



**LEBANON PLANNING BOARD
JUNE 22, 2026 - 6:30 PM
COUNCIL CHAMBERS, CITY HALL OR
REMOTE VIA VIRTUAL PLATFORM
LEBANONNH.GOV/LIVE**

To participate in this meeting, please join live via Microsoft Teams or call 929-229-9356 (Access Code: 274 827 486#). If you have trouble accessing this meeting, please [email Tim Corwin](mailto:Tim.Corwin@lebanonnh.gov).

1. Call to Order

2. Public Hearing Items

- A. **Master Plan Housing Chapter Update:** A public hearing will be held for the purpose of receiving input and taking action on proposed changes to the Lebanon Housing Chapter of the Master Plan.
- B. **Zoning Amendments:** A public hearing will be held for the purpose of receiving input and taking action on proposed zoning amendments:

Amendment 1: Changes to Section 205 "One Principal Structure Per Residential Lot"

Amendment 2: Changes to Section 604 "Group Day Care Facilities"

- C. **City of Lebanon, 5 Airpark Road (Tax Map 131, Lot 1), zoned IND-L:** Pursuant to NH RSA 674:54 (Governmental Land Uses), applicant requests advisory Site Plan Review to construct a +/-153 sq. ft. isolation valve building on a site located on the west side of Poverty Lane, south of the Lebanon Police Station. The building will service control of the flow of water to the Farnum Hill Water Storage tank. **PB2026-34-GOV**

3. Committee Reports

- A. **City Council Subcommittees:**
 - Class VI Roads Advisory Committee
 - Lebanon Energy Advisory Committee
- B. **Other Subcommittees:**
 - City Council Representative
 - Heritage Commission
 - Pedestrian & Bicyclist Advisory Committee
 - Upper Valley Lake Sunapee Regional Planning Commission
 - UV Subcommittee of the Connecticut River Joint Commissions
 - Upper Valley Transportation Management Association
 - Mascoma River Local Advisory Committee
 - West Lebanon Revitalization Advisory Committee
 - Planning & Development Department – Task Status
- C. **Development Regulations**

- D. Minor Site Plan Committee
- E. Housing Task Force
- 4. Other Business**
 - A. Presentation by the Lebanon Energy Advisory Committee (LEAC) on proposed Electric Vehicle (EV) Site Plan Regulations
- 5. Approval of Minutes**
 - A. May 26, 2026
 - B. June 8, 2026
- 6. Adjournment**

The order of agenda items is subject to change.

Meetings are open for in-person and remote attendance. Members of the public who wish to attend remotely may do so by going to LebanonNH.gov/Live where you will find instructions on how to enter the meeting. Members of the public will be able to participate and ask questions through the City's virtual platform or by phone. Please note: Should technical difficulties occur during the meeting that disrupt virtual or phone connection(s), the meeting will continue without remote access capabilities.

Any person with a disability who wishes to attend this public meeting and needs additional accommodation, please contact the ADA coordinator at City Hall by calling 603-448-4220 at least 72 hours in advance so that the City can make any necessary arrangements.



CITY OF LEBANON ~ PLANNING & DEVELOPMENT

MEMORANDUM

To: Lebanon Planning Board

From: Planning and Development Staff & Lebanon Housing Task Force

Re: Housing Master Plan Chapter

Date: June 11, 2026

Background:

The Lebanon Housing Task Force was created in 2024 and first met in the fall of that year. In May of 2025, the city was awarded \$100,000 in the form of a Housing Opportunity Housing Grant. This grant was used to hire Resilience Planning, a planning consulting firm, to work with the Housing Task Force to complete a full rewrite of the Housing Master Plan Chapter. Since then, we have completed a market analysis, a housing needs assessment, a fiscal analysis, hosted many community outreach events, and a community survey which received around 1,000 responses. These documents can be found on the City's website: [Lebanon Housing Plan - Living in Lebanon | Lebanon, NH](#). The final meeting of the Lebanon Housing Task Force was on June 1, 2026, where they made final edits to the draft chapter and prepared it to be sent to the Planning Board for its final approval.

Upcoming Dates:

- July 14-15, 2026: Urban Land Institute Technical Assistance Panel

Lebanon will be hosting an event in partnership with the Urban Land Institute with the topic of how to implement the goals and actions listed in the Housing Chapter of the Master Plan. The Urban Land Institute representatives will be presenting their findings at the July 15, 2026, City Council meeting.

Planning Board's Role:

The Master Plan is a document that belongs to the Planning Board and should influence their decisions. The Planning Board needs to approve any new Master Plan Chapter.

The Lebanon Housing Task Force and Planning Staff recommends approval of the draft Housing Charter of the Lebanon Master Plan that is attached to this agenda item.

Attachments:

1. Final Draft Housing Chapter of the Lebanon Master Plan



LIVING IN LEBANON 2035

A Housing Chapter for the City of
Lebanon Master Plan

Adopted _____

Acknowledgments

This Housing Chapter was developed through a collaborative effort involving the City of Lebanon Planning Department, the Lebanon Housing Task Force, community participants, and the consultant team, Resilience Planning and Design and RKG Associates. The Planning Department provided leadership and coordination throughout the process, while the Housing Task Force helped guide the chapter through review of housing data, identification of housing challenges and opportunities, and discussion of future housing needs and strategies. ***The City extends its appreciation to everyone who contributed their time, expertise, feedback, and perspectives throughout the development of this chapter.***

Housing Task Force Members:

Timothy McNamara, City Councilor
Andrew Faunce, Planning Board Representative and City Councilor
Sarah Riley, Conservation Commission Representative
Tia Winter, DEI Commission Representative
John D'Entremont, Lebanon School Board Representative
Ryan Dube, Lebanon Housing Authority Representative
David Duncan, Business Member Representative
Ellen Smith Ahern, Resident Representative

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SETTING THE STAGE

Lebanon's **existing housing stock**, along with **the housing units developed over the next decade**, will be defining factors in the city's future. The composition and availability of housing shape who is able to live in Lebanon, how neighborhoods change over time, and how effectively the local economy operates. As a regional center for employment, healthcare, and education, Lebanon's ability to provide a range of housing options directly affects **workforce retention and attraction, economic competitiveness, and long-term community stability**. The recent adoption of Pattern Zones Overlay District was an important step in the right direction.

Lebanon residents and decision makers are serious about addressing the documented housing supply issues, and this **Housing Chapter** establishes a clear framework for how housing related actions will support the community's broader vision. Doing so will ensure that growth is aligned with local values, that new development activity reinforces and enhances the existing development patterns, that pathways to ownership exist so residents build equity and contribute to community stability, and that residents across income levels and life stages have access to appropriate housing options.

KEY POINTS:

- Housing shapes Lebanon's **community composition** and **economic stability**
- **Municipal influence** over housing production is important but **limited**
- **Market pressures** are driving housing challenges
- A coordinated, policy-driven **housing strategy** is needed
- Core guiding principles focus on **housing diversity, neighborhood character**, and **greater accessibility**

A **glossary of planning and housing related terms** has been included at the end of this chapter. Some key terms are also explained within the body of this chapter.

The **VISION** for Lebanon's housing future is as follows:

Lebanon is a community that retains its socioeconomic diversity while maximizing opportunities for home ownership; a community where people can find housing that meets their needs at every stage of life, supported by a housing supply that balances economic growth and workforce retention with neighborhood stability, and guided by development patterns that reinforce walkability, reflect local character, ensure equity, and make efficient use of land.

To achieve this vision, five housing goals have been identified:

GOAL 1: Improve *Housing Affordability*

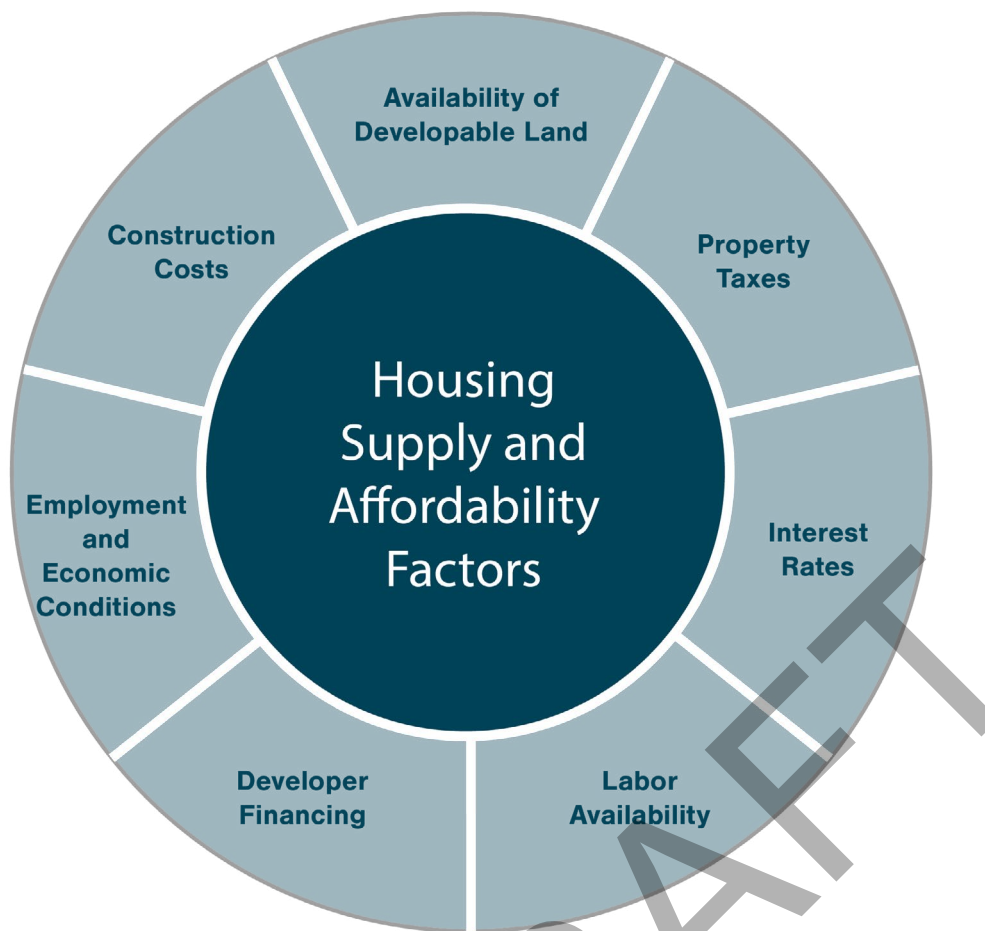
GOAL 2: Expand *Housing Diversity*

GOAL 3: Increase *Housing Supply*

GOAL 4: Direct Growth *Appropriately*

GOAL 5: Remove *Regulatory Barriers*

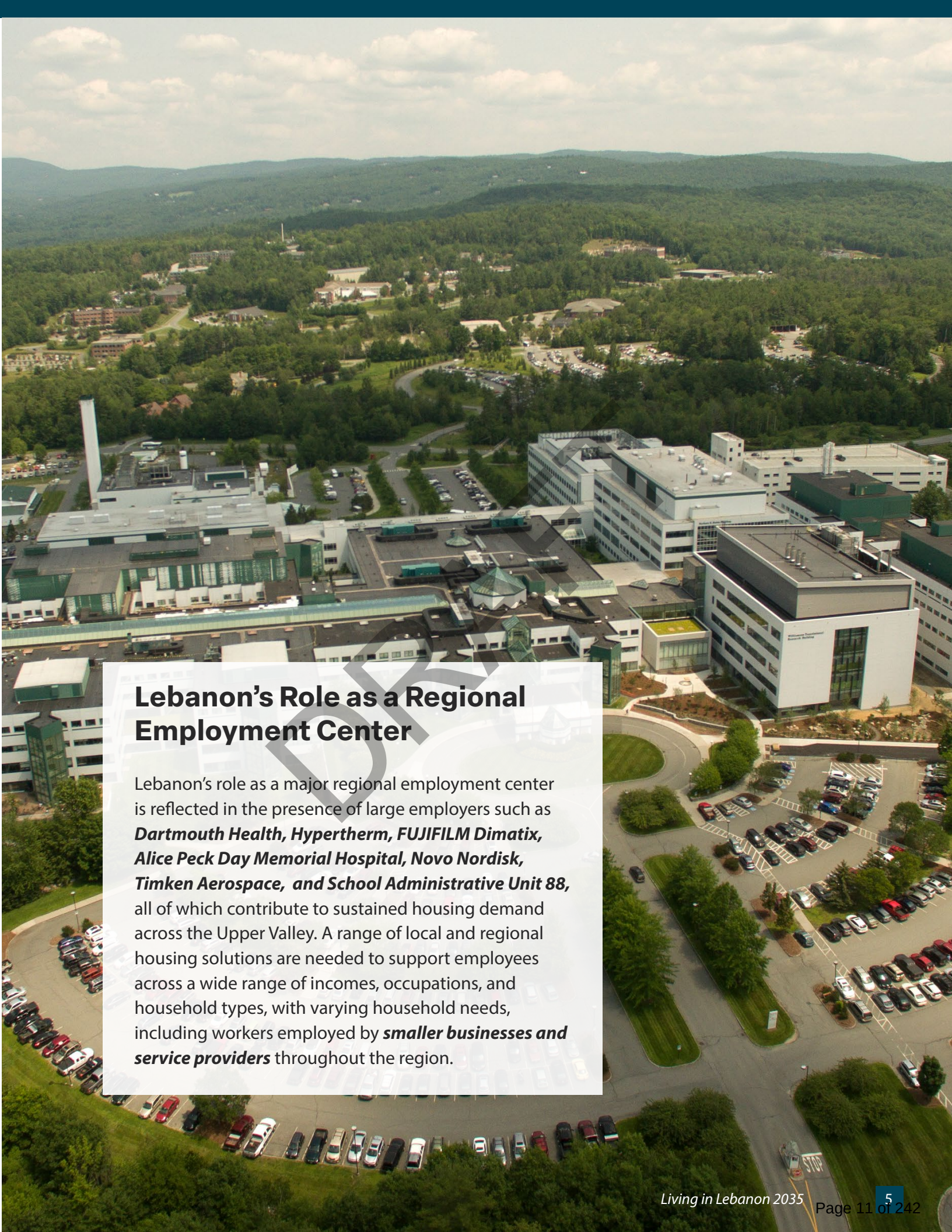
The **implementation actions** found at the end of this Chapter clarify the steps that need to be taken to achieve these goals and the housing vision over the next decade.



Limits of Municipal Influence on Housing Solutions

While the City of Lebanon plays an important role in shaping housing outcomes through its authority over land use regulations, zoning, and the development review and approval process, ***its influence over the broader topic of housing supply is inherently limited and should be noted***. Many of the factors that ultimately determine whether housing is built, the type of units produced, and at what price point are driven by external forces beyond municipal control. These include ***market dynamics*** such as construction costs, interest rates, labor availability, and developer financing, as well as ***regional demand pressures*** tied to employment and economic conditions. In addition, ***individual preferences***—such as choices about location, housing type, and tenure (owner occupied or rental)—and the tax rate ***further shape how the market responds***.

As a result, while the city cannot fully dictate the pace, scale, or affordability of housing development on its own, it can create a ***regulatory and policy environment*** that enables and encourages desired housing outcomes. This underscores the importance of partnerships, incentives, and coordinated regional approaches required to make Lebanon's housing vision a reality.



Lebanon's Role as a Regional Employment Center

Lebanon's role as a major regional employment center is reflected in the presence of large employers such as ***Dartmouth Health, Hypertherm, FUJIFILM Dimatix, Alice Peck Day Memorial Hospital, Novo Nordisk, Timken Aerospace, and School Administrative Unit 88,*** all of which contribute to sustained housing demand across the Upper Valley. A range of local and regional housing solutions are needed to support employees across a wide range of incomes, occupations, and household types, with varying household needs, including workers employed by ***smaller businesses and service providers*** throughout the region.

The Role of Housing in the Master Plan

Housing is not a standalone issue.

It is a foundational component of the Master Plan that intersects with land use, economic development, infrastructure, taxes, and community character. Lebanon's housing market reflects its role as the Upper Valley's primary employment center, with strong demand driven by major employers and regional in-migration.

At the same time, the city is experiencing changes that are placing **sustained pressure** on the housing supply:

- **Population growth** and an influx of new residents, including young professionals, are increasing demand for housing units.
- **Household sizes are declining**, with a growing share of one- and two-person households that are seeking new housing opportunities.
- **Rising housing and construction costs**, combined with **limited supply** across housing types, are creating **barriers** for renters, first-time homebuyers, moderate-income households, and residents wishing to age-in-place.
- **A mismatch between available housing and the evolving needs of residents**—particularly a lack of larger units and ownership opportunities—is limiting options for families and contributing to challenges in retaining residents over time.
- **Development projects are constrained by market conditions**, and guided by local

regulations, with most new construction skewing toward larger multifamily projects while smaller-scale and “missing middle” housing types remain difficult to deliver.

- **Regional employment dynamics and in-migration of higher-income households** are intensifying **competition** for housing, with implications for workforce retention and access to housing for local residents.

These trends reinforce the need for a **coordinated housing strategy** that balances growth with affordability, supports economic vitality, retains Lebanon's distinct character, and maintains quality of life.





Purpose of The Housing Chapter

The purpose of this chapter is to establish a policy and planning framework that guides housing decisions over the next decade.

It provides the foundation for **regulatory updates, investment priorities, and partnership strategies** that will shape Lebanon's housing landscape. By aligning housing with land use, economic development, transportation, energy, natural resource and other community goals, this chapter ensures that future growth contributes to a more balanced, inclusive, and sustainable city. A city that can accommodate continued housing demand while preserving the qualities that define Lebanon's distinct character and quality of life.



HOUSING ISSUES AND PRIORITIES

Lebanon's housing conditions reflect a combination of sustained regional demand, shifting demographics, and structural constraints in the housing market. Organized around the most consistent and actionable **six housing themes** identified, this section of the Housing Chapter provides a framework that integrates **existing conditions, key issues, and priority outcomes** to guide Lebanon's future housing strategies and implementation efforts.

This chapter was informed by the following work products created during the Living in Lebanon project funded in 2025/26 through a Housing Opportunity Planning Grant, and each document is included in the Appendix:

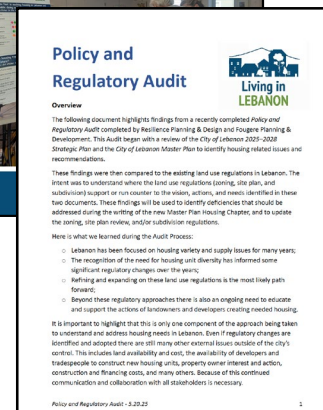
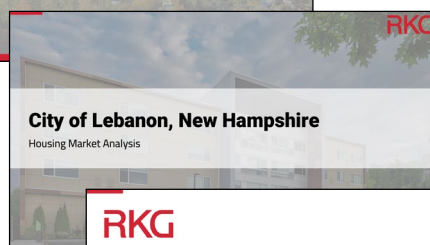
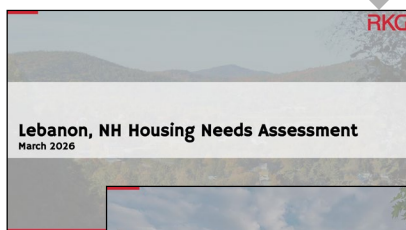
- **Housing Needs Assessment:** Evaluates current and projected housing demand, identifying gaps between available housing and the needs of residents across income levels, household types, and life stages.



- **Market Analysis:** Examines housing market conditions, including pricing, supply trends, vacancy rates, and development activity, to understand how the local market is functioning and responding to demand.
- **Fiscal Impact Analysis:** Assesses the costs and revenues associated with different types of housing development, helping to understand how housing growth affects municipal finances and service delivery.
- **Policy and Regulatory Audit:** Reviews existing zoning, land use regulations, and development processes to identify barriers, inconsistencies, and opportunities to better support housing production and diversity.
- **Outreach Summary:** Synthesizes input from Livable Lebanon community engagement efforts—including surveys, focus groups, and public events—to capture resident experiences, priorities, and preferences related to housing.

