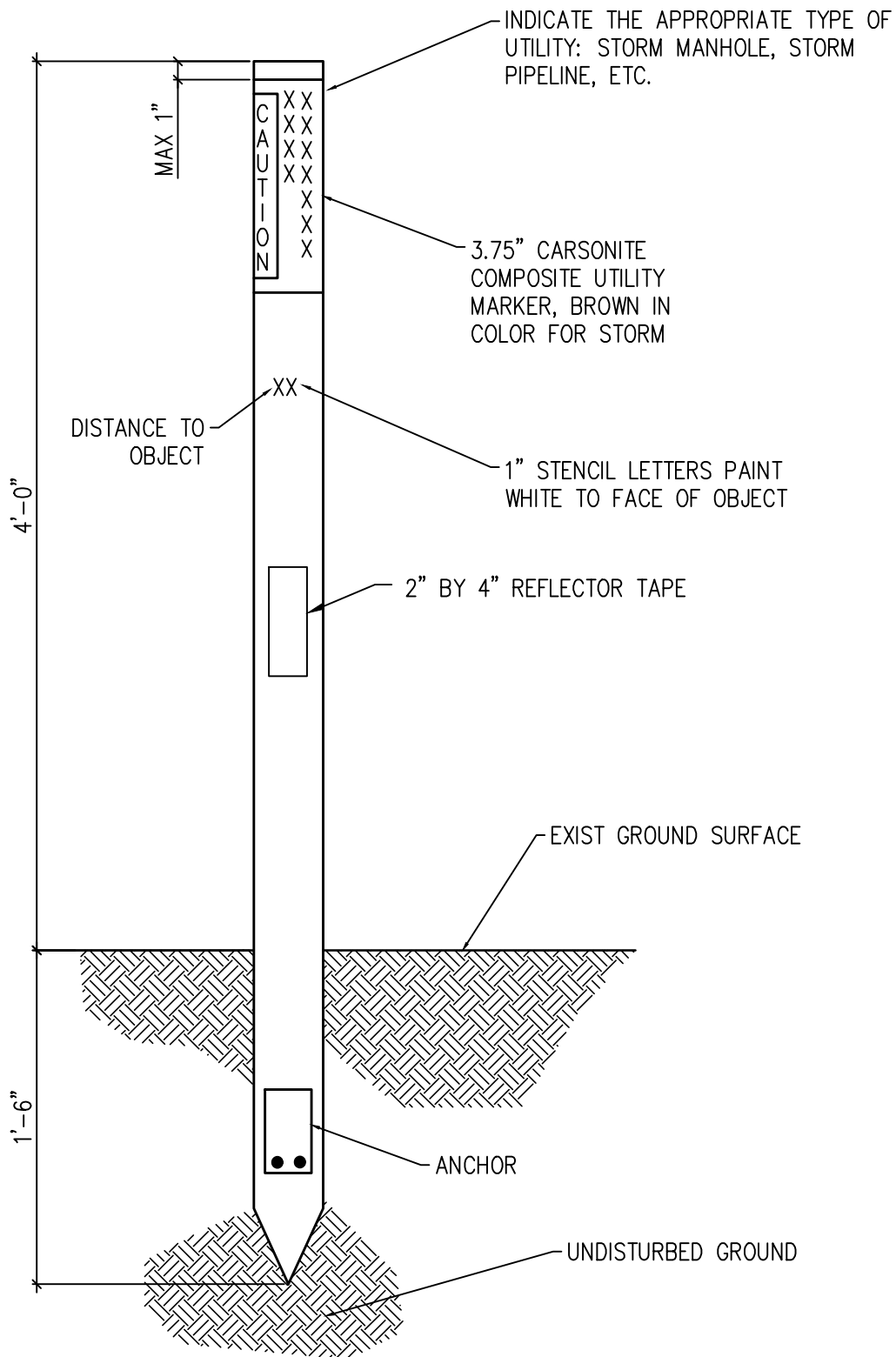


TOWN OF MEAD STANDARD DESIGN CRITERIA

HEADWALL WITH CIRCULAR PIPE

D6.12

DATE: 04/2021



SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

STORM UTILITY MARKER POST

D6.13

DATE: 04/2021

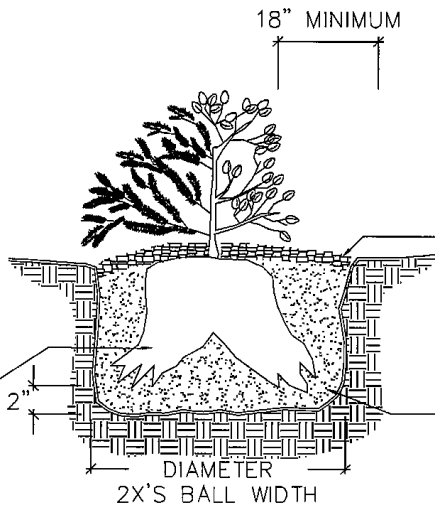
PRUNE DEAD OR DAMAGED BRANCHES PRIOR TO PLANTING. IF FORM IS COMPROMISED BY PRUNING, REPLACE SHRUB.

SPACE PLANTS AND SET PLUMB FOR BEST EFFECT.

MOUND COMPACTED BACKFILL UNDER ROOTBALL OR SET ON UNDISTURBED SOIL.

SPLIT BOTTOM 1/2 OF BALL. SPREAD AND PLANT.

REMOVE ALL CONTAINERS, BASKETS, WIRE ETC. FROM ROOTBALL



PROVIDE 18" MINIMUM DISTANCE FROM EDGE OF MATURE PLANT SPREAD TO EDGER OR CONCRETE.

SET SHRUB PLUMB. TOP OF ROOT BALL TO BE SLIGHTLY ABOVE FINISH GRADE.

3" - 4" DEEP APPROVED MULCH INSIDE SAUCER, ON GEO-TEXTILE WEED BARRIER. BUILD A 4" BASIN AROUND PIT IN NON-IRRIGATED AREAS ONLY.

PREPARED BACKFILL MIXTURE:

1. ONE PART SOIL AMENDMENT - SEE APPROVED MATERIALS LIST.
2. TWO PARTS TOPSOIL.
3. THREE PARTS NATIVE SOIL.
4. SUPERPHOSPHATE AMENDMENT.
5. MATERIALS TO BE THOROUGHLY BLENDED.

NOTES: SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

ADD BEAVER PROTECTION AROUND DECIDUOUS PLANTINGS WITHIN 200' OF ALL RIPARIAN AREAS, PER CITY STANDARDS.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

SHRUB PLANTING DETAIL

D8.01

DATE: 04/2021

NOTE: SET ROOT FLARE OF ALL TREES 4" ABOVE GRADE IN IRRIGATED AREAS AND AT GRADE TO 2" ABOVE GRADE IN NON-IRRIGATED AREAS. MODIFY IF SOIL CONDITIONS WARRANT & PER CITY DIRECTION. INSTALL A 5" HIGH BERM AROUND TREES TO CREATE A WATERING BASIN. BERM IS TEMPORARY IN IRRIGATED AREAS. REMOVE BERM AFTER TWO THOROUGH WATERINGS IN IRRIGATED AREAS & MULCH. LEAVE BERM & MULCH IN NON-IRRIGATED AREAS & IN AREAS ONLY IRRIGATED BY DRIP SYSTEMS AFTER DRYLAND GRASS ESTABLISHMENT PERIOD.

3" - 4" DEEP APPROVED MULCH FLUSH WITH SOD AT EDGE. & TO BE KEPT 2" FROM TRUNK. TREE WELL TO BE 5' MINIMUM DIAMETER.

PLANTING HOLE: ROOTBALL TO BE PLACED ON UNDISTURBED SOIL AT DEPTH AS NOTED. HOLE TO BE MORE OF A "DISH" SHAPE RATHER THAN CYLINDRICAL.

REMOVE BOTTOM 1/3 OF WIRE BASKET. SET TREE IN PIT TO PROPER GRADE AND PLUMB. REMOVE REMAINING WIRE & TWINE. IF PLASTIC OR TREATED BURLAP, REMOVE AS MUCH AS POSSIBLE & BACKFILL. IF REGULAR BURLAP, BACKFILL 2/3 OF PIT, REMOVE TOP 1/3 OF BURLAP & COMPLETE BACKFILL.

UNDISTURBED SOIL

TREES IN GRASS AREAS: PROVIDE A MINIMUM 4' RADIUS FROM TRUNK TO SEED/SOD.

PRUNE AS DIRECTED BY OWNER'S REPRESENTATIVE. DO NOT PRUNE OR DAMAGE CENTRAL LEADER.

WRAP TRUNK FROM GROUND LEVEL TO SECOND BRANCH WITH 4" KRAFT TYPE TREE WRAP. SECURE ENDS WITH FLEXIBLE TAPE.