KEY POINTS:

- **Housing demand continues to outpace supply**, resulting in a constrained and highly competitive market.
- **Affordability pressures are widespread**, with rising costs outpacing incomes across household types.
- **Workforce housing gaps** are impacting economic stability, employee retention, and access for essential workers.
- **Changing household composition is reshaping demand**, with increased need for smaller, flexible, and accessible housing options.
- **The housing stock lacks diversity**, particularly in missing middle and smaller-scale housing types, and units desirable to families.
- **Regulatory, financial, and market barriers** continue to limit housing production and access.
- **Community feedback** emphasized a desire for increasing housing options while maintaining affordability, neighborhood character, and quality of life.



Issue #1: Persistent Supply and Demand Imbalance

Housing demand in Lebanon continues to outpace supply, driven by steady population growth, workforce in-migration, and the city's role as the Upper Valley's primary employment and service center. Over the past decade, population growth of approximately 9% and continued projections of growth through 2030 have reinforced **sustained demand for housing across all types**.

At the same time, housing production—while active—has not kept pace with this demand. Multifamily development has increased significantly, particularly since 2015, positioning Lebanon as the focal point for regional rental housing. **However, overall production remains insufficient, especially for ownership opportunities and smaller-scale infill development.**

These conditions have resulted in a **constrained housing market** characterized by **low vacancy rates, rising prices, and intense competition** for available units. A significant share of homes sell above asking price, and rental units are quickly absorbed. This imbalance between supply and demand is the primary driver of broader housing challenges, limiting housing choice and increasing barriers to entry across income levels.

Median home prices
more than

DOUBLED

since 2015 (from
\$205,000 to \$451,000),
far outpacing local
income growth



Median Monthly Rent:

\$2,923

Source: 2024 NH Housing Data



Median Household Income:

\$92,288 - \$121,300

Source: 2024

American
Community Survey

Source: 2025 U.S. Dept.
of Housing and Urban
Development

TENURE PATTERNS

Lebanon has a **nearly even split between renters and homeowners**. This balance distinguishes Lebanon from many surrounding communities and reinforces its role as a regional housing center that supports a broad mix of households, housing needs, and life stages. Many of Lebanon's renters tend to be younger and more transient, while homeowners are more likely to be older and longer-term residents. This distinction has implications for housing demand, unit types, and neighborhood stability.

Strategic Priorities: Expand overall housing supply through a range of housing types and scales, with a focus on infill development, redevelopment, and adaptive reuse in areas with existing infrastructure and services.

Issue #2: Widespread Affordability Pressures

Housing affordability is a central issue affecting households across the income spectrum. Rising rents, home prices, property taxes, and utility costs have become a primary concern for residents, influencing their ability to remain in or move to Lebanon.

A significant portion of renters are cost-burdened, with approximately one in five households spending more than 30% of their income on housing. While household incomes have increased in recent years, these gains have not kept pace with escalating housing costs. Higher-income households have driven overall income growth, while lower- and moderate-income households face increasing difficulty accessing housing that aligns with their budgets. These conditions have created a widening affordability gap, reducing housing mobility and limiting options for first-time homebuyers, renters, and moderate-income households.

MARKET CONDITIONS

Lebanon's housing market is characterized by strong demand and constrained supply:

- **Rising Prices and Rents:** Home prices have increased substantially over the past decade, while rents continue to climb in response to sustained demand.
- **Low Vacancy Rates:** Rental vacancy rates remain low, indicating limited availability and a highly competitive market.
- **High Competition:** A significant share of home sales are above asking price, and rental units are quickly absorbed, reflecting intense competition for available housing.

These conditions collectively limit housing choice and increase barriers to entry for both renters and homebuyers.



18%

of **HOMEOWNERS** are cost-burdened in Lebanon, spending more than 30% of their incomes on housing

43%

of **RENTERS** are cost-burdened in Lebanon, spending more than 30% of their incomes on housing

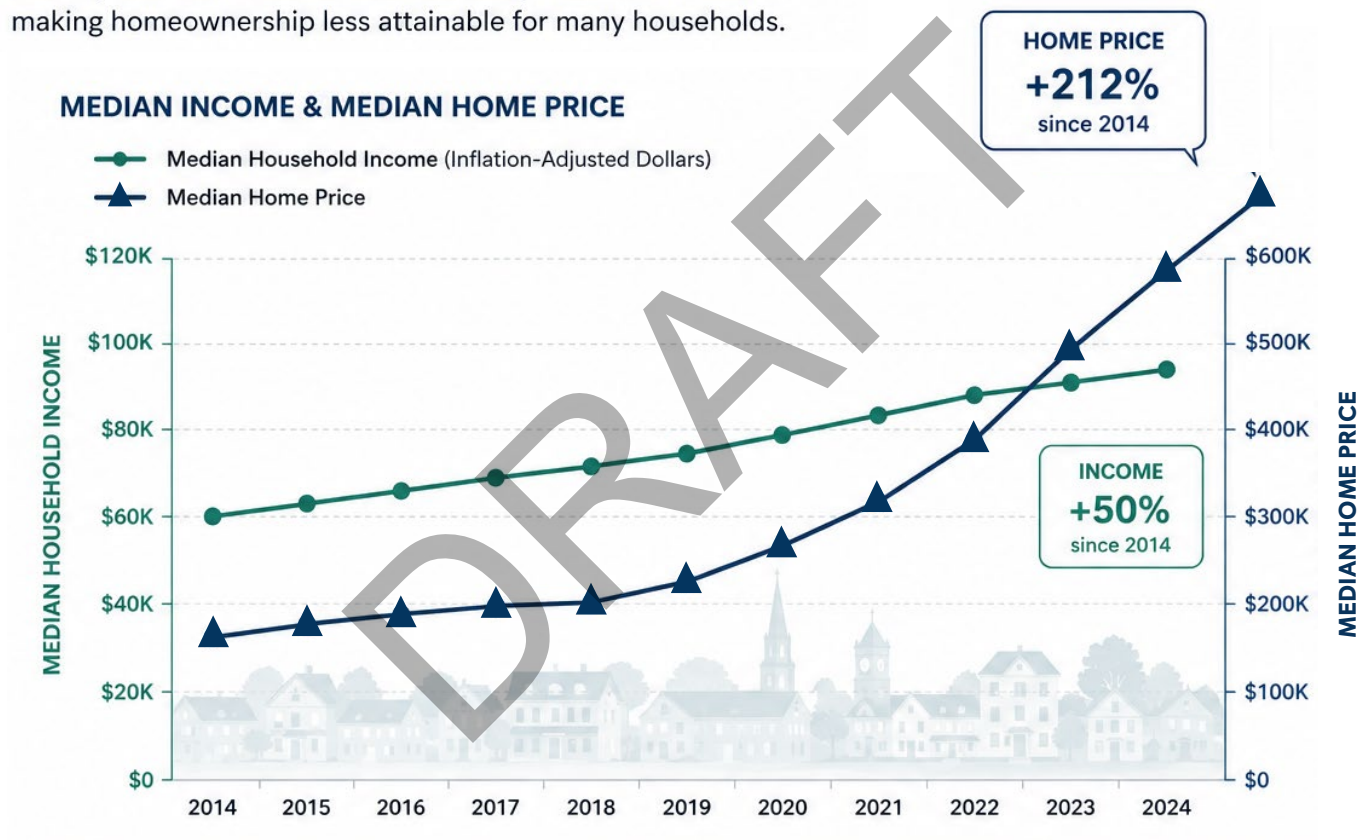
Strategic Priorities: Improve affordability and access by preserving existing affordable housing, incentivizing mixed-income and workforce housing, and reducing financial and regulatory barriers that contribute to cost burdens.

The growing gap between household income and housing costs in Lebanon highlights an increasing affordability challenge affecting households across the community. While household incomes have increased over the past decade, median home values and housing costs have risen at a substantially faster rate, making homeownership increasingly difficult for many residents, area employees, older adults, and first-time homebuyers. Current data indicates that the **median assessed value of a single-family home** in Lebanon is approximately **\$470,200**, with a median **annual property tax bill** of roughly **\$10,123**. Based on current housing cost estimates, purchasing a median-priced home in Lebanon would require the equivalent of two individuals each working full-time at approximately \$34.00 per hour to afford the estimated housing cost of \$3500 per month.

LEBANON, NH

Median Income vs. Median Home Price: A Decade of Change

Home prices have increased substantially faster than incomes, making homeownership less attainable for many households.



MEDIAN HOME PRICE
+212%
increase
(2014–2024)



MEDIAN INCOME
+50%
increase
(2014–2024)



THE GAP IS WIDENING
Home prices have
risen over
4x faster
than incomes.



Rising home prices make it harder for local workers, young families, and first-time buyers to achieve homeownership in Lebanon.

SOURCES:

American Community Survey (ACS) 5-Year Estimates
Zillow Home Value Index (ZHVI) – Lebanon, NH

Note: 2014 dollars adjusted for inflation using CPI-U-RS.

Issue #3: Workforce Housing Constraints

Lebanon's economy is closely tied to major employment sectors, including **healthcare, education, and professional services**. These sectors generate sustained demand for housing and shape both the scale and type of housing needed in the city.

However, a mismatch exists between wages—particularly for lower- and moderate-income workers—and available housing options. Many employees in essential sectors face difficulty finding housing within the

community, leading to longer commutes, reduced retention, and challenges in workforce recruitment.

This issue is particularly pronounced given Lebanon's role as a **regional employment hub**, drawing workers from across the Upper Valley. The lack of accessible workforce housing has direct implications for economic stability and the ability of employers to attract and retain staff.



Strategic Priorities: Strengthen workforce housing solutions through partnerships with employers, housing organizations, and regional stakeholders, and explore tools such as employer-assisted housing and targeted development incentives.

Issue #4: Changing Household Composition

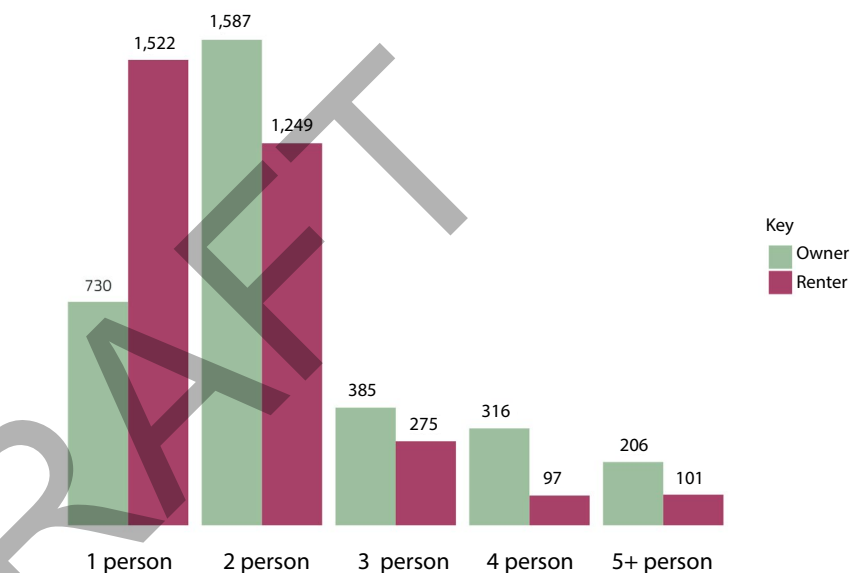
Demographic trends in Lebanon are reshaping housing demand.

Household sizes are decreasing, with one- and two-person households now representing approximately 80% of all households. At the same time, the community is experiencing both an **aging population** and an **influx of younger, working-age residents**.

These shifts are increasing demand for **smaller, more flexible housing options**, including rental units, downsizing opportunities, and housing that supports aging in place. However, gaps remain in the availability of family-sized units and accessible housing options for seniors and individuals with disabilities.

This evolving demographic profile requires **a housing stock that can accommodate a wider range of life stages and household needs**. These new units should be encouraged in locations that have the necessary infrastructure, and reinforce the desired development pattern.

Household Size by Ownership



Source: US Census Bureau ACS 5-Year Estimates, 2018 and 2023

Lebanon has a high concentration of smaller households.

Across owner and renter units in Lebanon there is a high proportion of smaller households, with **80%** consisting of one or two people. However, the many studio and one-bedroom units constructed may be contributing to this trend.

Strategic Priorities: Expand housing options that reflect changing household needs, including smaller units, accessible housing, and housing that supports aging in place, while maintaining adequate supply of family-oriented housing.

What is Missing Middle Housing?

Missing middle housing refers to a range of multi-unit housing types that fall between single-family homes and large apartment buildings. These housing forms are typically compatible in scale with traditional neighborhoods, but provide more units and a greater diversity of housing options.

Core Characteristics

- Moderate density (generally 2–12 units per building or lot)
- Residential scale (similar height and massing to single-family homes)
- Often integrated into existing neighborhoods rather than large standalone developments
- Supports both rental and ownership opportunities

Common Missing Middle Housing Types

- Duplexes, triplexes, and fourplexes
- Townhouses and rowhouses
- Cottage courts (small homes clustered around a shared open space)
- Small multiplex buildings (e.g., 6–12 units)
- Live/work units

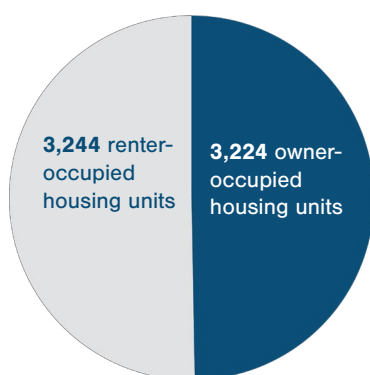
Below Images: Examples of Missing Middle Housing Types



Issue #5: Limited Diversity of Housing Types

Lebanon's housing stock includes a mix of traditional single-family homes and a growing share of multifamily developments. While this reflects its role as a regional center, ***the range of available housing types remains limited relative to current and emerging needs.***

Development activity has increasingly favored larger multifamily structures, while smaller-scale housing options—such as accessory dwelling units (ADUs), duplexes, townhouses, and other missing middle housing types—remain underrepresented. This limits the availability of intermediate housing options that can bridge the gap between single-family homes and large apartment buildings. As a result, the housing supply does not consistently provide a mix of unit types, tenures, and price points needed to support a diverse population.



The total number of 1 and 2-person households increased by
10 percent
between 2013 and 2023.

GAPS IN THE HOUSING SUPPLY

Despite ongoing development activity, significant gaps remain between the housing supply and community needs:

- **Small Units:** Demand for smaller units is increasing due to changing household composition, yet supply remains limited relative to need.
- **Family-Sized Housing:** There is a lack of larger rental units and ownership options suitable for families.
- **Entry-Level Homeownership:** Rising home prices and limited inventory restrict access for first-time homebuyers.
- **Senior Housing:** Aging residents require accessible, downsized, or supportive housing options that are currently limited.
- **Workforce Housing:** A mismatch persists between available housing and the needs of moderate-income and essential workers.

Strategic Priorities: Expand housing diversity by enabling and incentivizing missing middle housing, smaller-scale multifamily development, and a broader mix of ownership and rental opportunities.

Housing Production Trends

Lebanon's housing production patterns have shifted significantly in recent decades, with substantially lower rates of single-family home construction and a notable increase in multifamily housing development.

While single-family construction since 2020 has remained relatively consistent with the previous decade, multifamily production has accelerated considerably, reflecting growing demand for a wider range of housing types, household sizes, and price points. In addition, more than 900 housing units are currently identified within the development pipeline, indicating continued development pressure and the potential for substantial housing growth in the coming years. This trend highlights the increasing importance of long-range planning efforts related to infrastructure capacity, transportation, housing affordability, workforce needs, and maintaining a socially, economically, and generationally diverse year-round population.

Below: Table illustrating historic housing production trends in Lebanon and modelled future projections provided by the City of Lebanon

Year Units Built	Single-Family Units	Multi-Family Units
2026-2029 (projected)	130	1,768
2020-2025	65	884
2010-2019	126	521
2000-2009	409	420
1990-1999	220	169
1980-1989	509	489
1970-1979	447	477
1960-1969	488	84



Recent housing development activity in Lebanon may have influenced the community's household size trends, particularly the increase in one- and two-person households identified in recent demographic data. Several of the larger residential projects constructed in recent years were heavily weighted toward studio and one-bedroom units, which are more likely to attract single occupants or smaller households by design. For example, The Merek includes 123 studio units and 127 one-bedroom units, Hanover Place Residences consists entirely of 120 studio apartments, One Mechanic Street includes 17 studio units, and Heater Landing includes 30 one-bedroom units. As a result, the construction of these housing types may have contributed to or accelerated demographic trends showing growth in smaller household sizes, rather than solely reflecting an organic shift in the composition of existing residents or families within the community.

Issue #6: Barriers to Housing Access and Development

A variety of barriers continue to limit both access to housing and the production of new units. For many households, **competition, eligibility requirements, and financial constraints** restrict access to available housing, particularly for lower-income and nontraditional applicants.

From a development perspective, **regulatory complexity, development costs, and approval processes** can constrain housing production—especially for smaller-scale or infill projects. In some instances, requirements related to **zoning, permitting, and site development** can make it difficult to deliver the types of housing most needed by the community. These barriers contribute to both limited supply and reduced accessibility, reinforcing Lebanon’s broader housing challenges.

RELEVANT TRENDS

- Stakeholders report that Lebanon’s housing is both **too expensive and too limited**, with essential workers often living far away, buyers priced out, and renters unable to find units in the \$1,800–\$2,000 per month range.
- High development costs, long permitting timelines, and regulatory barriers are **limiting new construction**, pushing builders to pursue projects in other communities.
- Since 2015, **nearly all new housing growth has been in rental units**, while owner-occupied development has remained modest and inconsistent.

Key Findings from the Policy and Regulatory Audit of the Lebanon Master Plan and Land Use Regulations:

- Lebanon has been focused on addressing housing variety and supply issues for many years;
- The city’s recognition of the need for housing unit diversity has informed some significant regulatory changes over the years;
- Further refining and expanding on these land use regulations over the coming decade is the most likely path forward; and
- Beyond these regulatory approaches, there is also an ongoing need to educate and support the actions of landowners and developers creating needed housing.

Strategic Priorities: Continue to modernize zoning and development regulations to reduce constraints, streamline approvals, and enable a wider range of housing types, particularly small-scale and infill development.

COMMUNITY INTEREST AND GUIDING PRINCIPLES

Community engagement efforts completed during the Livable Lebanon initiative—including focus groups, community conversations, tabling events, and a citywide survey—collected input from over 1,000 participants, offering a broad perspective on housing needs and priorities.

Respondents consistently identified **housing costs and availability as major concerns**, while also expressing a strong desire for housing solutions that align with neighborhood character, walkability, and quality of life. There is clear support for **increasing housing options across a range of types and price points**, particularly in walkable, service-rich areas.

Community feedback also emphasized the importance of housing that supports **different life stages**, including young professionals, families, and older adults, as well as interest in **balancing growth with livability** through thoughtful design and location of new development.



1,000+ participants

engaged in all outreach activities
conducted for the Living in Lebanon
Housing Chapter

“We need housing to be affordable. Essential staff often make low wages. If they can’t afford to live close to work because of high housing costs, then they are less likely to remain in this area.”

“It’s really hard to want to stay here when it feels like we will never save enough for a down payment to buy a house, when we are paying \$2800+ in rent a month.”

“Pricing and availability are an issue. With the increase in inflation, everything is getting harder to afford. My income level stays the same.”

Together, Lebanon's ***housing issues and strategic priorities*** provide a comprehensive understanding of the city's housing landscape and establish a clear foundation for action.

They highlight the need to expand and diversify housing supply, improve affordability and access, support workforce housing, respond to demographic shifts, remove barriers to development, and better align housing efforts with broader community priorities.

The following guiding principles are intended to help frame future housing decisions, policies, investments, and implementation efforts throughout the city.

Guiding Principles

1. Provide a Range of Housing Options

As a city, Lebanon must support a ***diverse mix of housing types, sizes, and price points*** to meet the needs of a changing population. This includes rental and ownership opportunities, smaller units for individuals and couples, and larger units for families. A broader housing mix will better reflect the city's evolving household composition and workforce needs, while also addressing gaps in the existing housing supply identified through market analysis and community feedback.

2. Support Community Character and Neighborhood Quality

Housing development should reinforce Lebanon's ***existing neighborhood patterns***, maintain ***human-scale design***, and integrate with ***surrounding land uses***. New housing should contribute positively to neighborhood form, support safe and accessible public spaces, and reflect the community's expectations for design, scale, and livability. Land use regulations, zoning, and partnerships with private and public housing developers should help guide these outcomes.



3. Promote Walkability and Access to Services

Future housing should be directed toward areas with **existing infrastructure, services, and transportation options**. Encouraging infill, redevelopment, multi-family, and mixed-use development in walkable areas will reduce reliance on automobiles, improve access to jobs and services, and support more sustainable growth patterns. This approach also aligns with broader goals in the Master Plan to focus development in established areas rather than expanding into undeveloped land.



4. Maintain and Enhance Quality of Life

Housing policy should support **stable, safe, inclusive, and resilient neighborhoods for all people**, including marginalized communities*. This includes ensuring that residents can remain in the community as their housing needs change, supporting aging in place, and addressing cost pressures that affect household stability. Community input highlights that housing affordability, availability, and overall cost of living are central to residents' ability to stay in Lebanon.

**Marginalized communities are groups of people often excluded from mainstream social, economic, cultural, and political life, often relegated to the periphery of society due to systemic discrimination. They face unequal power relationships and reduced access to resources, opportunities, and rights based on factors like race, gender, disability, or low income. (National Institutes of Health)*

Building on this framework, **the implementation section translates these needs into a coordinated set of actions**. These actions are designed to be practical and achievable, reflecting both market realities and the City's regulatory role, while also identifying opportunities for partnerships and targeted investments. Grounded in both data and community input, this approach positions Lebanon to continue to thoughtfully respond to evolving housing needs and to guide future growth in a way that supports long-term economic stability and community well-being.

IMPLEMENTATION

This section serves as the **implementation framework** for Lebanon's housing vision. These identified strategies build on and respond to data analysis findings and community priorities presented in this chapter and its appendices. The intent is to guide policy, regulatory updates, partnerships, and investment decisions that collectively shape a more balanced, accessible, and resilient housing system.

Implementation Strategies

Lebanon's housing vision seeks to expand and diversify the housing supply by increasing production across a range of housing types, scales, and price points. This includes supporting missing middle housing, multifamily development, and the adaptive reuse of existing structures—particularly in areas with existing infrastructure, services, and transportation access. Directing housing development to these locations reinforces walkable neighborhoods, supports an efficient land use pattern, and strengthens Lebanon's downtown, neighborhoods, and key development corridors as priority areas for investment.

KEY POINTS:

- Strategies and actions reinforce the **Housing Chapter's Vision**
- A **multi-faceted approach** is what will help "move the needle"
- Housing solutions must also support the area's **workforce**
- **Land use regulations** play a key role in shaping the housing landscape
- **Housing stability** and meeting **life cycle needs** are core priorities
- Implementation must respond to **broader system level factors**

Improving housing affordability and access is a core priority and will require a multi-faceted approach. This includes preserving existing affordable housing, incentivizing new workforce and mixed-income development, and addressing financial and regulatory barriers that limit access for a broad range of households. Expanding the diversity of housing types—including smaller units, multifamily housing, and missing middle formats—will help ensure the housing stock reflects changing household needs while creating both rental and ownership opportunities at a scale that better aligns with demand. Supporting homeownership and exploring tools such as employer-assisted housing will further strengthen access and long-term stability for residents.

Supporting workforce and community-based housing solutions is also essential to implementation. Strengthening partnerships with employers, housing authorities, nonprofit

organizations, and regional stakeholders will be critical to advancing projects, leveraging funding, and aligning housing production with economic development goals. These partnerships will help address workforce retention challenges while ensuring that housing solutions respond to both local and regional dynamics.

Modernizing zoning and development regulations is a key enabling strategy.

Removing unnecessary constraints, streamlining approval processes, and allowing a broader range of housing types will be necessary to support housing production—particularly smaller-scale, infill, and context-sensitive development. These regulatory improvements should be paired with a continued focus on aligning new development with neighborhood character, ensuring that housing growth reinforces the scale, form, and identity of existing areas while accommodating needed change.





Supporting housing stability and lifecycle needs ensures that residents can access appropriate housing at different stages of life. This includes expanding options for aging in place, downsizing, family housing, and transitional or supportive housing where needed. In parallel, protecting and maintaining the existing housing stock through rehabilitation programs, quality standards, and long-term occupancy strategies will help preserve affordability and strengthen neighborhood stability.

Finally, implementation must respond to broader system-level factors that influence housing outcomes. This includes addressing market pressures such as short-term rentals, vacancies, and speculative ownership patterns, as well as coordinating housing growth with infrastructure capacity, capital planning, and fiscal sustainability. Ongoing outreach and education will support these efforts by building community understanding, increasing transparency, and fostering support for housing initiatives.

Together, these strategies establish a clear and integrated framework for action—one that expands and diversifies housing supply, improves affordability and access, strengthens partnerships, aligns growth with infrastructure and land use, and supports residents throughout all stages of life while maintaining Lebanon's distinct character and quality of life.

#	Action	Priority	Responsible Party	Secondary Party	Approaches Addressed	Action Status
1. Addressing Persistent Supply and Demand Imbalance						
1.1	Create housing production opportunities for households of all sizes and income levels using a variety of additional unit types including: ADUs, duplexes, triplexes/quadplexes, cottage courts, rowhouses, co-housing, shared living, boarding/rooming houses, modular/manufactured homes, and tiny homes where appropriate.					
1.2	Incentivize multifamily, small-scale infill, mixed-use, missing middle, and upper-story residential redevelopment in walkable and service-rich areas. Doing so will prioritize development and redevelopment in downtown neighborhoods and established development areas before greenfield expansion.					
1.3	Encourage the conversion of underutilized or overbuilt commercial sites and vacant buildings to residential uses.					
1.4	Assess and plan for water, sewer, utilities, transportation, and emergency service capacity to support projected housing unit development.					
1.5	Align housing growth with capital improvement planning and fiscal sustainability to ensure that higher-density housing is directed to areas already served by infrastructure and existing transit options.					
1.6	Regulate short-term rentals and other uses that remove units from the long-term housing stock available to residents.					
1.7	Encourage local ownership and management practices that enhance resident stability. Incentivize occupancy and revitalization of vacant housing units, structures, or storefronts.					
2. Responding to Widespread Affordability Pressures						
2.1	Preserve and expand the availability of affordable rental and ownership housing options, including subsidized housing, workforce housing, and homeownership programs. Reduce financial barriers to enable construction or redevelopment projects that will deliver affordable/workforce housing developments through fee waivers, tax relief, incentives, and impact fee adjustments.					

#	Action	Priority	Responsible Party	Secondary Party	Approaches Addressed	Action Status
2.2	Explore new ways to provide renter assistance (deposits, documentation, stabilization supports).					
2.3	Commit to strengthening the inspection/quality standards for rental units in Lebanon.					
2.4	Expand options for transitional, short-term, and supportive housing for unhoused or precariously housed populations.					
2.5	Evaluate the adequacy of the seasonal winter shelter system and explore options for more consistent year-round shelter and supportive services for unhoused residents.					
2.6	Stabilize rent escalation and promote consistent property management standards.					
2.7	Preserve and improve multimodal access and regional transit opportunities accessible to residential areas to reduce auto dependence.					
2.8	Ensure that new housing developments provide a net fiscal benefit to the city, reducing the tax burden per resident.					
2.9	Review assessment and tax policies to avoid any disproportionate burdens on homeowners. Advocacy at the state level for tax structure improvements should continue to focus on allowing appropriate distribution of municipal cost burdens between businesses, residents, and other parties.					
3. Expanding Workforce Housing Opportunities						
3.1	Expand partnerships with Lebanon Housing Authority, nonprofits, employers, and developers to deliver affordable and community-focused housing solutions.					
3.2	Coordinate with major regional and local employers to forecast and monitor housing demand and collaborate on solutions. This should include addressing housing barriers affecting recruitment and retention in essential sectors.					
3.3	Explore employer-supported nonprofit housing models that allow local employers to partner in acquiring, rehabilitating, and maintaining affordable housing.					

#	Action	Priority	Responsible Party	Secondary Party	Approaches Addressed	Action Status
3.4	Encourage employer-owned or sponsored, employer-adjacent, or workforce-dedicated housing and provide a regulatory path for the creation of these housing units. This could include options for both short-term/rotational workers and long-term employees.					
4. Adapting to Changing Household Needs						
4.1	Create new pathways to homeownership using both regulatory and non-regulatory strategies and incentives. This should be in addition to traditional single-family detached homes in order to promote additional owner-occupied housing types such as townhomes, small-lot starter homes, cottage courts, limited-equity models, rent-to-own, etc.					
4.2	Incentivize the inclusion of a percentage of ownership units in larger residential rental developments.					
4.3	Support downsizing options, intergenerational housing, and home-sharing/co-housing models.					
4.4	Explore programs that help homeowners finance repairs, conversions, or accessory units that allow them to create rental housing while remaining in their homes.					
4.5	Assist homeowners with rehabilitation and accessibility improvements to remain in their homes. This could include the adoption of a revitalization tax incentive for existing older residential structures.					
5. Encouraging a Greater Diversity of Housing Types						
5.1	Promote mixed-income and mixed-tenure developments (rental and ownership) to improve housing opportunities for all household types.					
5.2	Incentivize or encourage the creation of family-sized housing options (2+ bedrooms) in both rental and owner-occupied housing.					
5.3	Enable a streamlined process for the conversion of existing buildings or large homes into multi-unit housing.					

#	Action	Priority	Responsible Party	Secondary Party	Approaches Addressed	Action Status
5.4	Reduce or eliminate regulatory barriers to the development or conversion of existing structures or the creation of new structures to support alternative living arrangements (boarding houses, co-housing, etc.).					
5.5	Integrate or improve green space, safe outdoor access, and trail/open space connectivity within existing neighborhoods and into new developments.					
5.6	Advocate for expanded weatherization, electrical upgrade, lead paint remediation, and home rehabilitation programs that allow older housing units to remain safe and habitable.					
5.7	Partner with housing focused nonprofits or cooperatives to acquire and rehabilitate homes while keeping them out of speculative markets.					
6. Reducing Barriers to Housing Access and Development						
6.1	Update zoning to allow a wider range of housing types and lot configurations by right or through a streamlined approval process.					
6.2	Reduce or eliminate dimensional, parking, design, and building code mandates that add unnecessary development or regulatory cost.					
6.3	Offer density bonuses or other incentives for workforce and affordable housing unit creation.					
6.4	Simplify subdivision and site plan review processes for smaller projects through the expansion of staff-level approvals.					
6.5	Relocate parking and architectural standards to site plan regulations to provide greater flexibility.					
6.6	Balance housing growth with protection of wetlands, steep slopes, wildlife corridors, and agricultural lands.					
6.7	Consider the use of conservation subdivision design, transfer of development rights (TDRs), and other regulatory tools to direct housing development and to protect natural resource areas.					
6.8	Review the Policy and Regulatory Audit Finding generated in 2025 through the Housing Opportunity Planning Grant for additional specific regulatory amendments.					

#	Action	Priority	Responsible Party	Secondary Party	Approaches Addressed	Action Status
7. Responding to Strong Community Interest in Housing Solutions						
7.1	Maintain a variety of ongoing, accessible engagement efforts on housing city-wide (tabling, surveys, focus groups, forums, etc.).					
7.2	Provide clear and accessible information about housing programs, processes, and resources.					
7.3	Use real stories and local examples to build broader understanding and support for local housing solutions, and promote regional cooperation on housing solutions.					
7.4	Research and promote the concept of home-sharing through a partnership with a dedicated organization that can provide coordination and oversight.					
7.5	Continue pursuing all appropriate municipal, state, and federal funding sources to develop local infrastructure and housing projects and explore innovative financing tools to allow sustainable growth.					
7.6	Explore the potential for cooperative or community-based housing ownership opportunities and management models.					
7.7	Coordinate regionally with neighboring communities on housing supply and transportation strategies, share best practices, and learn from peer communities to deliver improved outcomes.					
7.8	Within established neighborhoods require context-appropriate designs that reinforce a human-scale and help maintain the existing character, but do not drive-up construction costs.					

GLOSSARY

Accessory Dwelling Unit (ADU): A smaller, secondary housing unit located on the same lot as a primary residence. ADUs may be attached to, detached from, or located within the main home.

Adaptive Reuse: The conversion of an existing building or structure into a new use, such as transforming a commercial or industrial building into housing.

Affordable Housing: Housing that costs no more than 30% of a household's gross income, including rent or mortgage payments and basic utilities.

Aging in Place: The ability for individuals to remain in their homes and communities safely and comfortably as they grow older.

Area Median Income (AMI): The midpoint of household incomes within a region, as calculated annually by the U.S. Department of Housing and Urban Development (HUD). AMI is commonly used to determine eligibility for housing assistance and affordable housing programs.

Co-Housing: A housing model in which residents have private living spaces but share common facilities, amenities, or open spaces to encourage community interaction.

Community Character: The overall identity and feel of a community, shaped by factors such as building patterns, architecture, scale, public spaces, natural features, and cultural identity.

Context-Sensitive Development: Development designed to fit the scale, character, and surrounding conditions of an existing neighborhood or area.

Cost-Burdened Household: A household spending more than 30% of its income on housing costs. Severe cost burden typically refers to spending more than 50% of income on housing.

Density Bonus: A regulatory incentive that allows additional housing units or development intensity in exchange for providing public benefits such as affordable or workforce housing.

Duplex: A residential building containing two separate dwelling units, either side-by-side or stacked vertically.

Employer-Assisted Housing: Housing programs or initiatives supported by employers to help employees secure housing, often through financial assistance, partnerships, or dedicated housing development.

Family-Sized Housing: Housing units designed to accommodate larger households, typically including two or more bedrooms and sufficient living space for families.

Housing Diversity: A range of housing types, sizes, tenures, and price points that can meet the needs of households at different income levels and life stages.

Human-Scale Design: Development designed to be comfortable and accessible for people, emphasizing walkability and bikeability, building proportions, and streetscape quality.

Infill Development: New development occurring on vacant or underutilized land within already developed areas that are served by existing infrastructure and services.

Live/Work Unit: A building or dwelling designed to accommodate both residential living and small-scale commercial or professional work activities.

Missing Middle Housing: A range of housing types between single-family homes and large apartment buildings, such as small single family units, duplexes, triplexes, townhouses, and cottage courts, that provide moderate-density housing options.

Mixed-Income Housing: Housing developments that include units affordable to households with a variety of income levels within the same project or neighborhood.

Mixed-Use Development: Development that combines multiple land uses, such as residential, commercial, office, or civic uses, within a single building or area.

Mixed-Tenure Housing: Housing developments that include both rental and owner-occupied units within the same project or neighborhood.

Modular Housing: Housing constructed in sections within a factory and assembled on-site. Modular homes are built to the same building codes as traditional site-built homes.

Multifamily Housing: Residential buildings containing three or more dwelling units, such as apartment buildings or condominium complexes.

Short-Term Rental (STR): A dwelling unit rented for short periods of time, typically fewer than 30 days, often through online rental platforms.

Subsidized Housing: Housing supported through public funding or financial assistance programs to make it more affordable for lower- or moderate-income households.

Supportive Housing: Housing combined with support services intended to assist individuals or households facing challenges such as disabilities, chronic homelessness, or health-related needs.

Tenure: The legal status under which a household occupies housing, most commonly categorized as owner-occupied or renter-occupied.

Townhouse / Rowhouse: Attached single-family housing units that share one or more walls with adjacent units but have separate entrances and ownership arrangements.

Transitional Housing: Temporary housing intended to provide stability and support for individuals or families moving from homelessness or unstable living situations toward permanent housing.

Triplex / Quadplex: Residential buildings containing three or four separate dwelling units within a single structure.

Upper-Story Residential: Housing units located above ground-floor commercial or nonresidential uses, commonly found in downtowns and mixed-use areas.

Walkability: The extent to which an area supports safe, convenient, and comfortable walking access to destinations such as housing, jobs, services, parks, and businesses.

Workforce Housing: Housing affordable to households earning moderate incomes, including many essential and local workers, based on regional income levels and housing costs.

DRAFT



CITY OF LEBANON ~ PLANNING & DEVELOPMENT

MEMORANDUM

TO: City of Lebanon Planning Board

FROM: Planning and Development Department Staff

RE: Proposed Zoning Amendments: Sections 205 and 604

DATE: June 11, 2026

City of Lebanon, NH planning staff are proposing zoning amendments that are focused on allowing a Child Care Center to be constructed in West Lebanon. Two zoning amendments would be required to construct the childcare center on Seminary Hill beside the SAU 88 Administrative Building.

This project has been ongoing on for several years. In 2023, the City of Lebanon advanced a concept of having a childcare facility at Airport Road. This project stalled but led to exploration of other opportunities with the Boys and Girls Club of New Hampshire and SAU 88. The outcome of these discussions led to the project most recently before you, the construction of a childcare center on Seminary Hill. In January of 2026, the School Board placed a warrant article before the voters authorizing negotiation of a potential long-term lease with the Boys and Girls Club of NH in collaboration with the City. The article was supported by Lebanon voters. The concept shows a 5,400 sq. ft. building that provides around 50 childcare slots. The concept design attempts to balance the use of underutilized space, preservation of current recreational use, and flexibility for school and civic operations.

From a zoning perspective, two changes to the Zoning Ordinance need to occur for this project to be conforming. The first amendment is to add **Child Care Facility** to a list of exceptions when more than one principal structure is allowed (Section 205.3). **Group Residences** were already allowed in this section. The second amendment is to make changes to parking for **Group Day Care Facilities**. The new language gives provision to use on-street parking and parking on adjacent parking facilities to be used to satisfy all or a portion of the parking requirement.

Role of the Planning Board:

Pursuant to Article X, Section 1000 of the Zoning Ordinance, proposed zoning amendments must be reviewed by City legal counsel, and the Land Use Boards (Planning Board, Conservation Commission, and Zoning Board) at a public forum in order to provide an opportunity for the public to provide input. The Boards will review and provide written comments to the City Council prior to the Public Hearing held before the City Council on August 19th.

Tentative schedule:

- June 17, 2026 – City Council Meeting: Order to Land Use Boards & legal review
- June 22, 2026 – Planning Board Public Review

- July 6, 2026 – Zoning Board of Adjustment Public Review
- July 09, 2026 – Conservation Commission Public Review
- July 15, 2026 – City Council Meeting: Council sets Public Hearing to be on August 19, 2026
- August 19, 2026 – City Council Public Hearing and Decision

Attachments

- Section 205 “One Principal Structure Per Residential Lot” - Redline version of Amendment
- Section 604 “Group Day Care Facilities” - Redline version of Amendment

ARTICLE II GENERAL PROVISIONS

[...]

SECTION 205 ONE PRINCIPAL STRUCTURE PER RESIDENTIAL LOT.

There shall be only one **principal structure** on a **lot** in the **residential districts**, R-O district, and R-O-1 district, except when:

- 205.1 Approved pursuant to the PUD provisions of this Ordinance or as a **cottage development** per Section 509; or
- 205.2 ~~When~~ the project involves solely the permitted remodeling or reconstruction of existing buildings, or when constructing new buildings for multi-family use, as otherwise permitted by this Ordinance; or
- 205.3 ~~When~~ the project involves a **group residence** or a child day care facility, provided that site plan approval is obtained from the Planning Board.

[...]

ARTICLE VI ADDITIONAL STANDARDS FOR SPECIFIC USES

[...]

SECTION 604 GROUP DAY CARE FACILITIES.

604.1 Play Area.

- A. There shall be a fenced outside play area which shall be free from hazards such as hidden corners; unprotected pools, wells, and steps; poisonous plants such as poison ivy, foxglove, and rhubarb; farm or lawn machinery or implements.
- B. It shall contain at least 50 square feet of usable play space per child using it, and the average width shall not be less than eight feet. Play areas shall not be permitted in front yards.
- C. By **special exception**, the Board of Adjustment may waive the requirement for a fence or the requirement that the play area not be in the front yard.