APPROVED GUYING SYSTEM:

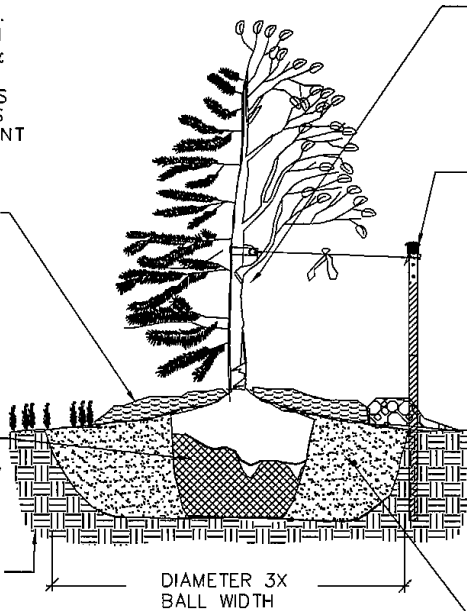
MIN. 6' LONG HEAVY DUTY T-BAR STEEL POST STAKES WITH WHITE T-POST CAPS OR 6' WOODEN POLE STAKES (PREFERRED). GUYS ARE TO BE 17 GAUGE GALVANIZED STEEL WIRES OR STRAP-X GUYS (PREFERRED) SECURED TO TREE WITH CANVAS STRAP ABOVE FIRST BRANCH. WIRE TO BE TAUT BUT NOT OVER-TIGHT. FLAG WIRE WITH WHITE PLASTIC FLAGGING TAPE OR PVC PIPE. CONIFERS TO HAVE 2 STAKES FOR TREES 6' AND LESS, 3 STAKES FOR TREES ABOVE 6'. NO SHORT STAKES PERMITTED FOR EVERGREENS. DECIDUOUS TREES TO HAVE 2 STAKES FOR TREES 2-1/2" CAL. AND LESS, 3 STAKES ABOVE 2-1/2" CAL. ONE STAKE ALWAYS IN DIRECTION OF PREVAILING WINDS. REMOVE STAKES & GUYS AFTER 1 YEAR OR BEFORE FINAL ACCEPTANCE BY CITY.

PREPARED BACKFILL MIXTURE:

1. ONE PART SOIL AMENDMENT - SEE APPROVED MATERIALS LIST.
2. TWO PARTS TOPSOIL.
3. THREE PARTS NATIVE SOIL.
4. SUPERPHOSPHATE AMENDMENT
5. MATERIALS TO BE THOROUGHLY BLENDED.

NOTES: SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

ADD BEAVER PROTECTION AROUND DECIDUOUS PLANTINGS WITHIN 200' OF ALL RIPARIAN AREAS, PER CITY STANDARDS.



SCALE: NTS

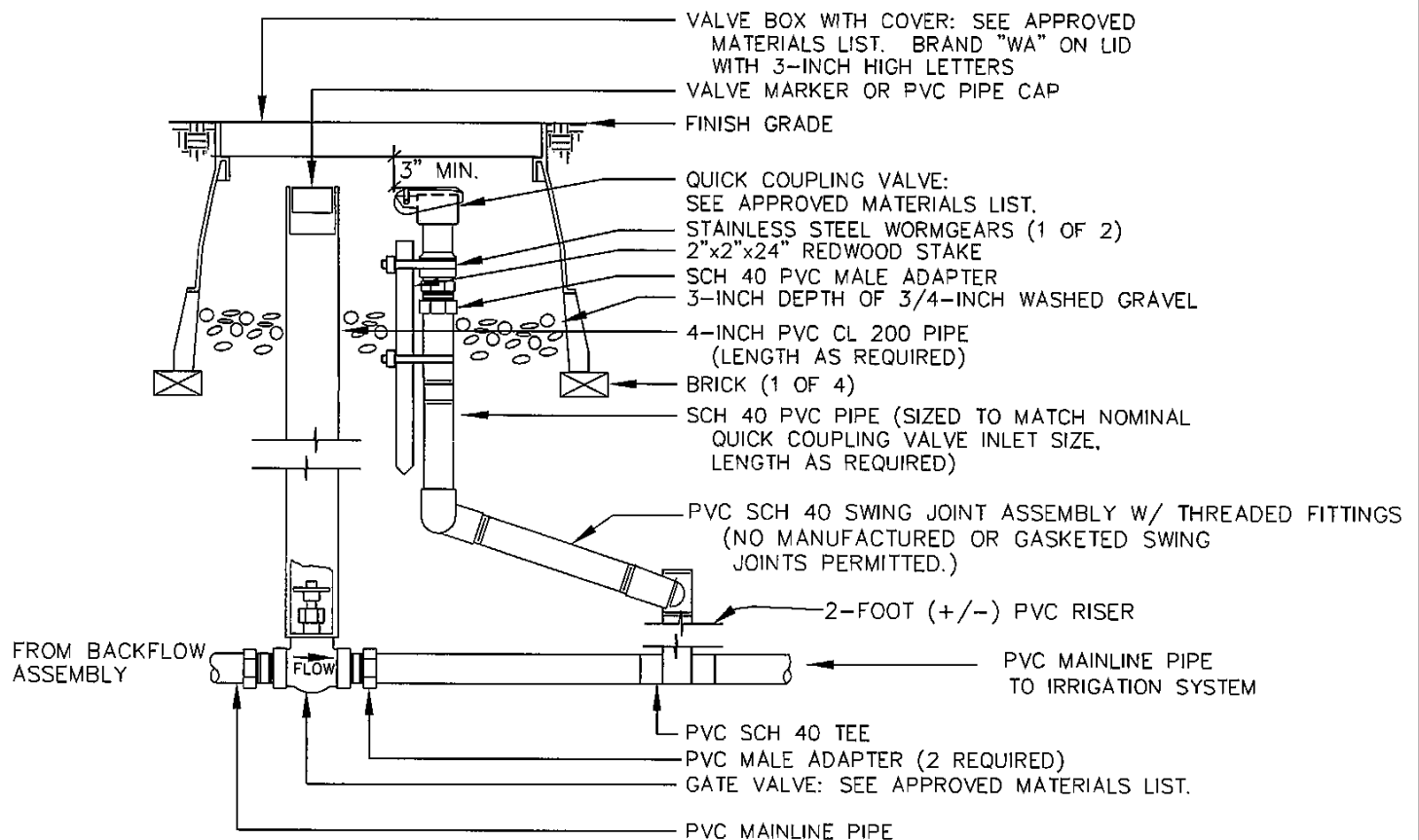


TOWN OF MEAD STANDARD DESIGN CRITERIA

TREE PLANTING DETAIL

D8.02

DATE: 04/2021



NOTES:

- 1) NOMINAL VALVE AND FITTING SIZES SHALL BE IDENTICAL WITH MAINLINE PIPE SIZE UNLESS OTHERWISE NOTED.
2. DEPTH OF BURY OF GATE VALVE TO BE 24" MIN.
3. SEE BACKFLOW PREVENTER, METER PIT & DOWNSTREAM ASSEMBLIES DETAIL.
4. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