604.2 Other Requirements.

- A. A suitable loading and unloading area shall be provided for those children for whom the facility provides transportation. This area shall be in addition to required ***parking areas***.
- B. Group day care facilities shall comply with all applicable state and federal regulations.
- C. Parking: One (1) parking space for each employee and one (1) parking space for every eight (8) clients shall be provided on site. On-street parking spaces adjacent to the ***child day care facility*** and/or parking spaces located within an adjacent ***parking facility***, may be used to satisfy all or a portion of the parking requirement.

[...]

DRAFT





CITY OF LEBANON ~ PLANNING & DEVELOPMENT

PLANNING BOARD

June 22, 2026 Meeting

Staff Memorandum – PB2026-34-SPRGOV

APPLICATION INFORMATION

Agenda Item:
2.C

Application ID#:
PB2026-34-SPRGOV

Application Type:
Governmental Use Site Plan
Review (advisory only)

Property Location:
5 Airpark Road (Tax Map 131,
Lot 1)

Property Owner/Applicant:
City of Lebanon

Existing Improvements & Use:
Lebanon Airport

Proposed Improvements:
Isolation valve building along the
property's Poverty Lane frontage
together with parking and other
associated site improvements

Property Size:
+/-447.5 acres (per City Assessor's
records)

Future Land Use Map:
Residential – Low

Zoning District:
Light Industrial (IND-L)

LEGAL NOTICE

City of Lebanon, 5 Airpark Road (Tax Map 131, Lot 1), zoned IND-L:
Pursuant to NH RSA 674:54 (Governmental Land Uses), applicant requests advisory Site Plan Review to construct a +/-153 sq. ft. isolation valve building on a site located on the west side of Poverty Lane, south of the Lebanon Police Station. The building will control the flow of water to the Farnum Hill Water Storage Tank. PB2026-34-SPRGOV

APPLICATION MATERIALS

- ▶ Poverty Lane Isolation Valve Building Project description (1 page)
- ▶ Project Schedule (2 sheets)
- ▶ Abutters List
- ▶ Plan set titled, "City of Lebanon Poverty Lane Isolation Valve Building Project," prepared by the City of Lebanon Department of Public Works, dated February 20, 2026 (10 sheets)
- ▶ **ON-LINE ONLY:** Document titled, "Material Specifications for Poverty Lane Isolation Valve Building," prepared by the City of Lebanon Department of Public Works, Project ID: 2025-RFx-039, dated March 2026

COMPLETENESS REVIEW

This application is being reviewed in accordance with New Hampshire RSA 674:54, Governmental Land Uses. As such, there is no completeness review for this project. In addition, any comments on the proposal by the Planning Board and City staff are considered non-binding on the applicant.

APPLICATION OVERVIEW

The subject property is improved with the Lebanon Airport and has frontage on multiple roads including Poverty Lane to the east. The City of Lebanon proposes to construct a +/-153 sq. ft. isolation valve building on a site located on the airport property along Poverty Lane, south of the Lebanon Police Station, together with parking and other associated site improvements. As described in the attached project narrative, the building will control the flow of water to the Farnum Hill Water Storage Tank to help maintain water quality.

The proposed project constitutes a "major change" to the property as defined in Article II of the Site Plan Review Regulations and, therefore, would ordinarily require site plan review from the Planning Board per Section 3.1.D and would need to comply with the applicable design require-

ments set forth in Article VI. However, because the facility will be owned and operated by the City of Lebanon, the proposed charter school qualifies as a "governmental use" as defined in RSA 674:54, I, and, therefore, is not subject to the Site Plan Review Regulations. Rather, the project is subject to NH RSA 674:54, II, which provides as follows:

The [...] city [...] shall give written notification to the [...] planning board [...] of a municipality of any proposed governmental use of property within its jurisdiction, which constitutes a substantial change in use or a substantial new use. Written notification shall contain plans, specifications, explanations of proposed changes available at the time, a statement of the governmental nature of the use as set forth in paragraph I, and a proposed construction schedule. Such notification shall be provided at least 60 days prior to the beginning of construction. Either the governing body or planning board of the municipality may conduct a public hearing relative to the proposed governmental use. A representative of the governmental entity which provided notice shall be available to present the plans, specifications, and construction schedule, and to provide explanations. The governing body or planning board may issue nonbinding written comments relative to conformity or nonconformity of the proposal with normally applicable land use regulations to the sponsor of the governmental use within 30 days after the hearing.

Pursuant to NH RSA 674:54, II, the Planning Board is permitted to conduct a public hearing on the project and provide advisory review and comments. Although the Planning Board's review and comments (if any) are advisory only, note that all improvements/structures will need to comply with all other applicable rules and regulations including but not limited to the Building Code.

Cc (via e-mail): Rod Finley, PE, City Engineer

Poverty Lane Isolation Valve Building Project

In accordance with RSA 674:54, we are providing written notice to the Planning Board requesting advisory review of a municipal infrastructure project serving Lebanon's Water System. The project consists of furnishing and installing an isolation valve building to control the flow of water to and from the Farnum Hill Water Storage Tank.

The purpose of the project is to force the 12A plaza area to draw water from the Farnum Hill Water Storage Tank by closing a valve along Poverty Lane preventing water being drawn from the Prospect Hill pressure zone. At night, the valve will be opened to allow the Prospect Hill Water Storage tank to refill the Farnum Hill Storage tank. This will allow water to turnover in the Farnum Hill Water Storage Tank thereby improving its quality.

The isolation valve building will be mounted on a cast-in-place reinforced concrete foundation consisting of frost walls and a slab on grade. Equipment will include a butterfly valve, a flow meter and transmitter, hypochlorite feeding system, chlorine controller, chlorine analyzer, pressure transmitter, telemetry panel, and a power and control panel with a PLC controller. The isolation valve building will be supplied with two wall mounted heaters, a dehumidifier, ventilation fan and louver, and interior and exterior LED lights.

Additional work includes a primary electric service and transformer, secondary underground electrical service, conduit, and meter box, and communication service and conduit. Site work includes interconnections to the existing system, water main, gate valves, copper sampling service, driveway, paved apron, grading, and landscaping.

Attached to this notification are plans, specifications, and a construction schedule.

ID		Task Mode	Task Name	Duration	Start	Finish	Task Calendar	% Complete	Predecessors	Successors
1			MILESTONES	140.88 days	Mon 4/20/26	Mon 9/7/26	Calendar Days	0%		
2			CONTRACT DATE	0 days	Mon 4/20/26	Mon 4/20/26	Standard	0%		
3			SUBSTANTIAL COMPLETION (9/30/2026)	19.88 days	Wed 8/19/26	Mon 9/7/26	Calendar Days	0%	59	
4			PUNCH LIST	14 days	Wed 8/19/26	Mon 9/7/26	None	0%		5
5			FINAL COMPLETION (10/14/2026)	0 days	Mon 9/7/26	Mon 9/7/26	Calendar Days	0%	4	
6			SUBMITTALS	91.88 days	Mon 4/20/26	Mon 7/20/26	Calendar Days	0%		
7			PREPARE, SUBMIT, & APPROVE	27 days	Mon 4/20/26	Tue 5/26/26	Standard	0%		
8			SITE & PROCESS PIPE (P&S)	15 days	Mon 4/20/26	Fri 5/8/26	Standard	0%		
9			PROCESS EQUIPMENT (P&S)	15 days	Mon 4/20/26	Fri 5/8/26	Standard	0%		
10			ELECTRICAL (P&S)	15 days	Mon 4/20/26	Fri 5/8/26	Standard	0%		
11			CONCRETE (P&S)	19 days	Mon 4/20/26	Thu 5/14/26	Standard	0%		
12			BUILDING (P&S)	27 days	Mon 4/20/26	Tue 5/26/26	Standard	0%		
13			EARTHWORK (P&S)	15 days	Mon 4/20/26	Fri 5/8/26	Standard	0%		
14			FAB & DELIVER	65 days	Mon 4/20/26	Mon 7/20/26	Standard	0%		
15			SITE & PROCESS PIPE (F&D)	45 days	Mon 4/20/26	Fri 6/19/26	Standard	0%		
16			PROCESS EQUIPMENT (F&D)	65 days	Mon 4/20/26	Mon 7/20/26	Standard	0%		
17			ELECTRICAL (F&D)	65 days	Mon 4/20/26	Mon 7/20/26	Standard	0%		
18			CONCRETE (F&D)	60 days	Mon 4/20/26	Mon 7/13/26	Standard	0%		
19			BUILDING (F&D)	65 days	Mon 4/20/26	Mon 7/20/26	Standard	0%		
20			EARTHWORK (F&D)	35 days	Mon 4/20/26	Fri 6/5/26	Standard	0%		
21			GENERAL & SITE	36 days	Thu 6/4/26	Fri 7/24/26	Standard	0%		
22			CLEAR & GRUB	4 days	Thu 6/4/26	Tue 6/9/26	Standard	0%		23
23			SETUP EROSION CONTROLS	3 days	Wed 6/10/26	Fri 6/12/26	Standard	0%	22	24
24			MOBILIZE	1 day	Mon 6/15/26	Mon 6/15/26	Standard	0%	23	25
25			TEST PITS	1 day	Tue 6/16/26	Tue 6/16/26	Standard	0%	24	26
26			EXCAVATE & INSTALL UNDERSLAB UTILITIES	7 days	Wed 6/17/26	Thu 6/25/26	Standard	0%	25	27
27			EXCAVATE FOR BUILDING FOUNDATION	3 days	Fri 6/26/26	Tue 6/30/26	Standard	0%	26	28,30
28			FORCEMAIN TIE IN'S	1 day	Wed 7/1/26	Wed 7/1/26	Standard	0%	27	29
29			SAMPLE LINE TIE IN	1 day	Thu 7/2/26	Thu 7/2/26	Standard	0%	28	
30			FOUNDATION FOOTINGS	1 day	Wed 7/1/26	Wed 7/1/26	Standard	0%	27	31



ID		Task Mode	Task Name	Duration	Start	Finish	Task Calendar	% Complete	Predecessors	Successors
31			FOUNDATION WALLS	2 days	Thu 7/2/26	Mon 7/6/26	Standard	0%	30	32
32			BACKFILL & SLAB PREP	2 days	Tue 7/7/26	Wed 7/8/26	Standard	0%	31	33
33			PLACE FLOOR SLAB	1 day	Thu 7/9/26	Thu 7/9/26	Standard	0%	32	39,34
34			SITE GRADING	3 days	Fri 7/10/26	Tue 7/14/26	Standard	0%	33	35
35			DRIVEWAY PREP	3 days	Wed 7/15/26	Fri 7/17/26	Standard	0%	34	36
36			PAVE DRIVEWAY APRON	2 days	Mon 7/20/26	Tue 7/21/26	Standard	0%	35	37
37			LOAM AND SEED	3 days	Wed 7/22/26	Fri 7/24/26	Standard	0%	36	
38			BUILDING	19 days	Fri 7/10/26	Wed 8/5/26	Standard	0%		
39			SET BUILDING	1 day	Fri 7/10/26	Fri 7/10/26	Standard	0%	33	40
40			INTERIOR PARTITION WALL	1 day	Mon 7/13/26	Mon 7/13/26	Standard	0%	39	41
41			ELECTRICAL ROUGH INS	5 days	Tue 7/14/26	Mon 7/20/26	Standard	0%	40	42
42			INSULATE WALLS & CEILING	1 day	Tue 7/21/26	Tue 7/21/26	Standard	0%	41	43
43			PLYWOOD INTERIOR WALLS & CEILING	2 days	Wed 7/22/26	Thu 7/23/26	Standard	0%	42	44
44			PAINT WALLS & CEILING	2 days	Fri 7/24/26	Mon 7/27/26	Standard	0%	43	47,51,52,45
45			INTERIOR DOOR INSTALL	1 day	Tue 7/28/26	Tue 7/28/26	Standard	0%	44	46
46			INSTALL DISCHARGE FAN AND LOUVER	3 days	Wed 7/29/26	Fri 7/31/26	Standard	0%	45	
47			ELECTRICAL PANEL	2 days	Tue 7/28/26	Wed 7/29/26	Standard	0%	44	48
48			LIGHTS	3 days	Thu 7/30/26	Mon 8/3/26	Standard	0%	47	49
49			TERMINATE WIRING	2 days	Tue 8/4/26	Wed 8/5/26	Standard	0%	48	
50			PROCESS	9 days	Tue 7/28/26	Fri 8/7/26	Standard	0%		
51			INTERIOR PIPE AND FITTINGS	5 days	Tue 7/28/26	Mon 8/3/26	Standard	0%	44	
52			INTERIOR PROCESS EQUIPMENT	5 days	Tue 7/28/26	Mon 8/3/26	Standard	0%	44	53,54
53			INSTALL ANALYZER & CONTROLLER	4 days	Tue 8/4/26	Fri 8/7/26	Standard	0%	52	
54			PAINT DI PIPE AND FITTINGS	3 days	Tue 8/4/26	Thu 8/6/26	Standard	0%	52	56
55			START-UP & COMMISSIONING	8 days	Fri 8/7/26	Tue 8/18/26	Standard	0%		
56			PRESSURE TEST WATERLINE	1 day	Fri 8/7/26	Fri 8/7/26	Standard	0%	54	57
57			ANALYZER START-UP	1 day	Mon 8/10/26	Mon 8/10/26	Standard	0%	56	58
58			FLOW METER START-UP	1 day	Tue 8/11/26	Tue 8/11/26	Standard	0%	57	59
59			COMMISSION STATION	5 days	Wed 8/12/26	Tue 8/18/26	Standard	0%	58	3

ID	Owner Name	Co-Owner	Owner Address	Owner City	Owner State	Owner Zip
117-9	3 HENRY, CHARLES D		37 POVERTY LN	LEBANON	NH	03766
132-9	8 WOOD STEPHEN M TTEE		98 POVERTY LN	LEBANON	NH	03766
117-7	2 MARTUCCI JR, ROBERT L		146 WALLACE RD	BEDFORD	NH	03110
117-10-100	4 MELAHN, JAYNE & DAVID		47 POVERTY LN	LEBANON	NH	03766
132-7	7 KENYON, ROGER L & SANDRA D		79 POVERTY LN	LEBANON	NH	03766
132-8	8 TAYLOR, GREG J & BEVERLY J		81 POVERTY LN	LEBANON	NH	03766
132-6	7 WALLACE, JR D B & G TTEES		75 POVERTY LN	LEBANON	NH	03766
117-8	3 PETROCELLI ROBERT W		42 WOLF RD	LEBANON	NH	03766
132-5	7 CHAPIN A M & BANKS M D TTEES		71 POVERTY LN	LEBANON	NH	03766
117-10	5 CARTER GOLF LLC		PO BOX 2460	NEW LONDON	CNH	03257

CITY OF LEBANON

POVERTY LANE ISOLATION VALVE

BUILDING PROJECT

TAX MAP 131, LOT 1

POVERTY LANE

LEBANON, NEW HAMPSHIRE

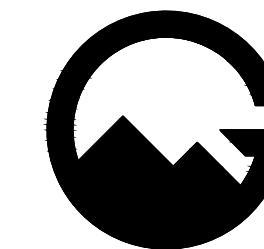
GRAFTON COUNTY



CIVIL ENGINEER:
CITY OF LEBANON
DEPARTMENT OF PUBLIC WORKS
193 DARTMOUTH COLLEGE HIGHWAY
LEBANON, NEW HAMPSHIRE 03766
(603) 558-7123



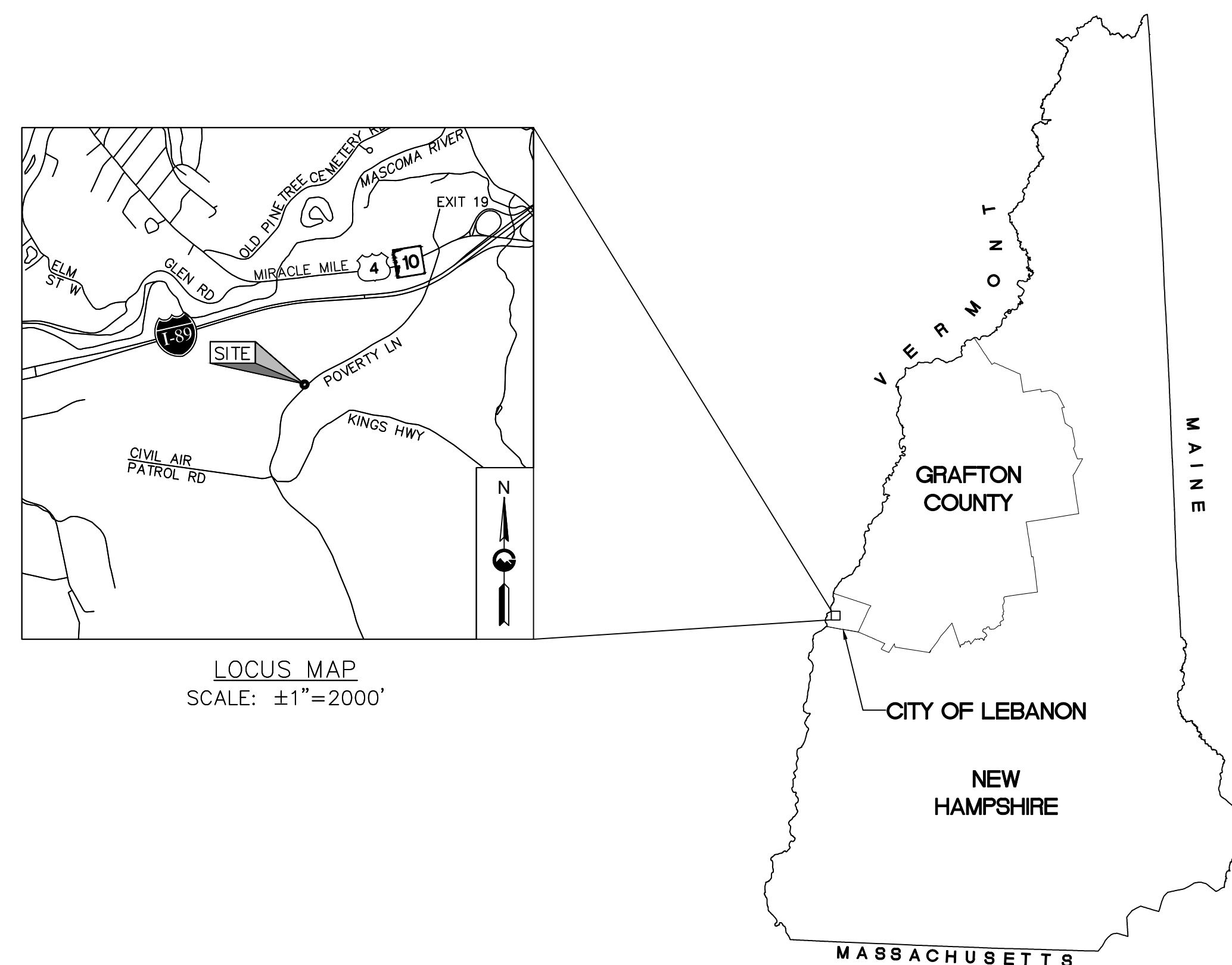
**APPLICANT, UTILITY OWNER &
RECORD OWNER:**
CITY OF LEBANON
DEPARTMENT OF PUBLIC WORKS
193 DARTMOUTH COLLEGE HIGHWAY
LEBANON, NEW HAMPSHIRE 03766



DRAFTSMANSHIP:
GRANITE ENGINEERING, LLC
150 DOW STREET
TOWER 2, SUITE 421
MANCHESTER, NEW HAMPSHIRE 03101
(603) 518-8030

**BIDDING
PLANS**

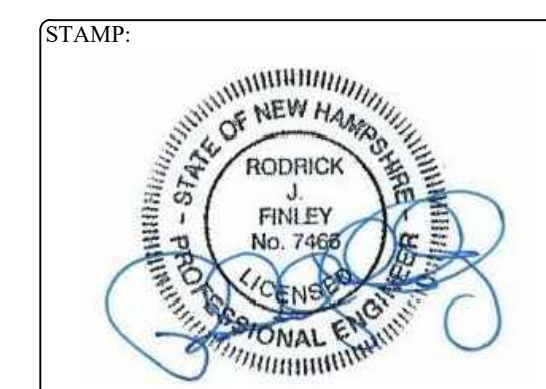
FEBRUARY 20, 2026



LOCUS MAP
SCALE: ±1"=2000'

LOCATION PLAN
SCALE: N.T.S.

SHEET NO.	TABLE OF CONTENTS
0	COVER: TABLE OF CONTENTS, LOCATION PLAN, AND LOCUS MAP
1	GENERAL NOTES
2	OVERVIEW PLAN
3	SITE PLAN
4	ISOLATION VALVE BUILDING DETAILS
5	ELECTRICAL AND MECHANICAL NOTES & DETAILS
6	WATER NOTES & DETAILS
7	MISCELLANEOUS DETAILS
8	EROSION CONTROL NOTES & SPECIFICATIONS
9	EROSION CONTROL DETAILS



REVISIONS			
No.	DATE	COMMENTS	BY

WORK TO BE PERFORMED UNDER THIS PROJECT INCLUDES THE INSTALLATION OF A WATER ISOLATION VALVE BUILDING WITHIN TAX MAP 131, LOT 1 ALONG POVERTY LANE.

1. THE CITY OF LEBANON IS THE OWNER AND ENGINEER FOR THIS POVERTY LINE ISOLATION VALVE BUILDING PROJECT.
2. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE APPROVED DRAWINGS, SPECIFICATIONS, AND ANY ISSUED ADDENDA.
3. THE CONTRACTOR SHALL SCHEDULE AND ATTEND A PRE-CONSTRUCTION MEETING WITH THE CITY AND ENGINEER PRIOR TO PROCEEDING WITH WORK.
4. WRITTEN DIMENSIONS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS. THE CONTRACTOR SHALL USE CAUTION WHEN SCALING REPRODUCED PLANS. IN CASE OF CONFLICT BETWEEN THIS PLAN SET AND ANY OTHER DRAWINGS AND SPECIFICATION, THE ENGINEER OR OWNER SHALL BE NOTIFIED IMMEDIATELY FOR CLARIFICATIONS.
5. ALL EXISTING WATER MAIN AND DRAINAGE COMPONENTS LOCATED WITHIN THE PROJECT LIMITS THAT ARE TO BE REPLACED BY NEW INFRASTRUCTURE SHALL BE REMOVED, UNLESS OTHERWISE INDICATED. ANY EXISTING STORM DRAIN LINES, CULVERTS, OR WATER LINE DAMAGED DURING CONSTRUCTION, AND NOT TO BE REPLACED SHALL BE REPAIRED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING DRAINAGE FLOWS THROUGHOUT THE DURATION OF CONSTRUCTION.
6. ALL STRUCTURES AND PIPELINES LOCATED ADJACENT TO THE TRENCH EXCAVATION SHALL BE PROTECTED AND FIRMLY SUPPORTED BY THE CONTRACTOR. IF THE TRENCH IS BACKFILLED, DAMAGE TO ANY SUCH STRUCTURES CAUSED BY, OR RESULTING FROM, THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED AT THE CONTRACTOR'S EXPENSE. ALL UTILITIES REQUIRING REPAIR, RELOCATION, OR ADJUSTMENT AS A RESULT OF THE PROJECT SHALL BE COORDINATED THROUGH THE RESPECTIVE UTILITY.
7. IN THOSE INSTANCES WHERE POWER OR TELEPHONE POLE SUPPORT IS REQUIRED, THE CONTRACTOR SHALL PROVIDE A MINIMUM 48 HOUR NOTIFICATION TO LIBERTY UTILITIES, COMCAST, OR CONSOLIDATED COMMUNICATIONS. NO ADDITIONAL PAYMENT WILL BE PROVIDED FOR TEMPORARY BRACING OF UTILITIES. THE CONTRACTOR SHALL COORDINATE RELOCATION OF TELEPHONE POLES WITH LIBERTY UTILITIES, COMCAST, OR CONSOLIDATED COMMUNICATIONS. NO ADDITIONAL PAYMENT IS NEEDED. NO ADDITIONAL PAYMENT WILL BE PROVIDED TO THE CONTRACTOR DUE TO DELAYS CAUSED BY THE UTILITY COMPANIES.
8. THE CONTRACTOR SHALL INSTALL AND MAINTAIN PERMANENT AND TEMPORARY TRAFFIC CONTROL DEVICES AS NECESSARY AND IN A MANNER CONSISTENT WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (M.U.T.C.D.).
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING TRAFFIC FLOW AT ALL TIMES. UNIFORM TRAFFIC OFFICERS ARE NOT ANTICIPATED FOR THIS PROJECT. THE CONTRACTOR SHALL PROVIDE NECESSARY CERTIFIED FLAGGERS NEEDED TO SAFELY CONTROL THE FLOW OF TRAFFIC AND COMPLY WITH CITY EXPECTATIONS.
10. COMPACTION TESTS SHALL BE PERFORMED IN ACCORDANCE WITH THE CONTRACT. ANY SETTLEMENT OCCURRING WITHIN TWO YEARS OF SUBSTANTIAL COMPLETION OF THE PROJECT SHALL BE CORRECTED BY THE CONTRACTOR IN A MANNER ACCEPTABLE TO THE ENGINEER AT NO ADDITIONAL COST TO THE OWNER.
11. CONTRACTOR SHALL MITIGATE FUGITIVE DUST TO A TOLERABLE LIMIT. A WATER TRUCK IS EXPECTED TO BE ON-SITE AT ALL TIMES DURING THE CONSTRUCTION OF THIS PROJECT. AT LEAST, ONCE A DAY AS NEEDED TO CONTROL DUST. CONTRACTOR SHALL NOT TRAVEL OR SPILL EARTH AND DEBRIS ON PUBLIC STREETS WITHIN AND/OR OUTSIDE THE PROJECT AREA. STREETS OPENED TO THE PUBLIC SHALL BE KEPT SWEEP AND FREE OF DEBRIS.
12. ALL AREAS THAT ARE EXCAVATED, FILLED OR OTHERWISE DISTURBED BY THE CONTRACTOR AND ARE NOT TO BE PAVED OR FILLED WITH GRAVEL OR RIPRAP SHALL BE LOAMED, GRADED, LIMED, FERTILIZED, SEEDED AND MULCHED. ALL AREAS TO RECEIVE 4" MINIMUM OF SCREENED TOPSOIL.
13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RESETTING ALL EXISTING PROPERTY MONUMENTATION THAT IS DISTURBED BY THEIR OPERATIONS AT NO EXPENSE TO THE CITY. THE WORK IS TO BE DONE BY A LAND SURVEYOR LICENSED IN THE STATE OF NEW HAMPSHIRE. PROPERTY MONUMENTS FOUND ARE SHOWN ON LAYOUT PLANS AND MAY NOT BE INCLUSIVE OF ALL BOUNDS THAT EXIST IN THE PROJECT AREA. IF ANY ADDITIONAL BOUNDS ARE FOUND, THE CONTRACTOR SHALL DOCUMENT THE LOCATION AND NOTIFY THE ENGINEER.
14. THE CONTRACTOR SHALL NOT HAVE ANY RIGHT OF PROPERTY OF ANY MATERIALS TAKEN FROM ANY EXCAVATION. SUITABLE EXCAVATED MATERIAL MAY BE INCORPORATED IN THE PROJECT. EXCESS MATERIAL IS TO BE TAKEN TO 370 PLAINFIELD ROAD (LEBANON LANDFILL) IF OWNER SO DESIRES, AT NO ADDITIONAL COST. THE CONTRACTOR SHALL DISPOSE OF UNSUITABLE AND EXCESS MATERIAL IN ACCORDANCE WITH THE APPLICABLE SECTIONS OF THE CONTRACT AND ALL STATE, FEDERAL, AND LOCAL REGULATIONS.
15. THE CONTRACTOR IS TO TAKE SPECIAL CARE NOT TO DAMAGE TREES, SHRUBS, OR OTHER PLANTINGS WITHIN THE CONSTRUCTION AREA UNLESS THEY ARE NOTED TO BE REMOVED.
16. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING PROPER NOTICE TO RESIDENCE IF IN ADVANCE OF AN EXPECTED SHUTDOWN OF WATER SERVICE DUE TO IMPACT TO TRAFFIC AND BLOCKING OF DRIVEWAYS. WRITTEN NOTICES SHALL BE PLACED ON DOORS AT A MINIMUM OF 48 HOURS PRIOR TO EXPECTED WORK NOTIFYING THEM OF ANTICIPATED IMPACT. DAILY COORDINATION WITH RESIDENTS IS VERY IMPORTANT AND IS INCIDENTAL TO THE WORK. THE CONTRACTOR SHALL MAINTAIN EMERGENCY ACCESS TO ALL AREAS AFFECTED BY THEIR WORK AT ALL TIMES. ONE LANE OF TRAFFIC SHALL BE MAINTAINED AT ALL TIMES BY THE CONTRACTOR UNLESS OTHERWISE APPROVED BY THE OWNER.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION AND FOR CONDITIONS AT THE SITE. THESE PLANS PREPARED BY THE CITY OF LEBANON DO NOT EXTEND TO OR INCLUDE SYSTEMS PERTAINING TO THE SAFETY OF THE CONSTRUCTION OR THE WELL-BEING OR OTHER EMPLOYEES, AGENTS OR CITY'S REPRESENTATIVES IN THE PERFORMANCE OF THE WORK. THE SEAL OF THE SURVEYOR OR ENGINEER HEREON DOES NOT EXTEND TO ANY SUCH SAFETY SYSTEMS THAT MAY OR HEREAFTER BE INCORPORATED INTO THESE PLANS. THE CONSTRUCTION CONTRACTOR SHALL PREPARE OR OBTAIN THE APPROPRIATE SAFETY SYSTEMS WHICH MAY BE REQUIRED BY THE U.S. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA), LOCAL REGULATIONS, AND/OR THE BOARD OF LABOR.
18. IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO FAMILIARIZE THEMSELVES WITH THE PROJECT AREA AND ALL EXISTING CONDITIONS SURROUNDING IT THEREON.
19. THE ENGINEER SHALL BE NOTIFIED PRIOR TO CONSTRUCTION IF THERE ARE ANY DISCREPANCIES IN PLANS OR EXISTING DATA. CONSTRUCTION SHALL NOT PROCEED WITHOUT WRITTEN PERMISSION FROM THE ENGINEER.
20. THE ENGINEER WILL PROVIDE THE CONTRACTOR WITH A BENCHMARK.
21. PAYMENT IS TO BE SAW-CUT AT THE PROPOSED DRIVEWAY.
22. IF THE CONTRACTOR ANTICIPATES AN OVERAGE IN MATERIAL QUANTITIES INCLUDED IN THE CONTRACT, THE CONTRACTOR MUST NOTIFY THE ENGINEER IMMEDIATELY PRIOR TO PROCEEDING.
23. ANY SURFACE OR SUBSURFACE FEATURES DAMAGED BY THE CONTRACTOR DURING CONSTRUCTION SHALL BE RESTORED TO A CONDITION AT LEAST EQUAL TO THAT IN WHICH THEY, WERE FOUND IMMEDIATELY PRIOR TO THE BEGINNING OF CONSTRUCTION. ALL COSTS ASSOCIATED WITH THE RESTORATION SHALL BE AT THE CONTRACTORS SOLE EXPENSE.
24. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR WORK COMPLETED BY THE CONTRACTOR.

1. THE CONTRACTOR MUST PROVIDE PROPER INSTRUMENTATION TO RECORD ACCURATE COORDINATES AS WELL AS ELEVATIONS TO WITHIN .001" FOR ALL NEW INFRASTRUCTURE. THIS SHALL INCLUDE PIPE, FITTINGS, AND WATER VALVES. WATER PIPE AND FITTINGS TO BE RECORDED AT TOP OF PIPE. THIS INFORMATION MUST BE SUBMITTED IN AUTOCAD (DWG) FORMAT AND GIS FORMAT TO THE ENGINEER PRIOR TO SUBSTANTIAL COMPLETION. ON OR BEFORE SUBMITTING THIS INFORMATION, THE CONTRACTOR SHALL PROVIDE THE INFORMATION THROUGHOUT THE CONSTRUCTION. IF THE CONTRACTOR IS NOT CAPABLE OF COMPLETING THE RECORD WORK LISTED ABOVE, THEY MUST CONTRACT THIS WORK TO AN APPROPRIATE PARTY THAT HAS THE CAPABILITY AS SUBSIDIARY TO THIS WORK. SUBSTANTIAL COMPLETION WILL NOT BE AWARDED IF THIS IS NOT COMPLETED AND THE CONTRACTOR WILL BE SUBJECT TO LIQUIDATED DAMAGES.
2. THE CONTRACTOR SHALL PROVIDE FOUR (4) COPIES OF EACH MANUFACTURER'S DETAILED INSTRUCTIONS FOR MAINTENANCE AND OPERATION OF ALL MAJOR EQUIPMENT, MACHINERY, INSTRUMENTATION AND MONITORING DEVICES, CONTROLS AND INCIDENTALS PROVIDED UNDER THE CONTRACT. PREPARE ALL SUCH MANUALS IN ACCORDANCE WITH THE PROJECT CLOSEOUT REQUIREMENTS OF THE CONTRACT. SUCH MANUALS MUST BE PROVIDED PRIOR TO STARTUP AND ACTIVATION OF THE SYSTEMS WITH THE CITY.

GENERAL NOTEWORK:

ALL MATERIAL SPECIFIED, BUT NECESSARY REVIEW FOR COMPLETION OF THE WORK SHALL CONFORM TO THE REQUIREMENTS OF THE NHDOT STANDARDS AND SPECIFICATIONS FOR ROADWAY AND BRIDGE CONSTRUCTION.

A. COMMON EXCAVATION SHALL CONSIST OF ALL EXCAVATION OTHER THAN ROCK AND BOULDER EXCAVATION THAT IS NOT SPECIFICALLY CLASSIFIED.

C. EXCAVATION TO SUBGRADE SHALL BE DONE SO THAT THE SUBGRADE MATERIAL DOES NOT BECOME SATURATED WITH WATER OR CONTAMINATED WITH ORGANIC MATTER TO A DEGREE THAT SUBGRADE IS UNSTABLE.

D. SUBGRADE SOILS MADE UNSTABLE BY ERROR OR NEGLIGENCE OF THE CONTRACTOR SHALL BE REMOVED AND REPLACED BY SELECT BACKFILL AT THE CONTRACTOR'S EXPENSE.

E. UNSUITABLE MATERIAL SHALL CONSIST OF DEPOSITS OF SATURATED OR UNSATURATED MIXTURES OF SOILS AND ORGANIC MATTER NOT SUITABLE FOR FOUNDATION MATERIAL REGARDLESS OF MOISTURE CONTENT. UNSUITABLE MATERIALS ENCOUNTERED DURING ROADWAY EXCAVATION SHALL BE REMOVED AND REPLACED BY COMMON OR SELECT BACKFILL, AS DIRECTED BY THE ENGINEER.

F. SUBGRADE SURFACES SHALL BE DRY AND FIRM BEFORE PLACING GRANULAR SURFACE MATERIALS. SUBGRADE MATERIAL DISTURBED DURING EXCAVATION SHALL BE THOROUGHLY COMPACTED IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS.

G. ALL FILL MATERIAL SHALL BE SUBJECT TO APPROVAL BY THE ENGINEER.

H. BASE COURSE MATERIAL SHALL BE PLACED IN 8" MAXIMUM LIFTS AND THOROUGHLY COMPACTED AS REQUIRED PRIOR TO SUCCESSIVE LIFTS. CARE SHALL BE TAKEN TO PREVENT SEPARATION OF GRANULAR MATERIALS DURING PLACEMENT. SEGREGATED MATERIALS SHALL BE REMOVED AND REPLACED USING METHODS CALCULATED TO REDUCE THE SEPARATION OF AGGREGATES.

I. ROADWAY GRADING SHALL BE COMPLETED WITH A COMMERCIAL GRADER. THE OPERATOR SHALL HAVE SUFFICIENT EXPERIENCE TO COMPLETE THE WORK. ALL GRADING WORK SHALL BE APPROVED BY THE ENGINEER AND OWNER PRIOR TO PROVIDING PAYMENT. ALL AREAS GRADED IN ACCORDANCE WITH THE PLANS SHALL BE COMPACTED WITH A VIBRATORY ROLLER AFTER GRADING IS COMPLETE TO PREVENT WASHBOARDING AND EROSION OF THE ROADWAY.

J. GRAVEL (NHDOT ITEM 304.2): THE MAXIMUM SIZE OF STONE PARTICLES SHALL NOT EXCEED THREE-FOURTHS OF THE COMPACTED THICKNESS OF THE LAYER BEING PLACED BUT IN NO CASE LARGER THAN 6 INCHES. GRAVEL IS CHARACTERIZED AS HARD, DURABLE STONE WITH COARSE TO FINE SAND. SIEVE ANALYSIS BY WEIGHT AS FOLLOWS:

SIEVE SIZE	% PASSING BY WEIGHT
6"	100%
NO. 4	25-70%
* NO 200	0-12% (*BASED ON THE FRACTION PASSING NO. 4)

K. CRUSHED GRAVEL (NHDOT ITEM 304.3): AT LEAST 50 PERCENT OF THE MATERIAL RETAINED ON THE 1 INCH SIEVE SHALL HAVE A FRACTURED FACE. SIEVE ANALYSIS BY WEIGHT AS FOLLOWS:

SIEVE SIZE	% PASSING BY WEIGHT
3"	100%
2"	95-100%
1"	55-85%
NO. 4	27-52%
* NO 200	0-12% (*BASED ON THE FRACTION PASSING NO. 4)

L. SAND (NHDOT ITEM 304.1): THE MAXIMUM SIZE OF ANY STONE OR FRAGMENT SHALL NOT EXCEED THREE-FOURTHS OF THE COMPACTED DEPTH OF THE LAYER BEING PLACED BUT IN NO CASE LARGER THAN 6 INCHES. SAND SHALL CONSIST OF CLEAN, SHARP MINERAL PARTICLES FREE OF ORGANIC MATTER. SIEVE ANALYSIS BY WEIGHT AS FOLLOWS:

SIEVE SIZE	% PASSING BY WEIGHT
6"	100%
NO. 4	70-100%
* NO 200	0-12% (*BASED ON THE FRACTION PASSING NO. 4)

M. COARSE CRUSHED STONE (NHDOT ITEM 304.5) AND FINE CRUSHED STONE (NHDOT 304.4): SHALL BE CLEAN ANGULAR ROCK FRAGMENTS OBTAINED BY BREAKING AND CRUSHING ROCK MATERIAL. SIEVE ANALYSIS BY WEIGHT AS FOLLOWS:

NHDOT 304.4		NHDOT ITEM 304.5	
SIEVE SIZE	% PASSING BY WEIGHT	SIEVE SIZE	% PASSING BY WEIGHT
2"	100%	3 1/4"	100%
1-1/2"	85-100%	3"	85-100%
3/4"	45-75%	1 1/2"	60-90%
NO. 4	10-45%	3/8"	40-70%
NO 200	0-5%	NO. 4	15-40%
		NO. 200	0-5%

2. PAVING

A. ALL PAVING SHALL CONFORM TO THE REQUIREMENTS OF THE NHDOT STANDARDS AND SPECIFICATIONS FOR ROADWAY AND BRIDGE CONSTRUCTION, AS WELL AS APPLICABLE TOWN STANDARDS.