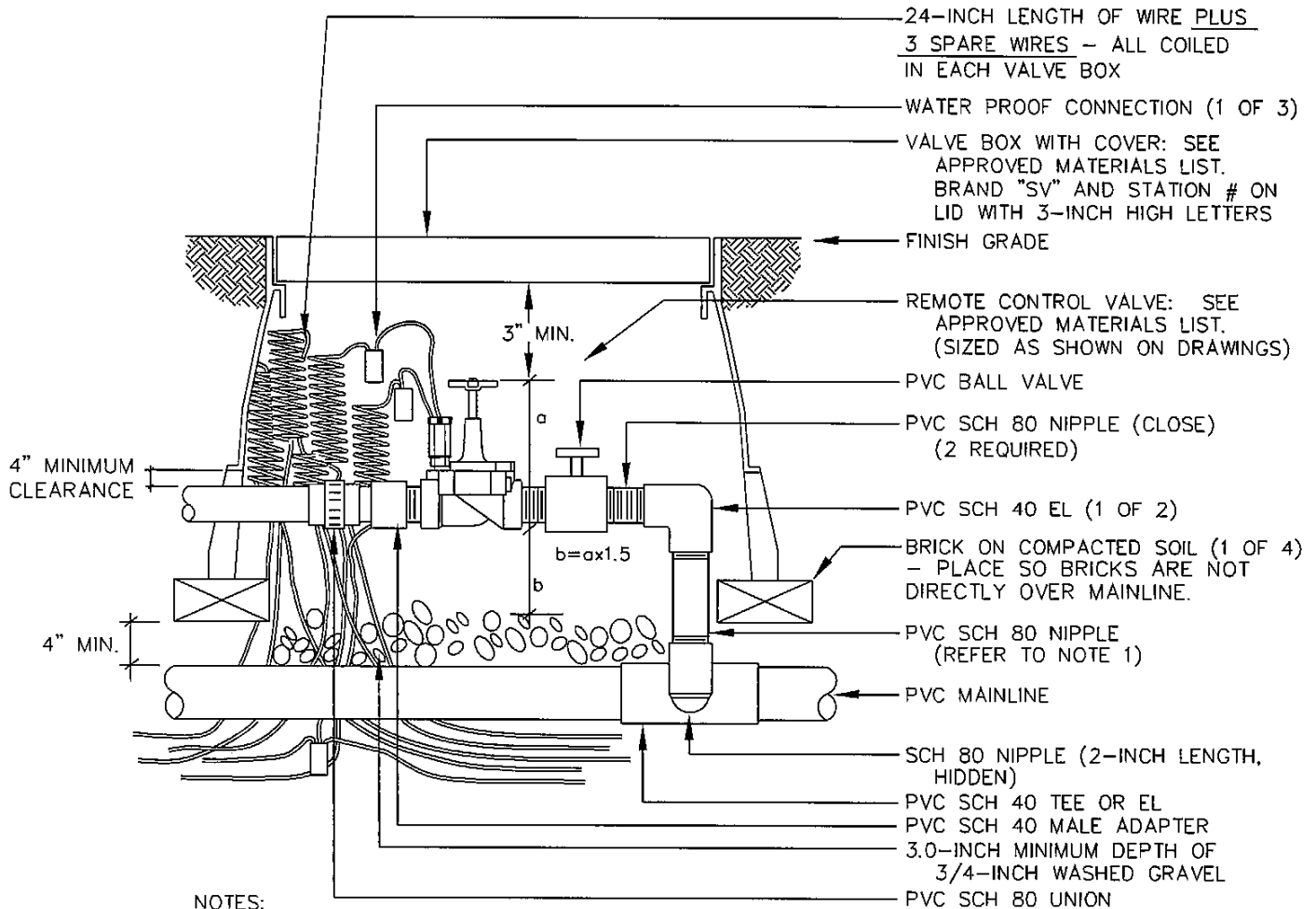


TOWN OF MEAD STANDARD DESIGN CRITERIA

WINTERIZATION ASSEMBLY

D8.03

DATE: 04/2021



NOTES:

1. INSTALL VERTICAL NIPPLE WITH LENGTH ADEQUATE TO ALLOW REMOVAL OF REMOTE CONTROL VALVE WITHOUT CUTTING PIPE OR REMOVING BONNET (IE. VALVE STEM SHOULD CLEAR MAINLINE PIPE).
2. FITTINGS AND BALL VALVE TO BE SIZED IDENTICALLY WITH CONTROL VALVE.
3. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

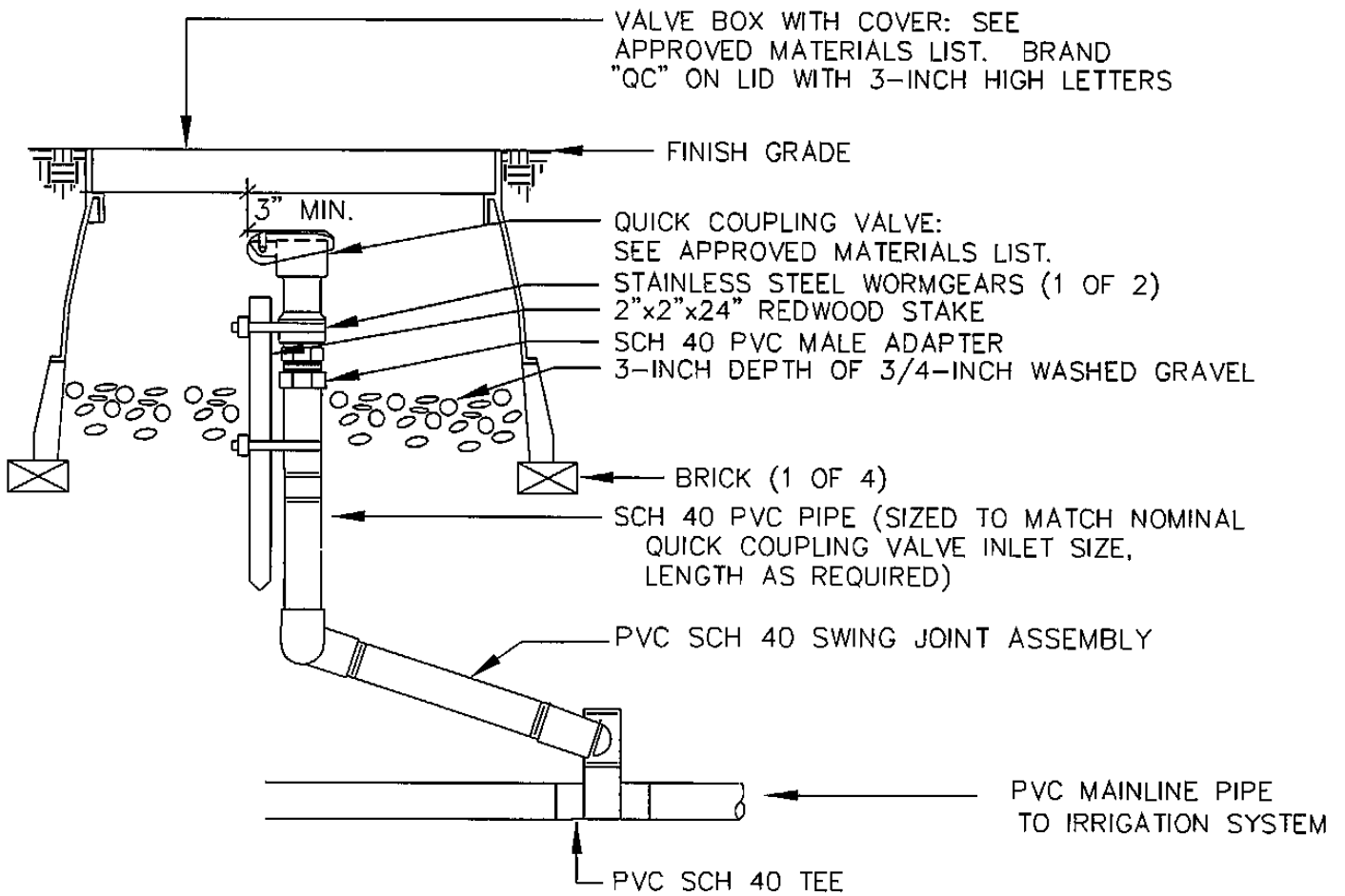


TOWN OF MEAD STANDARD DESIGN CRITERIA

REMOTE CONTROL VALVE ASSEMBLY

D8.04

DATE: 04/2021



NOTES:

1. QUICK COUPLER TO BE LOCATED IN THE CENTER OF THE VALVE BOX – PLACED AND STAKED COMPLETELY VERTICAL.
2. DEPTH OF BURY OF MAINLINE TO BE 24" MIN.
3. SEE DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

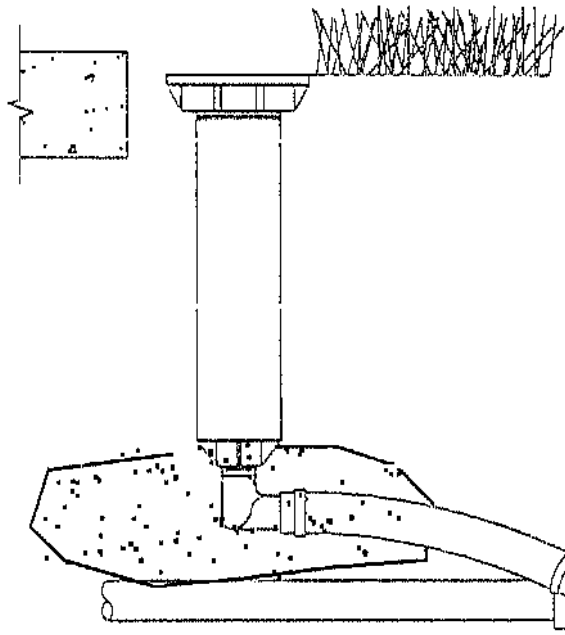


TOWN OF MEAD STANDARD DESIGN CRITERIA

QUICK COUPLER ASSEMBLY

D8.05

DATE: 04/2021



FINISH GRADE

CONCRETE BIKE PATH

POP-UP SPRAY SPRINKLER:
SEE APPROVED MATERIALS LIST.

BED HEADS IN 6" DEPTH OF SAND WHEN
LOCATED ADJACENT TO WALKS & BIKEPATHS.

1/2-INCH MALE NPT x .490 INCH BARB
ELBOW: SEE APPROVED MATERIALS LIST.

CRIMP-TYPE CLAMP

PVC LATERAL PIPE

PVC SCH. 40 TEE OR EL

SWING PIPE, 12-INCH LENGTH (MIN.):
TO MATCH PIPE BRAND. SEE APPROVED MATERIALS LIST.