B. BASE PAVEMENT SHALL NOT BE INSTALLED WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 45 DEGREES FAHRENHEIT, NOR WHEN THE ROAD BASE TEMPERATURE IS BELOW 40 DEGREES FAHRENHEIT. WEARING COURSE PAVEMENT SHALL NOT BE INSTALLED WHEN THE OUTSIDE AIR TEMPERATURE IS BELOW 50 DEGREES FAHRENHEIT, NOR WHEN THE ROAD BASE TEMPERATURE IS BELOW 50 DEGREES FAHRENHEIT. PAVEMENT SHALL NOT FALL BELOW 185 DEGREES FAHRENHEIT PRIOR TO COMPLETION OF THE ROLLING PROCESS. PAVEMENT SHALL NOT BE INSTALLED WHEN THE SUBGRADE IS FROZEN OR THE GRADES ARE INCORRECT. TRAFFIC SHALL NOT BE ALLOWED UNTIL NEWLY PAVED SURFACES UNTIL COMPACTION IS COMPLETED AND PAVEMENT SURFACE TEMPERATURE IS LESS THAN 150 DEGREES FAHRENHEIT. PAVING WILL NOT BE ALLOWED WHEN IT IS RAINING OR FOLLOWING RAIN THAT LEAVES THE SUBGRADE SOFT, WET, OR WITH STANDING WATER. WEARING COURSE PAVEMENT WILL NOT BE ALLOWED AFTER OCTOBER 1 OR BEFORE MAY 1. THE CONTRACTOR SHALL PROVIDE 24 HOURS NOTICE TO THE ENGINEER AND THE CITY PRIOR TO PAVING OPERATIONS WITH CLARIFICATION OF WEATHER FORECAST. ASPHALT, AIR, AND SURFACE TEMPERATURES ARE TO BE MONITORED BY THE CONTRACTOR, ENGINEER AND/OR A THIRD-PARTY TESTING AGENCY DURING INSTALLATION. THE PAVING CONTRACTOR SHALL HAVE THEIR OWN DESIGNATED REPRESENTATIVE PRESENT AT ALL TIMES VERIFYING AND MANAGING QUALITY CONTROL OF THE WORK. FAILURE TO DO SO MAY RESULT IN DELAY OR REJECTION OF WORK.

C. SWEEPING FOR BASE PAVEMENT AND CLEANING FOR PLACEMENT OF WEARING COURSE IS THE RESPONSIBILITY OF THE CONTRACTOR.

3. COMPACTION

A. MATERIAL DENSITY REQUIREMENTS SHALL BE FIELD DETERMINED IN ACCORDANCE WITH AASHTO T191 (SAND CONE) OR ASTM D2922/AASHTO T238-239 (NUCLEAR METHOD). MAXIMUM DENSITY SHALL BE DETERMINED BY ASTM D1557 MODIFIED PROCTOR. COMPACTION OF BACKFILL MATERIAL BELOW PAVEMENT AND STRUCTURES SHALL BE 95% OF THE MAXIMUM DENSITY.

B. FREQUENCY OF TESTING SHALL BE DETERMINED BY THE ENGINEER BASED UPON THE CONTRACTOR'S NOTIFICATION OF COMPLETED AREAS.

C. MATERIAL DENSITY TESTS WHICH INDICATE DEFICIENT MATERIAL OR INSUFFICIENT COMPACTION FOLLOWING A FIRST FAILURE SHALL BE PAID FOR BY THE CONTRACTOR. DENSITY TESTS RESULTING FROM A MATERIALS CHANGE BY THE CONTRACTOR OR REPEATED FAILURES SHALL BE PAID FOR BY THE CONTRACTOR.

D. MATERIAL WHICH DOES NOT MEET THE MINIMUM DENSITY REQUIREMENTS SHALL BE REWORKED IN ACCORDANCE WITH THE NHDOT SPEC. OR REMOVED AND REPLACED, AT THE CONTRACTOR'S EXPENSE, WITH ACCEPTABLE MATERIAL.

E. THE TAKING OF SAMPLES AND THE PERFORMING OF FIELD COMPACTION DENSITY TESTS SHALL BE DONE BY AN INDEPENDENT TESTING LABORATORY.

F. CONTRACTOR SHALL PROVIDE AT LEAST ONE QUALIFIED PERSON WHO SHALL BE PRESENT AT ALL TIMES DURING THE SOIL COMPACTION OPERATIONS AND WHO SHALL BE THOROUGHLY FAMILIAR WITH THE VARIOUS TYPES OF COMPACTION EQUIPMENT, PROPER COMPACTING TECHNIQUES AND METHODS, AND SOILS BEHAVIOR, AND WHO SHALL DIRECT THE COMPACTION OPERATIONS.

G. COMPACTION SHALL NOT TAKE PLACE IN FREEZING WEATHER OR WHEN MATERIALS TO BE COMPACTED ARE FROZEN, TOO WET OR MOIST, OR TOO DRY.

H. MOISTEN OR DRY EACH LAYER OF MATERIAL TO ACHIEVE OPTIMUM MOISTURE CONTENT. UNLESS OTHERWISE SPECIFIED OR DIRECTED BY ENGINEER. COMPACT EACH LAYER OF MATERIAL TO THE SPECIFIED REQUIREMENTS.

I. ROADS - ONE TEST FOR EACH LAYER OF COMPACTED FILL AND BASE MATERIAL AT INTERVALS OF APPROXIMATELY 300' ALONG THE ROADWAY.

J. TRENCHES - ONE TEST FOR TWO FEET OF BACKFILL AT INTERVALS OF APPROXIMATELY 300' ALONG THE TRENCH IN ROADWAYS.

1. ONCE THE CONTRACTOR IS SIGNED, THE PRIME CONTRACTOR IS RESPONSIBLE FOR PROVIDING A DETAILED CONSTRUCTION SCHEDULE TO THE ENGINEER AND OWNER FOR REVIEW PRIOR TO THE PRE-CONSTRUCTION MEETING.
2. PRIOR TO THE PRE-CONSTRUCTION MEETING, THE PRIME CONTRACTOR SHALL MEET WITH THE CITY, ENGINEER, AND OTHER PROJECT PARTIES PRIOR TO MOBILIZING TO THE SITE AND STARTING CONSTRUCTION. THE PRIME CONTRACTOR'S MAJOR SUBCONTRACTORS ON THE PROJECT MUST ATTEND THE PRE-CONSTRUCTION MEETING.
3. THE CONTRACTOR SHALL SUBMIT ALL MATERIAL SUBMITTALS AND SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL PRIOR TO ANY MATERIALS BEING DELIVERED TO THE PROJECT SITE.
4. ALL LAWSNS AND GREEN SPACE MUST BE RE-VEGETATED TO 85% AS DETERMINED BY THE ENGINEER PRIOR TO FINAL COMPLETION ON THE PROJECT.
5. ALL STAGING AND LANDYOWN AREAS MUST BE RESTORED TO ORIGINAL CONDITION OR BETTER PRIOR TO FINAL COMPLETION ON THE PROJECT.
6. ALL TEMPORARY EROSION CONTROL COMPONENTS (I.E. SILT SOXX) MUST BE REMOVED AND DISPOSED OF OFF SITE FOLLOWING PERMANENT STABILIZATION AS DETERMINED BY THE ENGINEER.
7. RECORD DRAWINGS AND NOTATIONS MUST BE PROVIDED TO THE ENGINEER IN ACCORDANCE WITH THE PROJECT RECORD REQUIREMENTS PRIOR TO SUBSTANTIAL COMPLETION. MUST BE PROVIDED IN AUTOCAD AND GIS FORMAT.

1. THE CONTRACTOR SHALL CONTACT ALL UTILITY COMPANIES OWNING UTILITIES, EITHER OVERHEAD OR UNDERGROUND, WITHIN THE CONSTRUCTION AREA. THE PROTECTION OR RELOCATION OF UTILITIES IS ULTIMATELY THE RESPONSIBILITY OF THE CONTRACTOR.
2. THE CONTRACTOR SHALL COORDINATE MATERIALS AND INSTALLATION SPECIFICATIONS WITH THE INDIVIDUAL UTILITY AGENCIES/COMPANIES, AND ARRANGE FOR ALL INSPECTIONS.

ELECTRIC: LIBERTY UTILITIES
ERIN GUZMAN; erin.guzman@libertyutilities.com

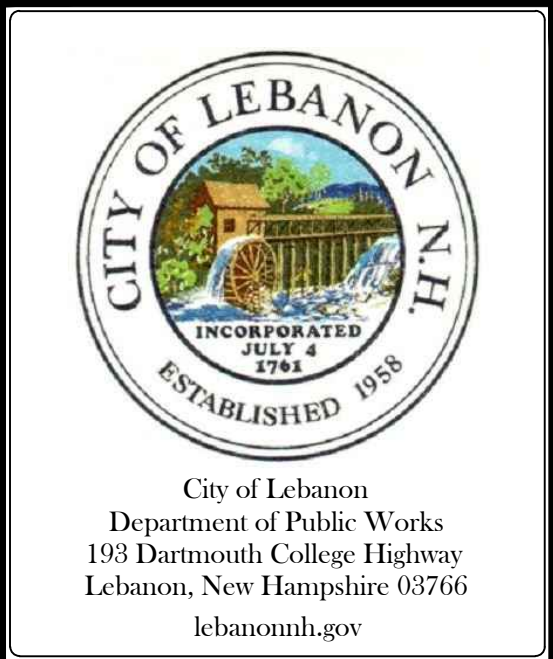
TELEPHONE: CONSOLIDATED COMMUNICATIONS
ERIC SEWARD; eric.seward@consolidated.com

WATER/SEWER: CITY OF LEBANON
 RICK BROWN, ASSISTANT PUBLIC WORKS DIRECTOR
 603-448-3112

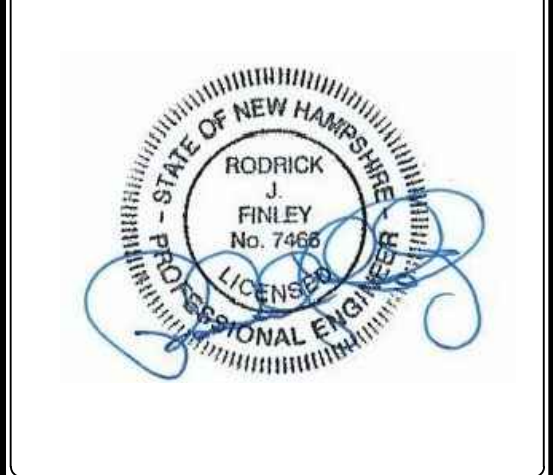
FIRE DEPARTMENT: LEBANON FIRE DEPARTMENT
JEFFREY LIBBY, 603-448-8810

[illegible]

OWNER: CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766	APPLICANT: CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766
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STAMP:



LOCATION:

TAX MAP 131, LOT 1
POVERTY LANE
LEBANON, NEW HAMPSHIRE
GRAFTON COUNTY

PROJECT:

PROJECT:
POVERTY LANE
ISOLATION VALVE
BUILDING

TITLE:

GENERAL NOTES

PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 1 OF 9		



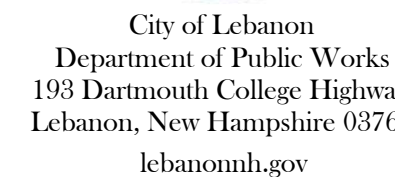
CONTACT DIG SAFE 72 HOURS
PRIOR TO CONSTRUCTION

THE LOCATION OF ANY UTILITY INFORMATION SHOWN ON THIS PLAN IS APPROXIMATE. THE CITY OF LEBANON MAKES NO CLAIM TO THE ACCURACY OR COMPLETENESS OF UTILITIES SHOWN. 72 HOURS PRIOR TO ANY EXCAVATION ON SITE, THE CONTRACTOR SHALL CONTACT DIG-SAFE AT 1-888-DIG-SAFE.

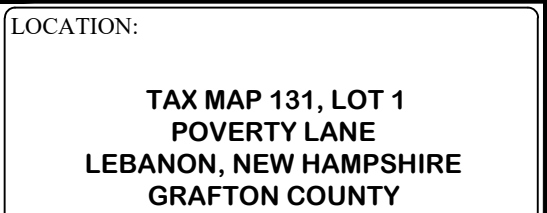
1. TOPOGRAPHY AND PLANIMETRIC DATA WAS COMPILED BY GRANITE ENGINEERING, LLC UTILIZING NH GRANIT GIS DATA.
2. TOPOGRAPHY GENERATED FROM NH GRANIT LIDAR DATA, SPECIFICALLY "TWO FOOT TOPOGRAPHIC CONTOURS - MASCOMA RIVER (0108010601) - SMOOTHED".
3. UNDERGROUND UTILITIES ARE APPROXIMATED BASED ON THE CITY OF LEBANON MAPEO WEB SITE AND IS NOT WARRANTED TO BE EXACT AND ARE TO BE VERIFIED PRIOR TO CONSTRUCTION.
4. OVERHEAD UTILITY LINES, UTILITY POLES, HYDRANTS, ROADWAY CENTER STRIPING, EDGES OF PAVEMENT AND GRAVEL SHOULDERS, AND EDGE OF TRAILINE WERE DIGITIZED BY GRANITE ENGINEERING, LLC FROM CITY OF LEBANON 2021 AERIAL IMAGERY AND ARE APPROXIMATE ONLY.
5. PARCEL LINES AND RIGHT-OF-WAY LINES SHOWN ARE NHRGRANT PARCEL DATA AND ARE APPROXIMATE ONLY.
6. HORIZONTAL DATUM: NH STATE PLANE GRID NAD83 (SURVEY FEET) FROM GIS DATA.
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM 1988 (NAV88) FROM NHRGRANT LIDAR DATA.

[illegible]

OWNER:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766
APPLICANT:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766



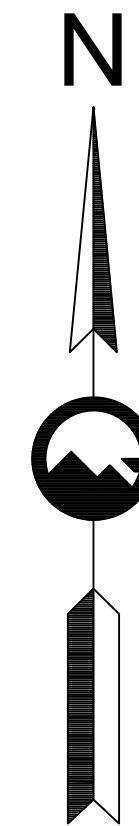
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TITLE:

OVERVIEW PLAN

PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 2 OF 9		



 / 	EX./PROP. HYDRANT
 / 	EX./PROP. WATER VALVE
 / 	EX./PROP. WATER SHUTOFF
 / 	EX./PROP. UTILITY POLE
	PROPERTY LINE
	EX. WATER LINE
	EX. OVERHEAD UTILITIES

(IN FEET)
1 inch = 200 ft.

BIDDING PLANS

[illegible]

OWNER:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766
APPLICANT:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766



City of Lebanon
Department of Public Works
193 Dartmouth College Highway
Lebanon, New Hampshire 03766
lebanonnh.gov

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LOCATION:

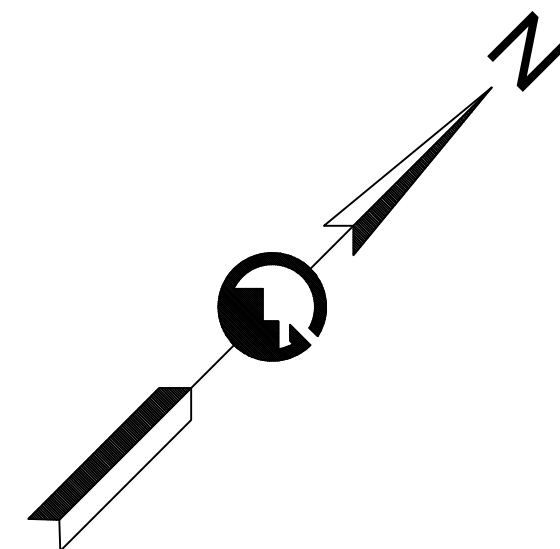
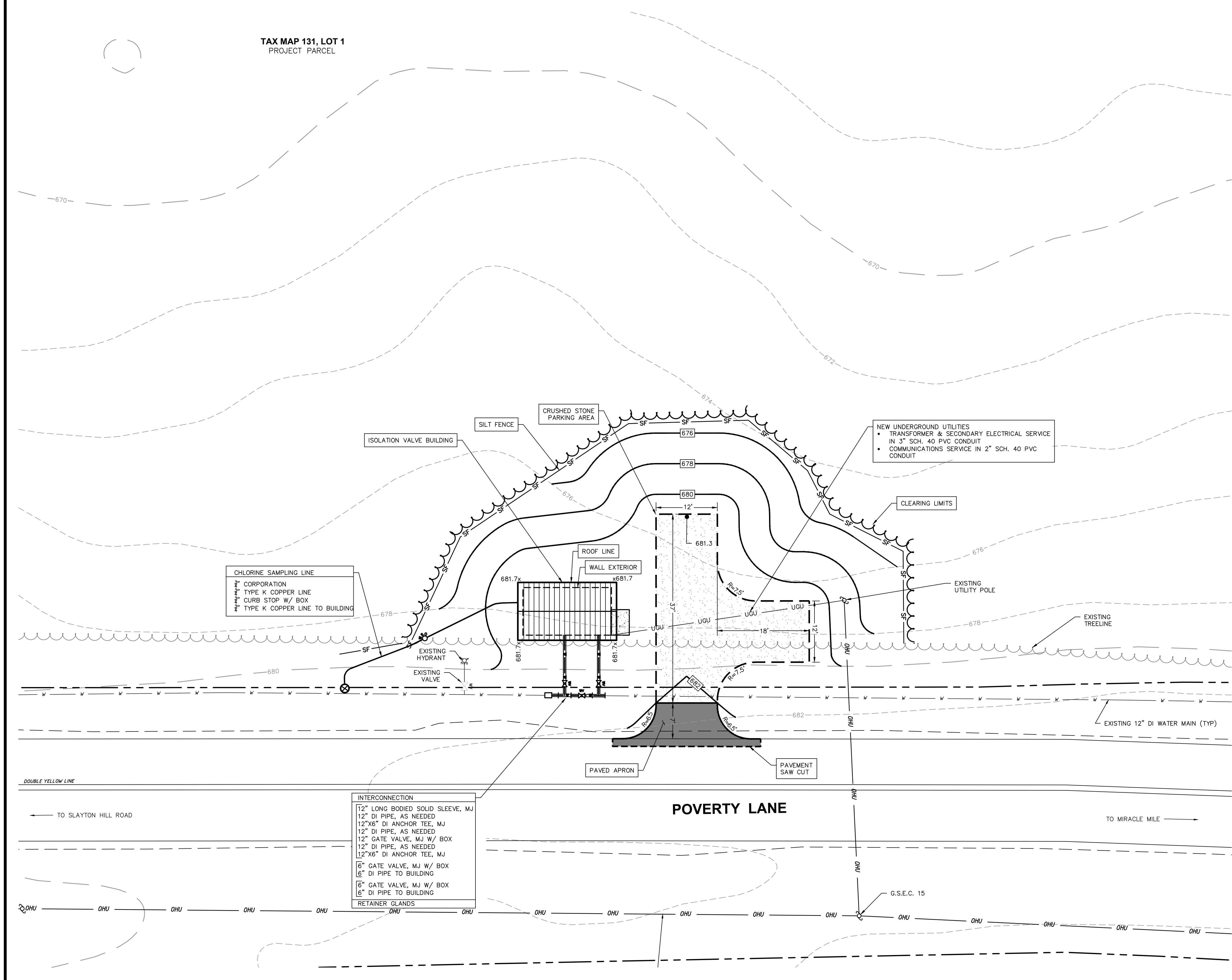
TAX MAP 131, LOT 1
POVERTY LANE
LEBANON, NEW HAMPSHIRE
GRAFTON COUNTY

PROJECT:
**POVERTY LANE
ISOLATION VALVE
BUILDING**

TITLE:

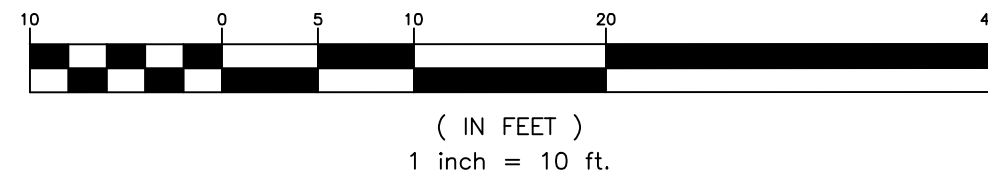
SITE PLAN

PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 3 OF 9		



- | LEGEND | |
|--------|----------------------------|
| | EX./PROP. SIGN |
| | EX./PROP. HYDRANT |
| | EX./PROP. WATER VALVE |
| | EX./PROP. CURB STOP |
| | EX./PROP. CORPORATION |
| | EX./PROP. UTILITY POLE |
| | BUILDING SETBACK |
| | PROPERTY LINE |
| | PROP. BUILDING |
| | EDGE GRAVEL DRIVE |
| | EX. WATER LINE |
| | PROP. WATER LINE |
| | EX. OVERHEAD UTILITIES |
| | EX./PROP. EDGE OF PAVEMENT |
| | EX./PROP. TREELINE |
| | PROPOSED ITEM |

GRAPHIC SCALE





EQUIPMENT SCHEDULE			
ITEM	QUANTITY	DESCRIPTION	MODEL
A	1	DEHUMIDIFIER	DRIZAIR 1200, OR EQUAL
B	2	HEATER (RECESSED WALL MOUNT)	DAYTON MODEL 2HAC5, OR EQUAL
C	1	HYPOCHLORITE FEEDING SYSTEM; EXTEND 3" TYPE K COPPER WATER SERVICE FROM WATER MAIN TO FEEDING SYSTEM	CONSTANT CHLOR MC4-50 LITE, OR EQUAL
D	1	TELEMETRY PANEL	MICROLOGIC PLC, OR EQUAL
E	1	POWER PANEL W/ PLC	EATON PANEL;ALAN BRADLEY 1400 MICROLOGIX PLC, OR EQUAL
F	1	36" INSULATED METAL DOOR & FRAME, U=0.37	
G	1	36" INSULATED FIBERGLASS DOOR & FRAME	
H	2	ADJUSTABLE PIPE SUPPORT	CARPENTER & PATTERSON FIG 101, OR EQUAL
I	1	VERTICAL DISCHARGE FAN	
J	1	INTAKE LOUVER	
K	1	CHLORINE CONTROLLER	HACH SC 4500, OR EQUAL
L	1	CHLORINE ANALYZER	HACH CL17sc W/ TUBING KIT & CELL CLEANING KIT, OR EQUAL



Page 54 of 242

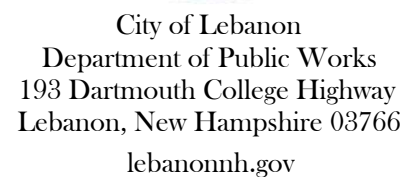
1. CONTRACT DOCUMENTS ARE IN PART DIAGRAMMATIC, INTENDED TO CONVEY SCOPE & ARRANGEMENT OF WORK. CONSULT CONSTRUCTION DOCUMENTS FOR FAMILIARITY WITH ALL CONDITIONS AFFECTING WORK. VERIFY ALL SPACES IN WHICH WORK WILL BE PERFORMED BY ON-SITE MEASUREMENTS. DO NOT SCALE DRAWINGS.
2. TAKE ALL NECESSARY MEASUREMENTS AT THE BUILDING AND FABRICATE CONDUITS ON THE SITE, IF REQUIRED, TO ENSURE AN APPROVABLE INSTALLATION.
3. MECHANICAL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL PERMITS REQUIRED FOR THE MECHANICAL WORK.
4. WORKMANSHIP SHALL BE OF THE BEST QUALITY AND DONE BY COMPETENT MECHANICS SKILLED IN THEIR TRADES. UNLESS OTHERWISE SPECIFIED, ALL MATERIAL AND EQUIPMENT UNDER THIS DIVISION SHALL BE NEW AND EACH ARTICLE OF ITS KIND SHALL BE THE STANDARD PRODUCT OF A SINGLE MANUFACTURER.
5. ALL SYSTEMS SHALL COMPLY WITH SMACNA, NFPA, ASME, UL, BOCA, IMC, AND ASHRAE STANDARDS.
6. MECHANICAL CONTRACTOR TO PROVIDE CODE COMPLIANT VENTILATION.
7. THE MECHANICAL CONTRACTOR SHALL SEAL ALL PENETRATIONS AS A PART OF THE MECHANICAL WORK IN ALL FIRE RATED BARRIERS.
8. THE MECHANICAL CONTRACTOR SHALL MAINTAIN AN ACCURATE SET OF DRAWINGS INDICATING ANY DEVIATIONS FROM THE CONTRACT DOCUMENTS AND ACCURATELY SHOW THE INSTALLED LOCATIONS OF CONCEALED OR REMOTE EQUIPMENT. THESE "RECORD" DRAWINGS SHALL BE SUBMITTED TO THE OWNER UPON COMPLETION OF THE WORK.
9. LABEL PIPING & EQUIPMENT BY THE TYPE OF SERVICE.
10. COORDINATE WITH ELECTRICAL CONTRACTOR THE LOCATIONS AND NUMBERS OF ALL DISCONNECTS TO BE MOUNTED ON EQUIPMENT.
11. PROVIDE START UP AND CHECK OUT OF ALL SYSTEMS PRIOR TO TURNOVER.
12. PROVIDE TWO (2) PAPER COPIES AND AN ELECTRONIC COPY OF THE OPERATION & MAINTENANCE MANUALS AND AS-BUILT DRAWINGS TO THE CITY OF LEBANON FOR REVIEW PRIOR TO SUBMITTING TO OWNER. AS-BUILT DRAWINGS SHALL BE IN DIGITAL AUTOCAD FORMAT.
13. ENGINEER TO BE PROVIDED WITH SUBMITTALS FOR APPROVAL PRIOR TO ORDERING EQUIPMENT.

1. ALL WORK SHALL BE IN COMPLIANCE WITH THE MOST RECENT LOCAL, STATE AND NATIONAL ELECTRICAL CODES.
2. ELECTRICAL CONTRACTOR SHALL VISIT THE SITE TO ASCERTAIN EXISTING CONDITIONS.
3. THESE DRAWINGS ARE DIAGRAMMATIC AND FUNCTIONAL ONLY. PROVIDE ALL MATERIALS NECESSARY FOR A COMPLETE/FUNCTIONAL INSTALLATION. DO NOT SCALE DRAWINGS.
4. UNLESS OTHERWISE SPECIFIED ALL MATERIAL AND EQUIPMENT UNDER THIS DIVISION SHALL BE NEW AND EACH ARTICLE OF ITS KIND SHALL BE THE STANDARD PRODUCT OF A SINGLE MANUFACTURER.
5. ELECTRICAL CONTRACTOR SHALL OBTAIN ALL PERMITS FOR THE INSTALLATION OF THE ELECTRICAL WORK.
6. COORDINATE WORK WITH OTHER BUILDING AND SITE TRADES PRIOR TO EQUIPMENT INSTALLATION.
7. PROVIDE GROUNDING PER NEC 250 AND/OR AS SHOWN.
8. TOP OF PANEL BOARD SHALL NOT BE MOUNTED HIGHER THAN 6" AFF.
9. NO CONDUIT OR RACEWAY SHALL CONTAIN MORE THAN 6 CONDUCTORS OR 8 WIRES UNLESS SPECIFICALLY SHOWN.
10. THE ELECTRICAL CONTRACTOR SHALL SEAL ALL PENETRATIONS MADE AS PART OF ELECTRICAL WORK IN FIRE RATED BARRIERS.
11. THE ELECTRICAL CONTRACTOR SHALL MAINTAIN AN ACCURATE SET OF DOCUMENTS AND ACCURATELY SHOW THE INSTALLED LOCATION OF THE UNDERGROUND AND CONCEALED OR REMOTE EQUIPMENT. THESE RECORD DRAWINGS SHALL BE SUBMITTED TO THE OWNER UPON COMPLETION OF THE WORK.
12. DO NOT SWITCH EMERGENCY OR EXIT LIGHT. ALL EXIT AND EMERGENCY LIGHTS SHALL BE POWERED FROM THE NEAREST LIGHTING CIRCUIT IN THE AREA LIGHTED BY THE EMERGENCY LIGHT OR SERVED BY THE EXIT SIGN OR AS INDICATED ON THE DRAWINGS.
13. REVIEW SHOP DRAWINGS TO DETERMINE LOCATION AND METHOD OF WIRING FOR EQUIPMENT SUPPLIED BY OTHERS.
14. ALL ELECTRICAL LOADS SHALL BE BALANCED EQUALLY.
15. SEE MECHANICAL PLUMBING SUBMITTALS FOR EXACT LOCATION OF EQUIPMENT AND DISCONNECTS TO BE MOUNTED ON EQUIPMENT.
16. THERE SHALL BE NO SHARED NEUTRALS.
17. PROVIDE LOCAL MEANS OF DISCONNECT IF NOT FURNISHED WITH OR AS PART OF THE EQUIPMENT.
18. CHECK OUT AND VERIFY PROPER OPERATION OF ALL ELECTRICAL SYSTEMS PRIOR TO TURN OVER TO THE OWNER.
19. PROVIDE TWO (2) PAPER COPIES AND AN ELECTRONIC COPY OF THE OPERATION & MAINTENANCE MANUALS AND AS-BUILT DRAWINGS TO THE CITY OF LEBANON FOR REVIEW PRIOR TO SUBMITTING TO OWNER. AS-BUILT DRAWINGS SHALL BE IN DIGITAL AUTOCAD FORMAT.
20. SWITCHES TO BE LOCATED 4" OFF DOOR JAMB AND 48" TO CENTER AFF.
21. RECEPTACLES TO BE LOCATED 48" TO CENTER AFF.
22. PROVIDE SUBMITTALS TO THE ENGINEER FOR APPROVAL ON LIGHTING & SWITCHGEAR.
23. LIGHT FIXTURES SHALL BE SECURELY FASTENED TO STRUCTURAL BUILDING MEMBERS, PER BUILDING CODES AND NEC REQUIREMENTS.
24. MINIMUM WIRE SIZE SHALL BE #14 CU. UNLESS OTHERWISE SPECIFIED.
25. NM CABLE WILL BE APPROVED ON THIS PROJECT.
26. ALL OUTLETS, JUNCTION AND PULL BOXES WILL BE GALVANIZED STAMPED STEEL PRODUCTS IN ALL AREAS.
27. ALL PANELS WILL HAVE COPPER BREAKERS, FULL SIZE CIRCUIT BUS ONLY AND HAVE 20% SPACE.

<u>PANEL DESIGNATION PP</u>					
AMP	100				
VOLTAGE	120/240 V				
MOUNTING	SURFACE				
CIRCUIT #	DESCRIPTION	AMP	AMP	DESCRIPTION	CIRCUIT #
1	AHU-1	20	20	AHU-2	2
3	DH RECEPT	20	20	RECEPTS	4
5	TELEMETRY PANEL	20	20	LIGHT CIRCUIT 1	6
7	LIGHT CIRCUIT 2	20	20	LIGHT CIRCUIT 3	8
9	FAN	20	20	SMOKE DETECTOR	10
11	SPARE	20	20	SPARE	12

[illegible]

OWNER:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766
APPLICANT:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766



TAX MAP 131, LOT 1
POVERTY LANE
LEBANON, NEW HAMPSHIRE
GRAFTON COUNTY

TITLE: ELECTRICAL AND MECHANICAL NOTES & DETAILS

PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 5 OF 9		



1/2" DIA. THREADED RODS BETWEEN FITTINGS, INSTALLED ON OPPOSITE SIDES OF RETAINING GLANDS (TYP.)

#5 REBAR STIRRUP

6 MIL. POLYETHYLENE PLASTIC WRAP OR BOND FITTING

MJ FITTING W/RETAINER GLANDS (TYP.)

DUCTILE IRON

2 NUTS INSTALLED AT BOTH ENDS OF THREADED ROD (TYP.)

UNDISTURBED MATERIAL

CAST-IN-PLACE CONCRETE THRUST BLOCK (TYP.)

6"

NOTE: EXTEND REINFORCED THRUST BLOCK 2' MINIMUM EITHER SIDE OF FITTING TO MAXIMIZE DOWN-PRESSURE EFFECT OF EARTH BACKFILL.

MJ VERTICAL BENDS - ELEVATION

NOT TO SCALE



A. THE CONTRACTOR SHALL NOT OPERATE ANY VALVES OR HYDRANTS WITHIN THE LEBANON WATER SYSTEM. ALL VALVES AND OR HYDRANTS SHALL BE OPERATED ONLY BY CITY OF LEBANON UTILITY MAINTENANCE DEPARTMENT PERSONNEL.

B. ALL WATER MAIN SHALL BE INSTALLED IN ACCORDANCE WITH CITY OF LEBANON AND AWWA STANDARDS.

C. PRIOR TO BACKFILLING, ALL WATER MAIN WORK AND SERVICES SHALL BE OBSERVED BY THE ENGINEER.

D. ALL WATER MAIN VALVES AND FITTINGS SHALL BE MECHANICAL JOINT CONSTRUCTION AND INSTALLED WITH RETAINER GLANDS AND THRUST BLOCKS.

E. DUCTILE IRON PIPE SHALL BE AWWA SPECIFICATION C-151, CLASS 52. PIPE LENGTHS SHALL BE SUPPLIED NOT EXCEEDING TWENTY (20) FEET IN LENGTH. ALL PIPE SHALL BE MECHANICAL JOINT WITH RUBBER GASKET COMPLYING WITH AWWA C-111. ALL PIPE AND FITTINGS SHALL HAVE A CEMENT MORTAR LINING AND ONE (1) MILLIMETER THICK BITUMINOUS SEAL COATING ON THE INSIDE AND ONE (1) MILLIMETER THICK BITUMINOUS SEAL COATING ON THE OUTSIDE. THE CEMENT LININGS SHALL BE IN ACCORDANCE WITH AWWA C104 AND BE $\frac{1}{8}$ " THICKNESS.

F. ALL VALVES SHALL BE OPEN COUNTER CLOCKWISE "LEFT".

G. ALL BELL JOINTS SHALL HAVE TWO SILICONE BRONZE SERRATED WEDGES INSTALLED FOR CONDUCTIVITY.

H. DUCTILE IRON FITTINGS SHALL CONFORM TO AWWA SPECIFICATIONS C-153 OR C-110. SOLID SLEEVES SHALL BE LONG BODY MECHANICAL JOINT ONLY.

I. 90° BENDS ARE NOT ALLOWED.

J. CHLORINATION/TESTING TAPS SHALL BE INSTALLED WITHIN 5' OF VALVES AND SHALL BE REMOVED FOLLOWING COMPLETION OF TESTING.

K. LEDGE AND LOOSE ROCK IN TRENCHES SHALL BE REMOVED TO 1' BELOW WATER MAIN AND SERVICE PIPING. LEDGE OR ROCK REMOVED SHALL NOT BE PLACED BACK INTO THE TRENCH.

L. ALL EXISTING WATER MAIN IS TO BE EXCAVATED AND REMOVED FROM THE SITE IN ACCORDANCE WITH THE CONTRACT PAYMENT ITEM.

M. WATER LINE BEDDING/BLANKET MATERIAL (SAND) ASTM C33, FINE AGGREGATE. MATERIAL SHALL BE OBTAINED FROM APPROVED SOURCES, AND SHALL CONSIST OF SATISFACTORY GRADED, FREE DRAINING MATERIAL, REASONABLY FREE FROM LOAM, SILT, CLAY, AND ORGANIC MATERIAL. SIEVE ANALYSIS BY WEIGHT AS FOLLOWS:

SIEVE SIZE	% PASSING BY WEIGHT
NO. 4	100%
*NO 200	0-12% (*BASED ON THE FRACTION PASSING NO. 4)

N. A MINIMUM VERTICAL SEPARATION OF 18 INCHES SHALL BE MAINTAINED BETWEEN WATER AND DRAINAGE UTILITIES, INCLUDING SERVICES. WHERE 18" UNLESS OTHERWISE SHOWN ON THE DRAWINGS. RIGID INSULATION SHALL BE INSTALLED BETWEEN THE CROSSING.

O. WATER SERVICE LINES SHALL BE INSTALLED AT A MINIMUM OF 5.5' DEPTH BELOW ALL DRAINAGE DITCH CROSSINGS. CONTRACTOR MUST VERIFY DEPTHS DURING CONSTRUCTION RELATIVE TO PROPOSED FINISH GRADE IN DITCHES.

THE CONTRACTOR SHALL NOTIFY THE ENGINEER AT LEAST 24 HOURS AND THE OWNER AT LEAST 48 HOURS IN ADVANCE OF BEGINNING TESTING OR DISINFECTION.

A. THE CONTRACTOR SHALL FURNISH ALL NECESSARY EQUIPMENT AND LABOR FOR CARRYING OUT A PRESSURE TEST AND LEAKAGE TEST ON THE PIPELINE IN ACCORDANCE WITH AWWA STANDARDS.

B. THE PIPE SHALL BE SUBJECTED TO A HYDROSTATIC PRESSURE OF ONE AND ONE-HALF (1½) TIMES THE WORKING PRESSURE, OR THE RATED PRESSURE, WHICHEVER IS GREATER, AND THIS PRESSURE MAINTAINED FOR AT LEAST TWO HOURS. THE LEAKAGE TEST SHALL BE CONDUCTED AT A PRESSURE AS DETERMINED BY THE ENGINEER AND THIS PRESSURE SHALL BE MAINTAINED FOR AT LEAST 120 MINUTES DURING THE TEST.

C. THE CONTRACTOR SHALL MAKE ANY TAPS AND FURNISH ALL NECESSARY CAPS, PLUGS, ETC., AS REQUIRED IN CONJUNCTION WITH TESTING. HE SHALL ALSO FURNISH A MOTORIZED TEST PUMP, GAUGES AND ANY OTHER EQUIPMENT REQUIRED IN CONJUNCTION WITH CARRYING ON THE HYDROSTATIC TESTS. HE SHALL AT ALL TIMES PROTECT THE NEW WATER MAINS AND THE EXISTING WATER MAINS AGAINST THE ENTRANCE OF POLLUTING MATERIAL.

D. TESTS TO BE MADE ONLY AFTER PARTIAL OR COMPLETE BACKFILLING OF TRENCHES.

E. POSITION OF ALL VALVES (FULLY OPENED OR CLOSED) IN SECTION OF LINE TO BE TESTED SHALL BE CHECKED IN THE PRESENCE OF THE ENGINEER TO INSURE THAT:

1. ALL HYDRANT BRANCH CONNECTIONS ARE OPEN TO THE HYDRANT (HYDRANT CLOSED, BRANCH CONNECTION VALVE OPEN).

2. ALL MAIN LINE VALVES ARE PROPERLY POSITIONED FOR SECTION OF LINE BEING TESTED.

F. TESTS NOT TO BE PERFORMED FOR AT LEAST SEVEN (7) DAYS AFTER LAST CONCRETE BLOCK OR ANCHOR HAS BEEN CAST.

G. FILL PIPELINES, FITTINGS, AND APPURTENANCES WITH WATER FOR TESTING SLOWLY.

H. EXPUL AIR FROM PIPELINES, FITTINGS AND APPURTENANCES PRIOR TO PERFORMING TESTS. IF PERMANENT AIR VENTS ARE NOT LOCATED AT ALL HIGH POINTS, THE CONTRACTOR SHALL INSTALL CORPORATION STOPS AT HIS EXPENSE AT SUCH POINTS SO THAT THE AIR CAN BE EXPULLED AS THE LINE IS FILLED WITH WATER. THESE STOPS SHALL BE PROTECTED WITH A MASONRY BRIDGE TO PREVENT BREAKAGE DURING BACKFILLING. SUCH POINTS ARE TO BE REMOVED DOWN TO THE CORPORATION ONCE TESTING IS COMPLETE.

I. EXAMINATION UNDER PRESSURE: ALL EXPOSED PIPES, FITTINGS, VALVES, HYDRANTS, JOINTS SHALL BE EXAMINED CAREFULLY DURING THE HYDROSTATIC AND LEAKAGE TESTS.