NOTES:

1. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

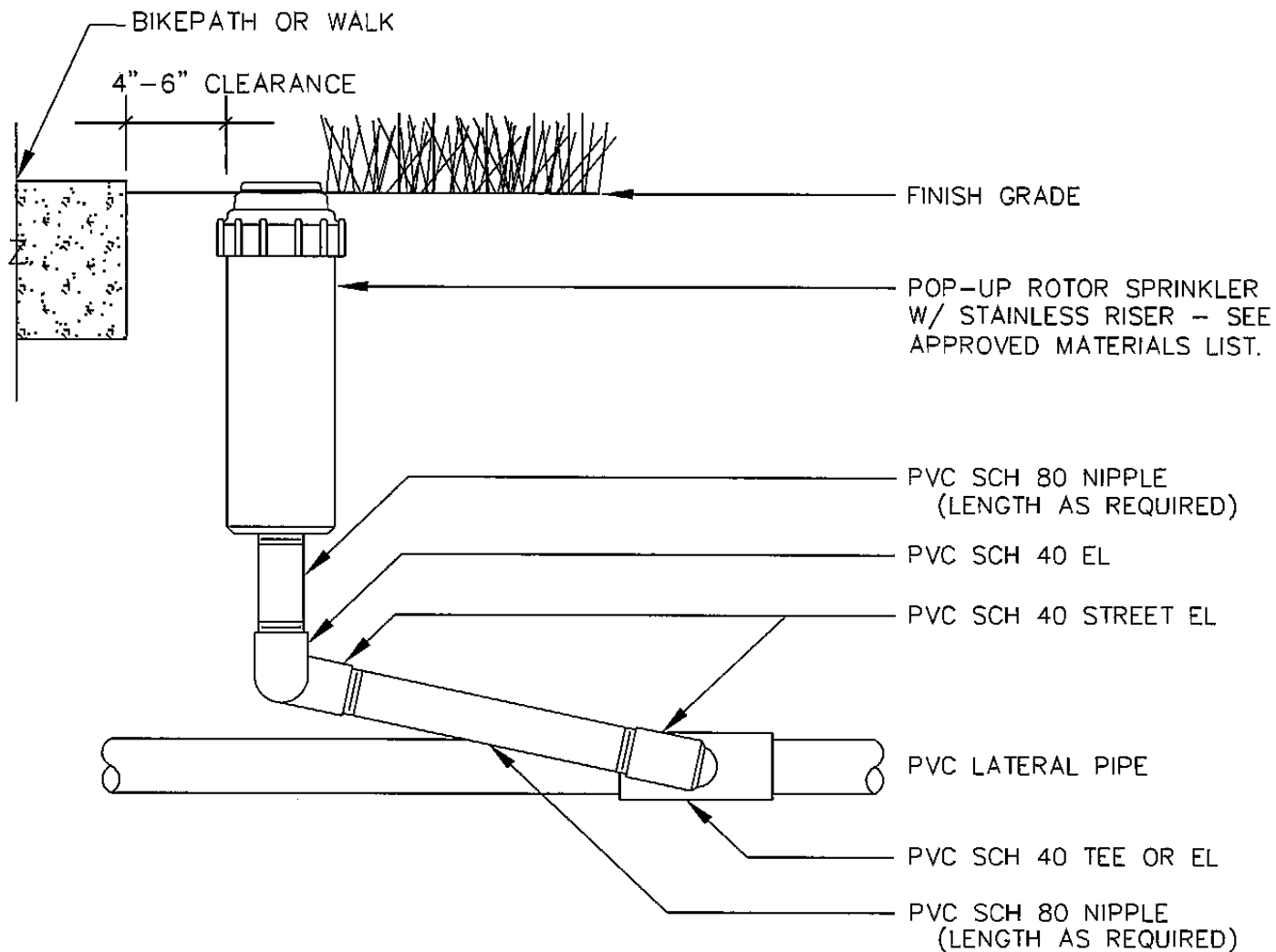


TOWN OF MEAD STANDARD DESIGN CRITERIA

POP-UP SPRAY SPRINKLER ASSEMBLY

D8.06

DATE: 04/2021



NOTES:

1. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

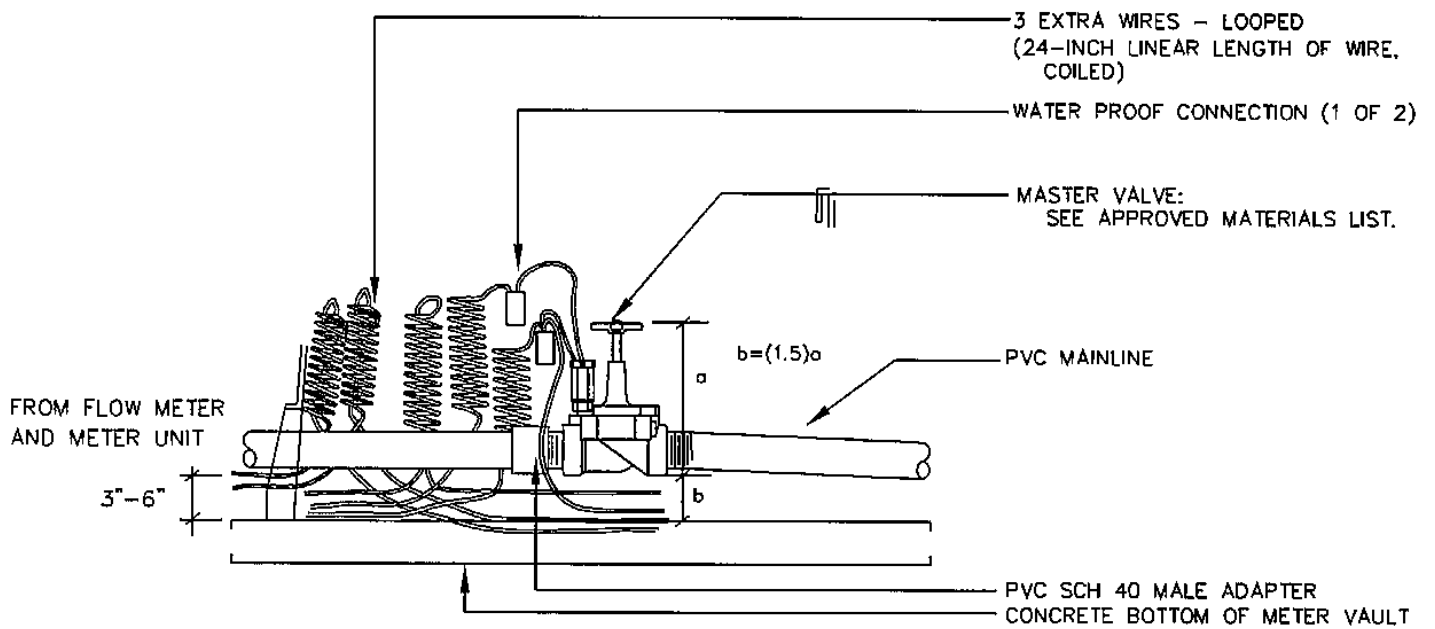


TOWN OF MEAD STANDARD DESIGN CRITERIA

POP-UP ROTOR SPRINKLER ASSEMBLY

D8.07

DATE:04/2021



NOTES:

1. FITTINGS AND MASTER VALVE TO BE SIZED IDENTICALLY WITH MAINLINE.
2. MASTER VALVE TO BE LOCATED WITHIN METER PIT (SEE DETAIL).
3. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

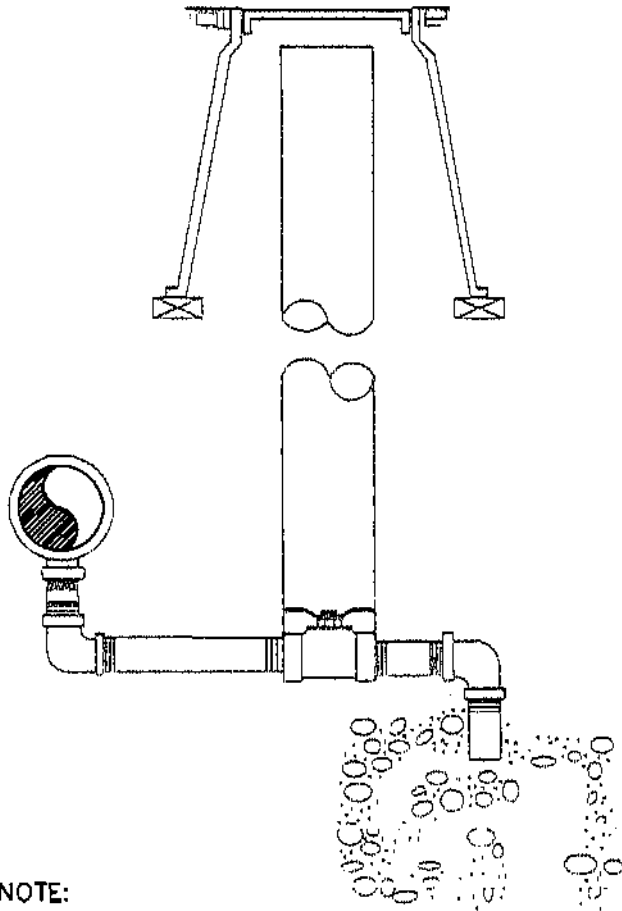
MASTER VALVE ASSEMBLY

D8.08

DATE: 04/2021

TEE OR EL ON MAINLINE PIPE

10" VALVE BOX WITH COVER: SEE APPROVED MATERIALS LIST. BRAND "DV" IN LID WITH 3-INCH HIGH LETTERS. FINISH GRADE



6-INCH PVC CL 160 PIPE
(LENGTH AS REQUIRED)

BRICK (1 OF 2)

PVC SCH 80 NIPPLE (2.0-INCH LENGTH)

PVC SCH 80 NIPPLE (4.0-INCH LENGTH)

PVC SCH 80 EL (1 OF 2)

PVC SCH 80 NIPPLE (4.0-INCH LENGTH)

SUMP OF 4.0 CUBIC FEET OF 3/4-INCH
WASHED GRAVEL

3/4-INCH BALL VALVE WITH TEE
HANDLE: SEE APPROVED MATERIALS LIST.

PVC SCH 80 NIPPLE (8.0-INCH LENGTH)

NOTE:

1. SLEEVE TO BE SET SQUARE OVER BALL VALVE TO ALLOW FOR OPERATION OF VALVE WITHOUT BINDING.
2. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST.

SCALE: NTS

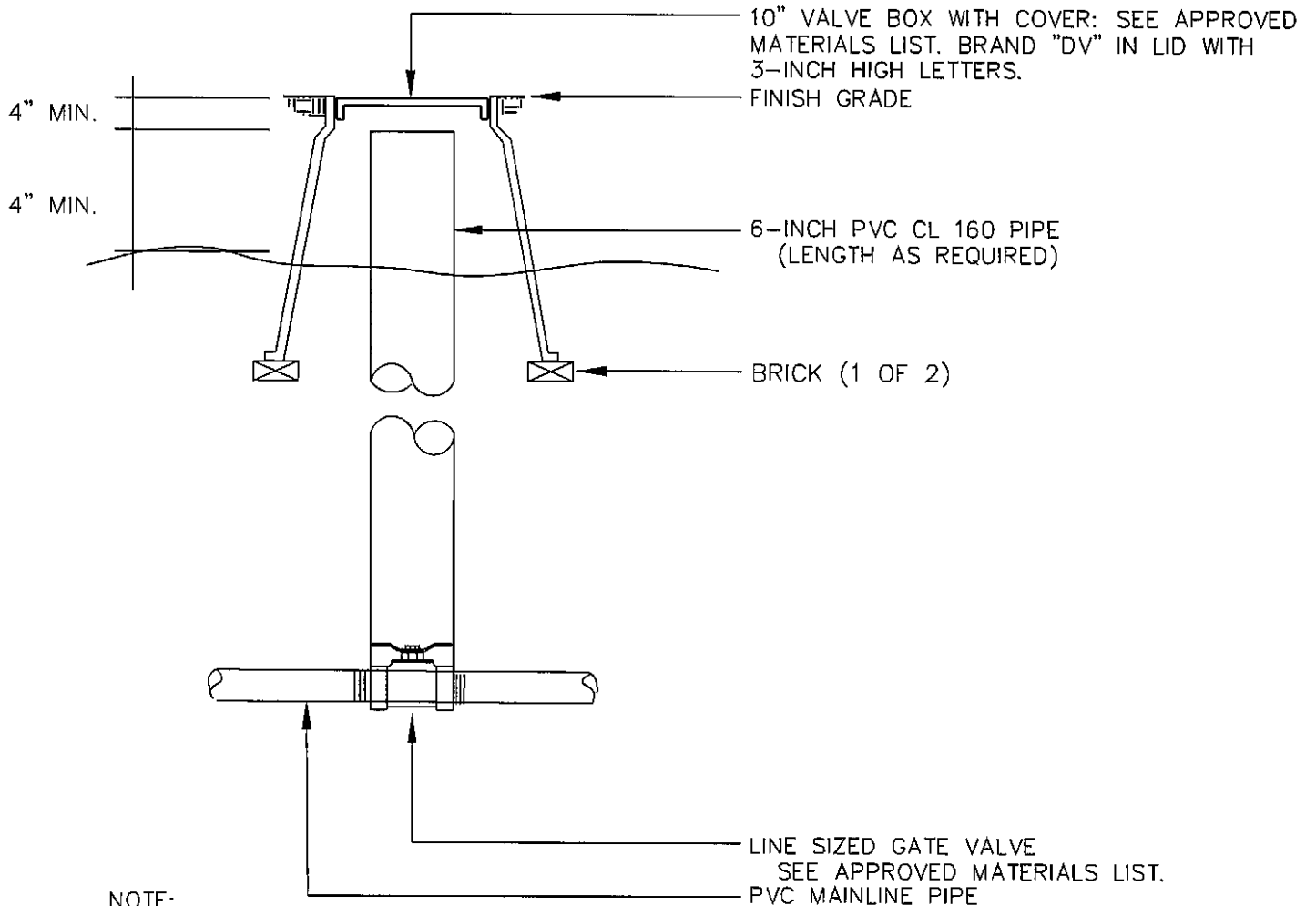


TOWN OF MEAD STANDARD DESIGN CRITERIA

VALVE DRAIN ASSEMBLY

D8.09

DATE: 04/2021



NOTE:

1. SLEEVE TO BE SET SQUARE OVER BALL VALVE TO ALLOW FOR OPERATION OF VALVE WITHOUT BINDING.
2. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

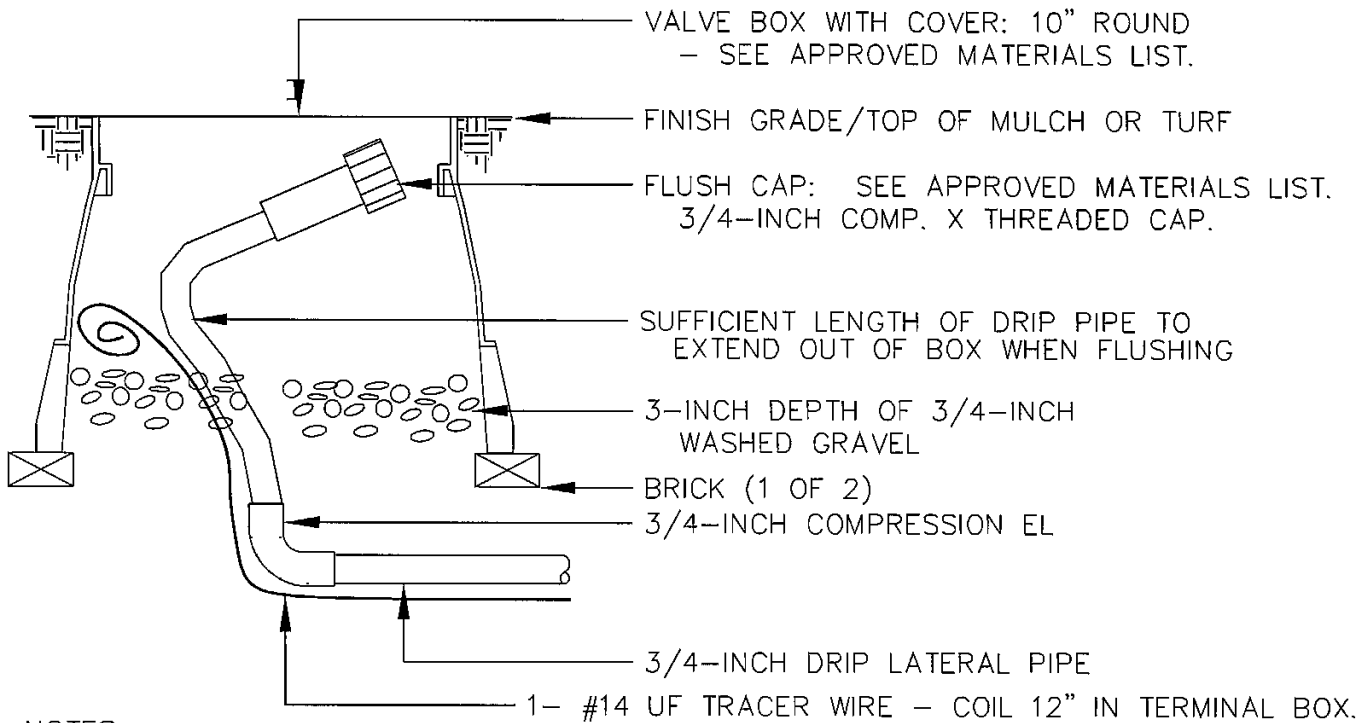


TOWN OF MEAD STANDARD DESIGN CRITERIA

GATE VALVE ASSEMBLY

D8.10

DATE: 04/2021



NOTES:

1. FLUSH CAP ASSEMBLY TO BE LOCATED AT THE TERMINUS OF EACH DRIP LINE.
2. INSTALL TRACER WIRE TO END OF EACH DRIP LINE BRANCH (TO TREES IN TURF AREAS ONLY) FOR EASE OF FUTURE LOCATES.
3. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

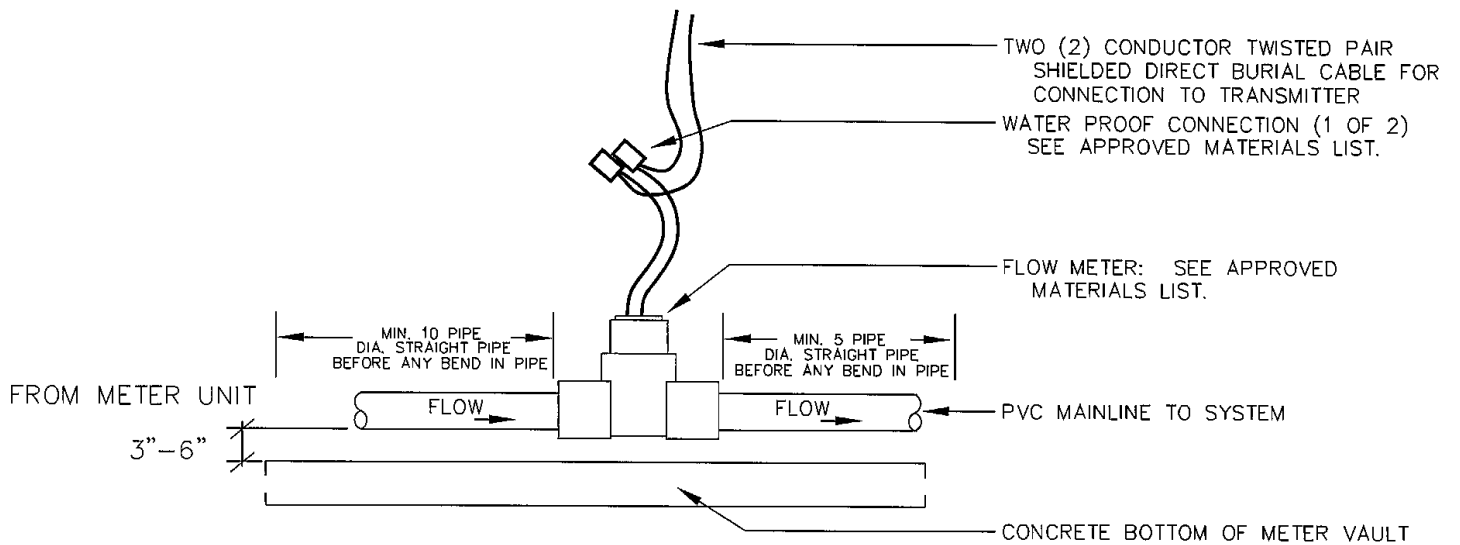


TOWN OF MEAD STANDARD DESIGN CRITERIA

FLUSH CAP ASSEMBLY

D8.11

DATE: 04/2021



- NOTES: 1. LOCATION OF FLOW METER ASSEMBLY TO BE LOCATED WITHIN METER PIT (SEE DETAIL) AND DETERMINED BY DISTANCES NOTED ON DETAIL ABOVE.
2. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

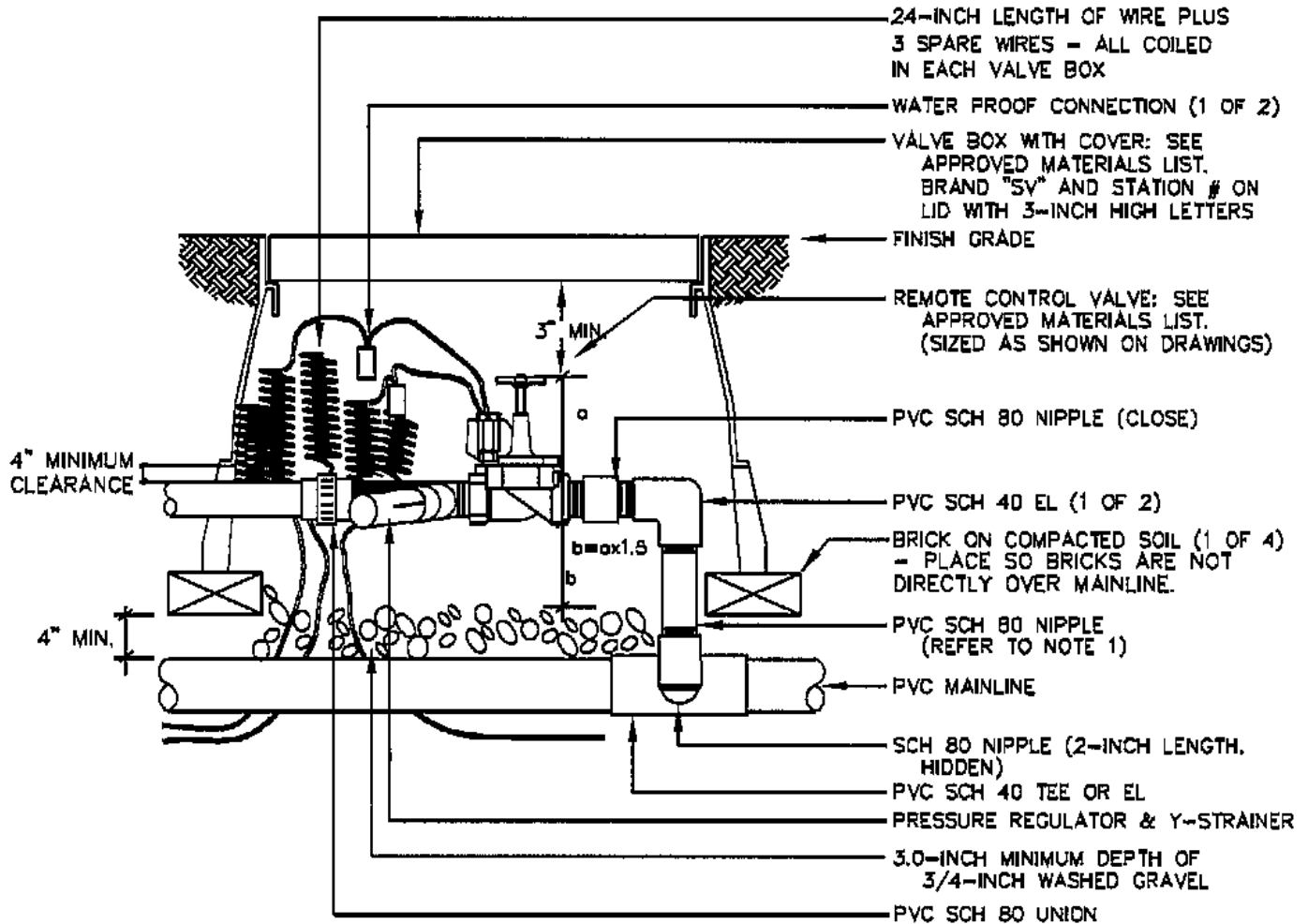


TOWN OF MEAD STANDARD DESIGN CRITERIA

FLOW METER ASSEMBLY

D8.12

DATE: 04/2021



NOTES:

1. FITTINGS AND BALL VALVE TO BE SIZED IDENTICALLY WITH CONTROL VALVE.
2. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

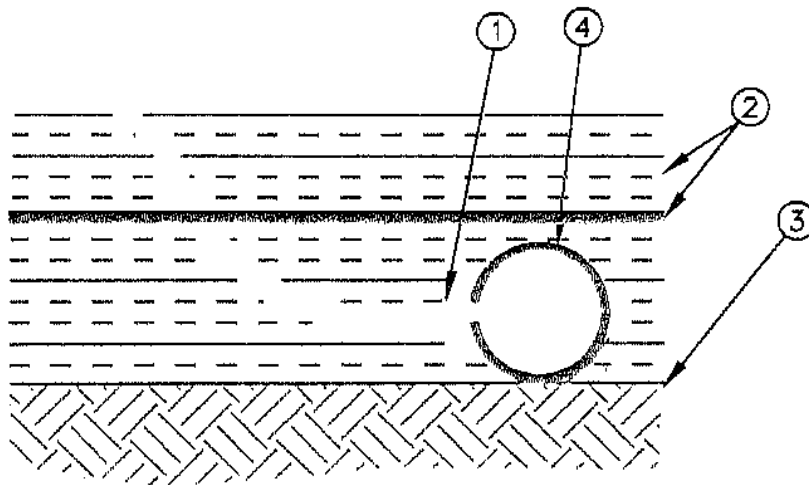
DRIP REMOTE CONTROL VALVE ASSEMBLY

D8.13

DATE: 04/2021

LEGEND

1. SPIRAL BARB EMITTER – SEE APPROVED MATERIALS LIST.
2. 4" MINIMUM DEPTH OF MULCH OVER WEED BARRIER
3. UNDISTURBED SOIL
4. DRIP LATERAL PIPE – SEE APPROVED MATERIALS LIST.



NOTES:

1. PROVIDE SUFFICIENT STAKES TO SECURE PIPE BELOW MULCH.
2. EMITTER TO BE PLACED WITHIN PLANTING PIT AREA OF SHRUBS OR TREES. IF SLOPED AREA, PLACE ON UPHILL SIDE OF PLANTING.
3. 2 – 1 GAL/HR EMITTERS PER SHRUB & 4 1 GAL/HR EMITTERS / TREE (2" CAL. SIZE) ARE REQUIRED. SPACE EMITTERS EVENLY.
4. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.
5. NO SPAGHETTI TUBING ALLOWED!
6. TRACER WIRE TO BE INSTALLED WITH ALL BURIED DRIP PIPE IN NATIVE GRASS AREAS AND IN OTHER AREAS WHERE NOT LOCATED AT THE SURFACE IN A SHRUB BED.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

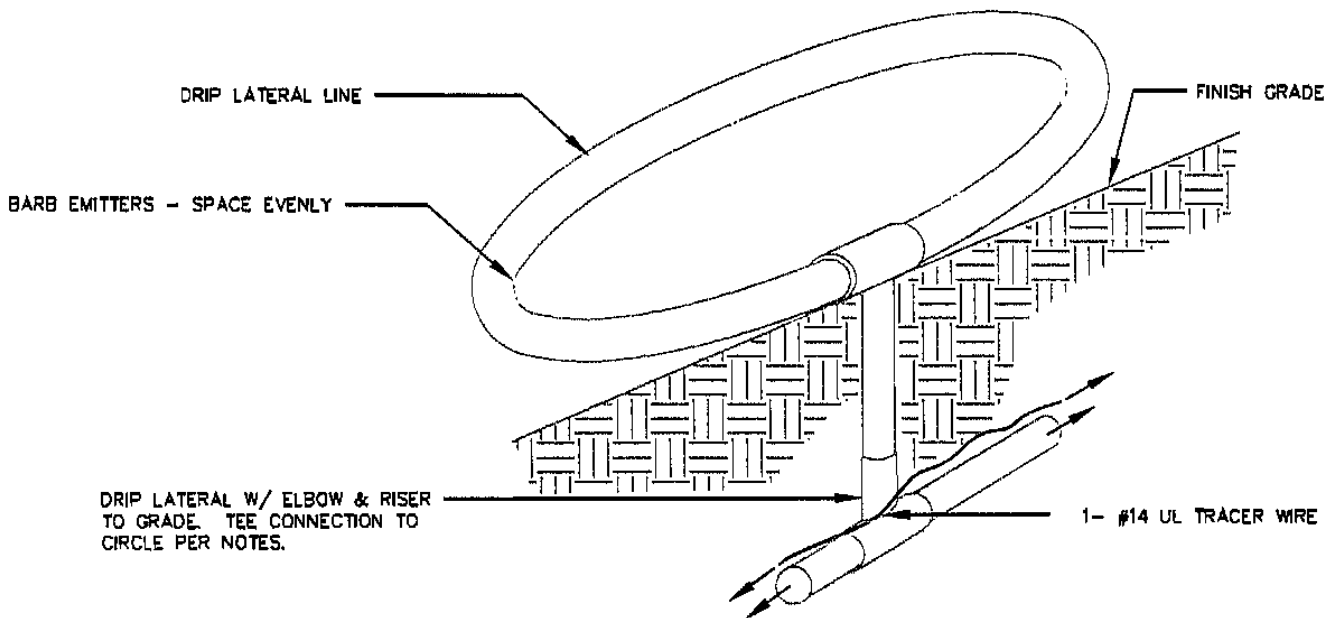
SHRUB BED DRIP DETAIL

D8.14

DATE: 04/2021

NOTES

1. SPIRAL BARB EMITTER - SEE APPROVED MATERIALS LIST.
2. 3" MINIMUM DEPTH OF COVER BELOW MULCH IN PLANTING PITS
3. 12" MIN. TRENCH DEPTH FOR DRIP LATERALS BETWEEN PLANTINGS
4. DRIP LATERAL PIPE - SEE APPROVED MATERIALS LIST.
(NO 1/4" DISTRIBUTION TUBING (SPAGHETTI TUBING) ALLOWED!)
5. 2' DIAMETER DRIP PIPE TO CIRCLE EACH TREE, 18" DIAMETER DRIP PIPE TO CIRCLE EACH SHRUB IN OPEN TURF AREAS. STAKE SECURELY AT PERIMETER OF PLANTING PIT AND COVER WITH 3" MIN. DEPTH MULCH.
6. ALL FITTINGS TO BE SECURED WITH STAINLESS COMPRESSION TYPE FITTINGS, OR APPROVED EQUAL.
7. INSTALL TRACER WIRE DIRECTLY ABOVE DRIP LATERALS BURIED UNDER TURF AREAS FOR EASE OF FUTURE LOCATES.



NOTES:

1. SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.

SCALE: NTS

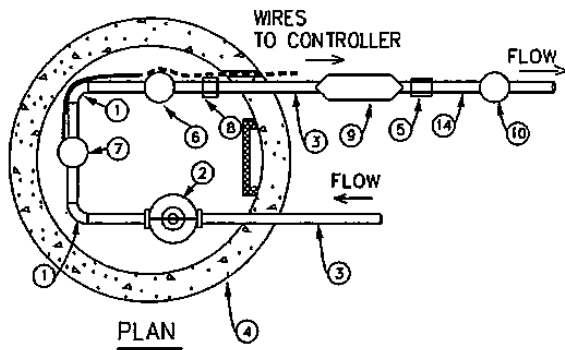


TOWN OF MEAD STANDARD DESIGN CRITERIA

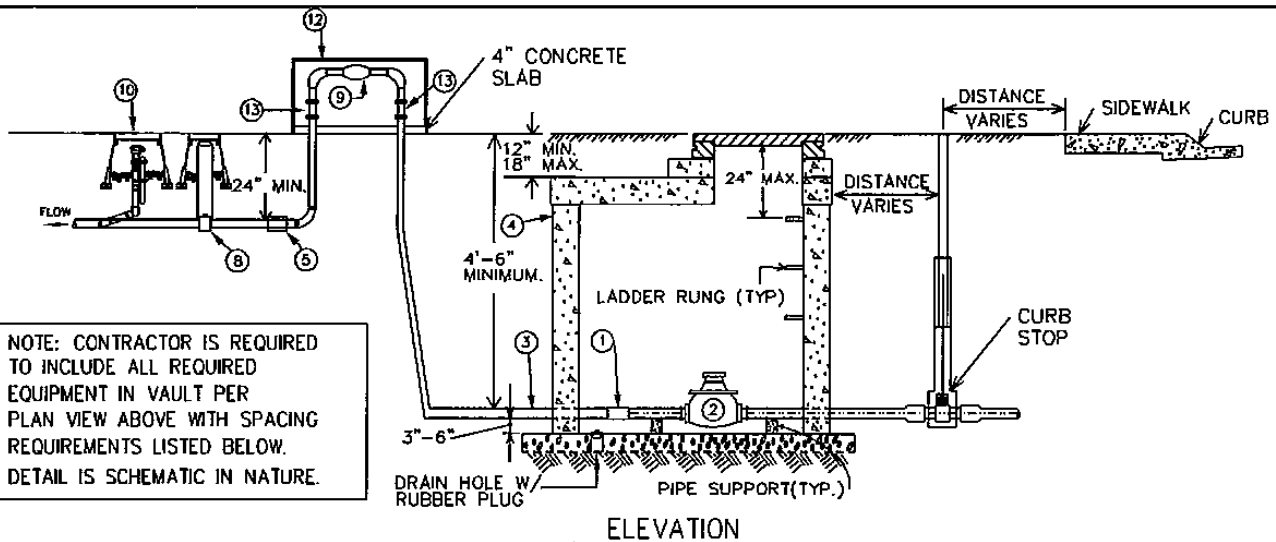
DRIP TO TREES IN OPEN TURF AREAS

D8.15

DATE: 04/2021



- ① - 90 DEG. ELBOW
- ② - METER UNIT
- ③ - TYPE K 'SOFT' COPPER TUBING
- ④ - 60" CONCRETE VAULT
- ⑤ - PVC ADAPTER
- ⑥ - MASTER VALVE
- ⑦ - FLOW METER
- ⑧ - DRAIN VALVE
- ⑨ - REDUCED PRESSURE PRINCIPLE BPD
- ⑩ - WINTERIZATION ASSEMBLY
- ⑪ - 2" CLASS 200 PVC OR SMALLER
- ⑫ - STRONGBOX ENCLOSURE
- ⑬ - UNION



NOTE: CONTRACTOR IS REQUIRED TO INCLUDE ALL REQUIRED EQUIPMENT IN VAULT PER PLAN VIEW ABOVE WITH SPACING REQUIREMENTS LISTED BELOW. DETAIL IS SCHEMATIC IN NATURE.

NOTES:

- A - BASE AND BOTTOM BARREL SECTION SHALL BE PRECAST AS A SINGLE UNIT. THE VAULT IS INTENDED TO BE WATERTIGHT, USE APPROVED GASKET MATERIALS TO SEAL PIPE PENETRATIONS.
- B - A 60" DIA. VAULT IS REQUIRED FOR ALL TAPS 3/4" - 2" IN SIZE. METERS LARGER THAN 2" OR NON-POTABLE SYSTEMS WILL REQUIRE A SPECIAL DESIGN TO VERIFY VAULT SIZE.
- C - COPPER JOINTS INSIDE METER VAULT SHALL BE EITHER THREAD OR SOLDERED WITH 95-5 TINANTIMONY SOLDER.
- D - COORDINATE WITH CITY OF LONGMONT WATER/WASTEWATER OPERATIONS & MAINTENANCE FOR PICK-UP OF METERS & METER CONNECTERS.
- E - METERS TO BE INSTALLED PER WATER/WASTEWATER STANDARDS AND DETAILS.
- F - NO CONNECTIONS OR CHANGES IN PIPE DIRECTION SHALL BE MADE IN 10 PIPE DIAMETERS UPSTREAM OF THE FLOW SENSOR OR 5 PIPE DIAMETERS DOWNSTREAM OF THE FLOW SENSOR.
- G - LADDER RUNGS SHALL BE CENTERED UNDER EITHER SIDE OF PIT LID AND OVER METER.
- H - EXTEND 2 SPARE WIRES BETWEEN THE FLOW SENSOR AND THE CONTROLLER. WIRES TO BE IN 3/4" PVC CONDUIT THROUGH VAULT WALL. CONDUIT TO BE SEALED WITH WATERPROOF SILICONE FROM INSIDE OF VAULT.
- I - REDUCED PRESSURE BPDs ARE TO BE LOCATED SO SURROUNDING GRADES DRAIN TO A PAVED SURFACE WITHOUT ENCOUNTERING BUILDINGS OR OTHER STRUCTURES.
- J - SEE CITY OF LONGMONT DESIGN STANDARDS & CONSTRUCTION SPECIFICATIONS AND APPROVED MATERIALS LIST FOR APPROVED PRODUCTS AND INSTALLATION REQUIREMENTS.
- K - SEE WINTERIZATION, FLOW METER AND MASTER VALVE DETAILS.

SCALE: NTS

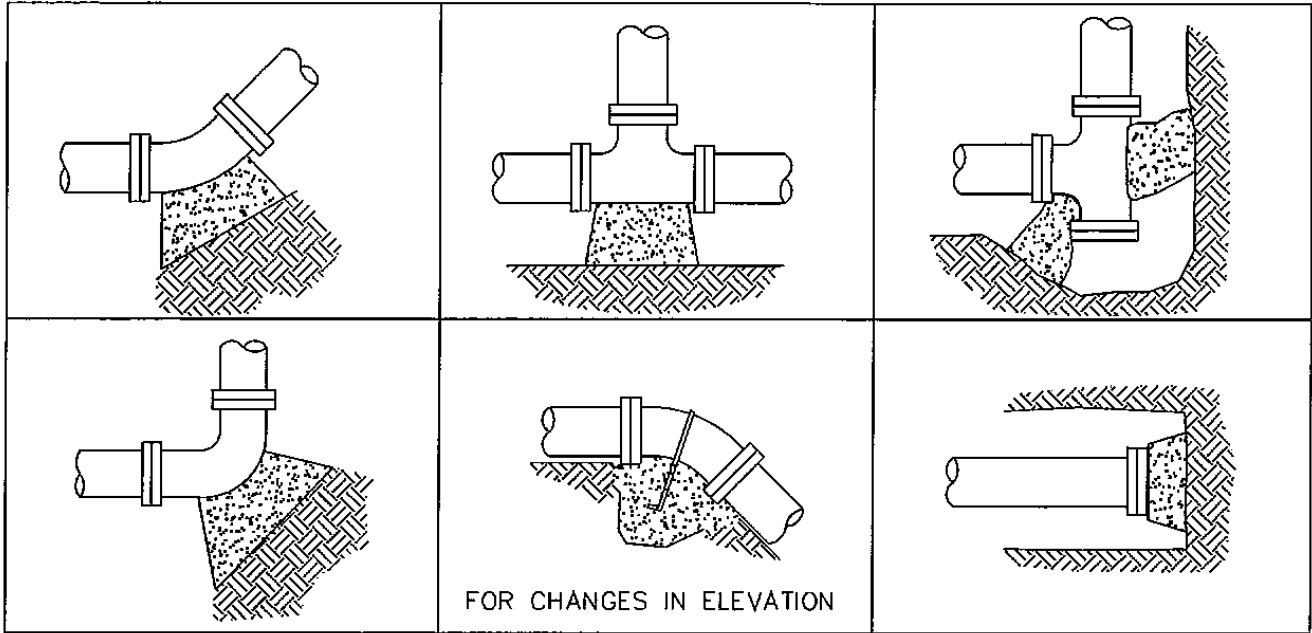


TOWN OF MEAD STANDARD DESIGN CRITERIA

BACKFLOW PREVENTER CONCRETE VAULT

D8.16

DATE: 04/2021



THRUST BLOCK SURFACE AREA AGAINST UNDISTURBED SOIL (SF)

PIPE SIZE	BENDS			TEE OR DEAD END
	22-1/2°	45°	90°	
3"	0.3	0.6	1.1	0.8
4"	0.5	1.1	1.9	1.4

*BASED ON 2,000 PSF SOIL BEARING CAPACITY

NOTES:

1. USE NO. 4 REBAR WITH MASTIC COATING WHERE PIPE MUST BE ANCHORED TO THRUST BLOCK.
2. INSTALL THRUST BLOCK SO THE HORIZONTAL AND VERTICAL DIMENSIONS OF THE THRUST BLOCK ARE APPROXIMATELY EQUAL.
3. INSTALL THRUST BLOCKS AGAINST UNDISTURBED SOIL.
4. KEEP WIRES CLEAR OF THRUST BLOCK.
5. IRRIGATION CONTRACTOR SHALL VERIFY SOIL BEARING CAPACITY. IF SOIL BEARING CAPACITY VARIES FROM ASSUMPTION LISTED ABOVE, CONTRACTOR SHALL RE-DESIGN AS NEEDED.

SCALE: NTS

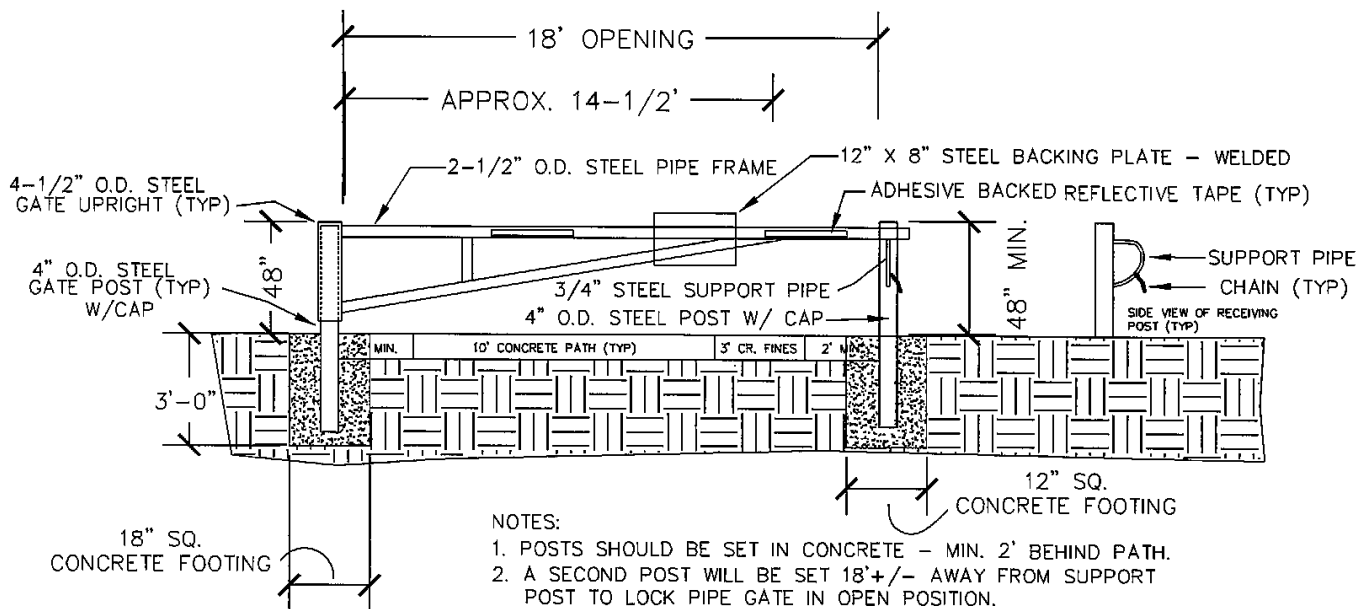


TOWN OF MEAD STANDARD DESIGN CRITERIA

CONCRETE THRUST BLOCK

D8.17

DATE: 04/2021



NOTES:

1. POSTS SHOULD BE SET IN CONCRETE - MIN. 2' BEHIND PATH.
2. A SECOND POST WILL BE SET 18'+/- AWAY FROM SUPPORT POST TO LOCK PIPE GATE IN OPEN POSITION.
3. ASSUMING 200 PSF SOIL PRESSURE
4. PROVIDE SHOP DRAWINGS FOR REVIEW
5. ALUMINUM SIGN READING "PATH CLOSED DUE TO HIGH WATER - PLEASE USE ALTERNATE ROUTE. EL PASADERO CERRO DEBIDO REGAR ALTO - POR FAVOR USE ALTERNA LA RUTA PASADERO" TO BE INSTALLED ON BACKING PLATE.
6. REFLECTIVE TAPE REQUIRED ON ALL POSTS.
7. 3/16" CHAIN REQUIRED ON POSTS TO SECURE GATE OPEN AND CLOSED.
8. FINISH TO BE GALVANIZED OR APPROVED EQUAL.

SCALE: NTS



TOWN OF MEAD STANDARD DESIGN CRITERIA

FLOOD GATE

D8.18

DATE: 04/2021