J. ALLOWABLE LEAKAGE IN GALLONS PER HOUR SHALL BE AS DETERMINED BY THE FOLLOWING FORMULA:

$$L = \frac{SDP}{149,000}$$

WHERE L = ALLOWABLE LEAKAGE

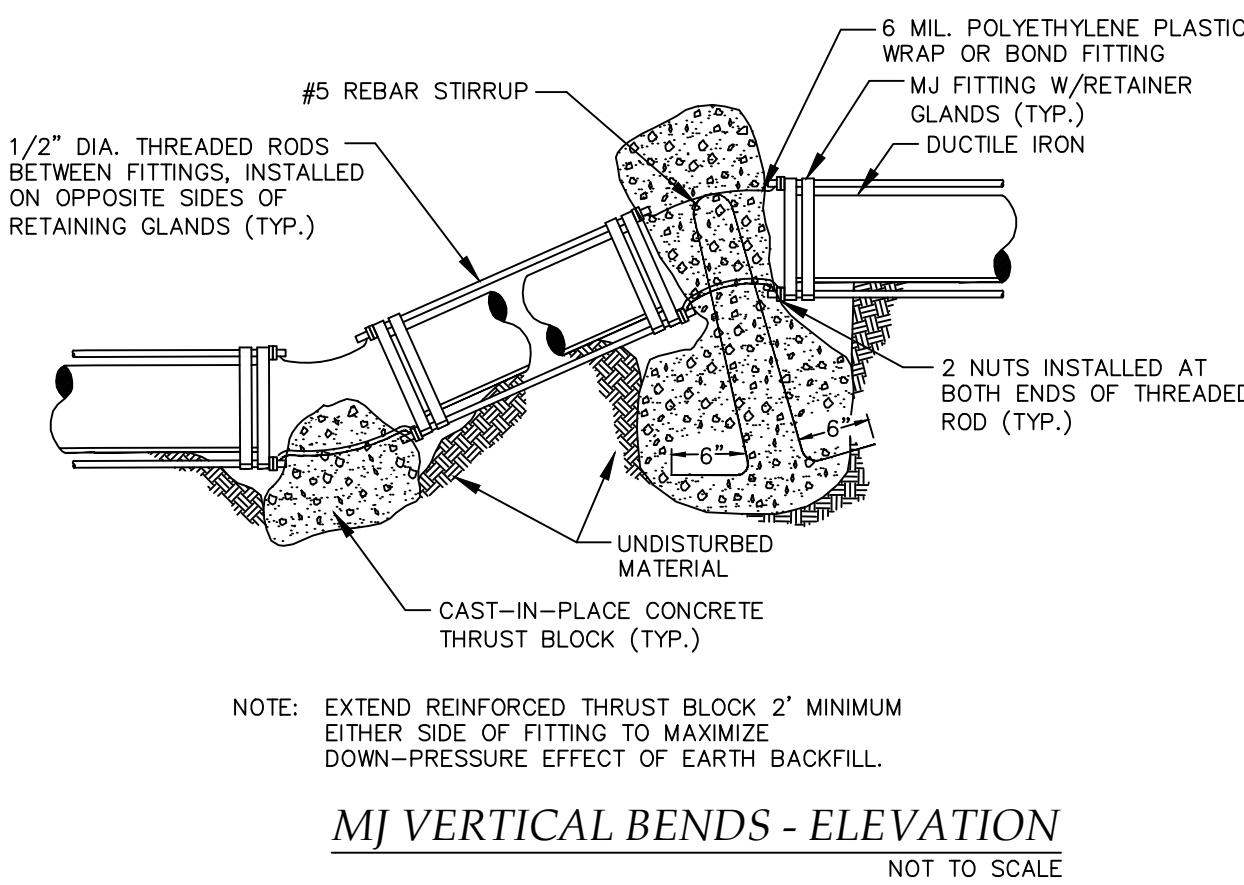
S = LENGTH OF PIPE TESTED

D = PIPE DIAMETER IN INCHES

P = TEST PRESSURE

FOR FLANGED JOINTS: NO LEAKAGE ALLOWABLE.

THE CONTRACTOR AND THE ENGINEER SHALL COMPUTE THE ALLOWABLE LEAKAGE FOR EACH SECTION TO BE TESTED AND AGREE ON THE ALLOWABLE AMOUNT PRIOR TO PERFORMING ANY TESTS.



A. BEFORE BEING PLACED IN SERVICE, ALL NEW WATER PIPELINES SHALL BE CHLORINATED IN ACCORDANCE WITH ANSA/AWWA C-651 (RESENT REVISION), "STANDARD FOR DISINFECTING WATER MAINS." THE PROCEDURE SHALL BE DISCUSSED WITH THE ENGINEER BEFORE DOING THE WORK AND SHALL BE APPROVED.

B. THE LOCATION OF THE CHLORINATION AND SAMPLING POINTS WILL BE DETERMINED BY THE ENGINEER IN THE FIELD. TAPS FOR CHLORINATION AND SAMPLING SHALL BE UNCOVERED AND BACKFILLED BY THE CONTRACTOR AS REQUIRED. AT LEAST TWO SETS OF SAMPLES SHALL BE COLLECTED.

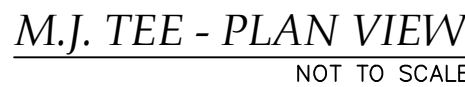
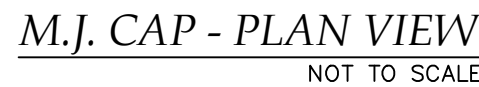
C. THE GENERAL PROCEDURE FOR CHLORINATION SHALL BE FIRST TO FLUSH ALL DIRTY OR DISCOLORED WATER FROM THE LINES AT A RATE OF AT LEAST 2.5 FPS. CHLORINE SHALL BE INTRODUCED THROUGH A TAP AT ONE END, WHILE WATER IS BEING WITHDRAWN AT THE OTHER END OF THE LINE. THE CHLORINE SOLUTION OF 50 PPM FREE CHLORINE SHALL REMAIN IN THE PIPELINE FOR ABOUT 24 HOURS. AT THE END OF THIS PERIOD THE RESIDUAL CHLORINE SHALL BE AT LEAST 10 PPM.

D. FOLLOWING THE CHLORINATION PERIOD, ALL WATER SHALL BE FLUSHED FROM THE LINES AT THEIR EXTREMITIES, AND REPLACED WITH WATER FROM THE DISTRIBUTION SYSTEM. BACTERIOLOGICAL SAMPLING OF THE REPLACEMENT WATER SHALL THEN BE OBTAINED BY THE CONTRACTOR OR TESTED BY THE APPROVED LABORATORY TO FULL ACCORDANCE WITH THE AWWA MANUAL 6001. THE CONTRACTOR WILL BE REQUIRED TO RE-CHLORINATE AT THEIR COST, IF NECESSARY, AND THE LINE SHALL NOT BE PLACED IN SERVICE UNTIL THE REQUIREMENTS OF THE STATE WATER SUPPLY DIVISION ARE MET. A WRITTEN COPY THAT THE WATER SAMPLE PASSES THE BACTERIOLOGICAL TEST SHALL BE PROVIDED TO THE ENGINEER AND OWNER PRIOR TO ALLOWING THE MAIN TO BE ACTIVATED.

E. SPECIAL DISINFECTION PROCEDURES, SUCH AS SOAKING OR SWABBING, APPROVED BY THE ENGINEER, SHALL BE USED IN CONNECTIONS TO EXISTING MAINS AND WHERE THE METHOD OUTLINED ABOVE IS NOT PRACTICABLE.

F. THE CONTRACTOR SHALL PROVIDE FOR AND ARRANGE FOR LABORATORY TO TEST ALL SAMPLES (2 SAMPLES FROM EACH LOCATION, ONE 24 HOURS AFTER THE LINE IS DISINFECTED AND THE SECOND AT 24 HOURS AFTER THE FIRST SAMPLE IS OBTAINED) FOR BACTERIOLOGICAL TESTING AS REQUIRED BY THIS SPECIFICATION AND REFERENCE STANDARDS INCLUDED THEREIN. THE APPROVED LAB IS ENDYNE LABORATORIES IN LEBANON, NH. ONCE THE SAMPLES ARE COLLECTED BY THE CONTRACTOR AND RECEIVED BY THE APPROVED LAB, THE RESULTS SHALL BE FURNISHED TO THE ENGINEER BY THE ENGINEER. THE CONTRACTOR SHALL FILL OUT ALL NECESSARY FORMS AND CHAIN OF CUSTODY IN RELATION TO THE SAMPLES. COPIES OF ALL RESULTS SHALL BE FURNISHED IMMEDIATELY UPON RECEIPT TO THE ENGINEER AND OWNER.

G. DURING THE 24 HOUR STANDING PERIOD, ALL GATE VALVES WITHIN THE SECTION BEING TESTED SHALL BE OPERATED TO DISINFECT THE MECHANISM.



REVISIONS

[illegible]

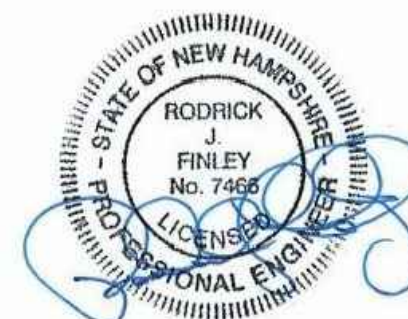
OWNER:
CITY OF LEBANON
DEPARTMENT OF PUBLIC WORKS
193 DARTMOUTH COLLEGE HIGHWAY
LEBANON, NEW HAMPSHIRE 03766

APPLICANT:
CITY OF LEBANON
DEPARTMENT OF PUBLIC WORKS
193 DARTMOUTH COLLEGE HIGHWAY
LEBANON, NEW HAMPSHIRE 03766



City of Lebanon
Department of Public Works
193 Dartmouth College Highway
Lebanon, New Hampshire 03766
lebanonnh.gov

STAMP



LOCATION:

TAX MAP 131, LOT 1
POVERTY LANE
LEBANON, NEW HAMPSHIRE
GRAFTON COUNTY

PROJECT:

**POVERTY LANE
ISOLATION VALVE
BUILDING**

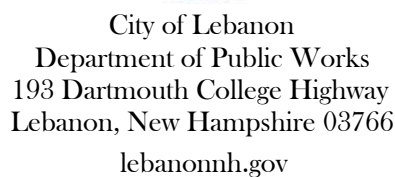
TITLE:

WATER NOTES & DETAILS

PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 6 OF 9		

[illegible]

OWNER:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766
APPLICANT:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766



TAX MAP 131, LOT 1
POVERTY LANE
LEBANON, NEW HAMPSHIRE
GRAFTON COUNTY

TITLE: MISCELLANEOUS
DETAILS

PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 7 OF 8		



TO ADEQUATELY PROTECT WATER QUALITY DURING COLD WEATHER AND DURING SPRING RUNOFF, THE ADDITIONAL STABILIZATION TECHNIQUES SPECIFIED IN THIS SECTION SHALL BE EMPLOYED DURING THE PERIOD FROM OCTOBER 15 THROUGH MAY 1.

1. IF DURING CONSTRUCTION A WINTER SHUTDOWN IS NECESSARY, THE CONTRACTOR SHALL STABILIZE ALL INCOMPLETE WORK AND PROVIDE FOR SUITABLE METHODS OF DIVERTING RUNOFF IN ORDER TO ELIMINATE SHEET FLOW ACROSS FROZEN SURFACES.
2. ALL PROPOSED, UNSTABILIZED SLOES SHALL BE LIMITED TO ONE ACRE AND PROTECTED AGAINST EROSION BY THE METHODS DESCRIBED BELOW PRIOR TO ANY THAW OR SPRING MELT EVENT.
3. THE ALLOWABLE AREA OF EXPOSED SOIL MAY BE INCREASED IF A WINTER CONSTRUCTION PLAN IS DEVELOPED BY A QUALIFIED ENGINEER OR A PROFESSIONAL LANDSCAPE ARCHITECT, AND THE PLAN IS APPROVED BY THE DISTRICT. THE PLAN MUST PROVIDE FOR THE PROTECTION OF ALL PROPOSED VEGETATED AREAS HAVING A SLOPE OF LESS THAN 15% THAT DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15, OR THAT ARE DISTURBED AFTER OCTOBER 15, SHALL BE SEEDED AND COVERED WITH 3 TO 4 TONS OF HAY OR STRAW MULCH PER ACRE SECURED WITH ANCHORED NETTING OR TACKIFIER OR WITH AT LEAST 2 INCHES OF EROSION CONTROL MIX MEETING THE CRITERIA OF ENV-WQ 1506.05(A).
4. ALL PROPOSED VEGETATED AREAS HAVING A SLOPE OF 15% OR GREATER THAT DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15, OR THAT ARE DISTURBED AFTER OCTOBER 15, SHALL BE SEEDED AND COVERED WITH A PROPERLY INSTALLED AND ANCHORED EROSION CONTROL BLANKET OR WITH AT LEAST 4 INCHES OF EROSION CONTROL MIX MEETING THE CRITERIA OF ENV-WQ 1506.05(B).
5. ANCHORED HAY OR STRAW MULCH OR EROSION CONTROL MIX THAT MEETS THE CRITERIA OF ENV-WQ 1506.05(B) SHALL NOT BE INSTALLED OVER SNOW OR FROZEN GROUND DEEPER THAN ONE INCH IN DEPTH.
6. THE INSTALLATION OF EROSION CONTROL BLANKETS OR MULCH NETTING SHALL NOT OCCUR OVER ACCUMULATED SNOW OR ON FROZEN GROUND AND SHALL BE COMPLETED IN ADVANCE OF THAW OR SPRING MELT EVENTS.
7. ALL PROPOSED STABILIZATION IN ACCORDANCE WITH (D) OR (E), ABOVE, SHALL BE COMPLETED WITHIN A DAY OF ESTABLISHING THE GRADE OF THE DISTURBED AREA OR THAW OF THE EXISTING GRADE.
8. ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15, OR WHICH ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED TEMPORARILY WITH STONE OR EROSION CONTROL BLANKETS APPROPRIATE FOR THE DESIGN FLOW CAPACITY.
9. AFTER OCTOBER 15, INCOMPLETE PARKING AREAS WHERE ACTIVE CONSTRUCTION HAS STOPPED FOR THE WINTER SHALL BE PROTECTED WITH A MINIMUM 3-INCH LAYER OF BASE COURSE GRAVELS (NHDOT ITEM 304.1, 304.2, OR 304.3).

1. THE AREA OF DISTURBANCE SHALL BE KEPT TO A MINIMUM. EARTHWORK SHALL BE LIMITED TO THE AREAS WITHIN THE LIMITS OF CLEARING AS SHOWN ON THE PLAN. AT NO TIME SHALL MORE THAN FIVE (5) ACRES OF SITE AREA BE IN AN UNSTABLE CONDITION IN AREAS WHERE FINAL GRADING HAS NOT OCCURRED. IMPLEMENT TEMPORARY STABILIZATION MEASURES WITHIN 7 DAYS AFTER INITIAL DISTURBANCE. EXPOSED SOILS EXPOSED TO 100 FEET OF A SURFACE WATER BODY OR WETLAND AND NO MORE THAN 14 DAYS AFTER INITIAL DISTURBANCE FOR ALL OTHER AREAS.
2. APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES, INCLUDING PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO LAND DISTURBANCE.
3. ALL MEASURES IN THE PLAN SHALL MEET AS A MINIMUM THE BEST MANAGEMENT PRACTICES SET FORTH IN VOLUME 3 OF THE NEW HAMPSHIRE STORMWATER MANUAL "EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION" AS PUBLISHED AND AMENDED BY THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES.
4. ALL EROSION CONTROL MEASURES SHALL BE INSTALLED IN STRICT ACCORDANCE WITH PROJECT PLANS.
5. IN NO WAY ARE THOSE TEMPORARY EROSION CONTROL MEASURES INDICATED ON THESE PLANS TO BE CONSIDERED ALL INCLUSIVE. THE CONTRACTOR SHALL USE JUDGEMENT IN INSTALLING SUPPLEMENTARY EROSION CONTROL MEASURES WHERE AND WHEN SPECIFIC SITE CONDITIONS REQUIRE THEM.
6. THE CITY OF LEBANON SHALL RESERVE THE RIGHT TO REQUIRE FURTHER EROSION CONTROL PRACTICES DURING CONSTRUCTION SHOULD THEY FIND IT NECESSARY.
7. THE PROJECT IS TO BE MANAGED IN A MANNER THAT MEETS THE REQUIREMENTS AND INTENT OF RSA 430:53 AND CHAPTER AGR 3800:1 RELATIVE TO INVASIVE SPECIES CONTROL.
8. WHENEVER PRACTICAL, NATURAL VEGETATION SHALL BE RETAINED, PROTECTED OR SUPPLEMENTED. THE STRIPPING OF VEGETATION SHALL BE DONE IN A MANNER THAT MINIMIZES SOIL EROSION.
9. MEASURES SHALL BE TAKEN TO PREVENT EROSION. A SEDIMENT IN RUNOFF WATER SHALL BE TRAPPED AND RETAINED WITHIN THE PROJECT AREA USING APPROVED MEASURES.
10. EROSION CONTROL MEASURES USED SHALL BE INSPECTED AT LEAST ONCE A WEEK AND WITHIN TWENTY-FOUR (24) HOURS OF THE END OF A STORM WITH RAINFALL AMOUNT GREATER THAN 0.25 INCHES. THE INSPECTIONS SHALL VERIFY THAT THE STRUCTURAL BMPs SHOWN ON THE PLAN ARE MAINTAINED AND OPERATING AS DESIGNED. WHENEVER PRACTICAL, THE CONTRACTOR SHALL REPAIR DAMAGE TO BMPs BE MADE WITH EACH INSPECTION. ALL SITE INSPECTION REPORTS SHALL BE RETAINED ON SITE AT ALL TIMES DURING CONSTRUCTION AND SUBMITTED TO DPW/EPD ON NO LONGER THAN A MONTHLY BASIS IN A FORMAT APPROVED BY THE DPW.
11. ALL DEFICIENCIES DISCOVERED BY INSPECTIONS SHALL BE FIXED IN ORDER FOR OPERATION TO BE EFFECTIVE. THEY SHALL BE CLEANED AND MAINTAINED AND OTHERWISE KEPT AN EFFECTIVE OPERATING RUNOFF THROUGHOUT THE CONSTRUCTION PERIOD. LAND AND DISTURBANCE ACTIVITIES CONTINUE.
12. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED IN FUNCTIONING CONDITION UNTIL FINAL SITE STABILIZATION IS COMPLETED.
13. OFF-SITE SURFACE WATER AND RUNOFF FROM UNDISTURBED AREAS SHALL BE DIVERTED AWAY FROM DISTURBED AREAS WHERE FEASIBLE OR CARRIED NON EROSIVLY THROUGH THE PROJECT AREA. INTEGRITY OF DOWNSTREAM DRAINAGE SYSTEMS SHALL BE MAINTAINED.
14. ANY PONDS AND SWALES SHALL BE INSTALLED EARLY ON IN THE CONSTRUCTION SEQUENCE (BEFORE ROUGH GRADING THE SITE).
15. ANY DISTURBED AREAS SHALL BE STABILIZED WITHIN 30 DAYS OF COMPLETION OF THE DISTURBANCE.
16. TEMPORARY WATER DIVERSIONS (SWALES, BASINS, ETC.) MUST BE USED AS NECESSARY UNTIL AREAS ARE STABILIZED.
17. COVER STOCKPILES AT THE END OF EACH WORKING DAY (UNLESS TEMPORARY-SEEDED).
18. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED AFTER FINAL SITE STABILIZATION. TRAPPED SEDIMENT SHALL BE REMOVED FROM THE PROJECT AREA. THE REMOVAL OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED WITHIN 30 DAYS UNLESS CONDITIONS DICTATE OTHERWISE.
19. GRADED AREAS SHALL BE VEGETATED TO INSURE EROSION CONTROL BY SEEDING, MULCHING, AND FERTILIZING. DISTURBED AREAS SHALL BE REVEGETATED WITHIN 30 DAYS OF COMPLETION OF THE DISTURBANCE.
20. ALL DISTURBED AREAS DESIGNATED TO BE TURF, SHALL RECEIVE THE REQUIRED AMOUNT OF LOAM (COMPACTED THICKNESS), PRIOR TO FINAL SEEDING AND MULCHING.
21. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
 - A. AN AREA TO BE PAVED OR BASE COURSE GRAVELS MEETING THE REQUIREMENTS OF NHDOT STANDARD FOR ROAD AND BRIDGE CONSTRUCTION, 2016, ITEM 304.2 HAVE BEEN INSTALLED;
 - B. A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
 - C. A MINIMUM OF 3" OF NATURAL SUCH AS STONE OR RIP RAP HAS BEEN INSTALLED; OR EROSION CONTROL BLANKETS HAVE BEEN PROPERLY INSTALLED.
22. IF, DURING CONSTRUCTION, IT BECOMES APPARENT THAT ADDITIONAL EROSION AND SEDIMENT CONTROL DEVICES ARE REQUIRED, THE OWNER SHALL BE REQUIRED TO INSTALL THE NECESSARY DEVICES OR CONSULT WITH THE ENGINEER.
23. ALL EROSION CONTROL MEASURES SHALL BE MAINTAINED AND OPERATING AS DESIGNED. SPECIAL EROSION CONTROL MEASURES, NETTING OR SIMILAR MATERIAL SHALL BE PROVIDED ON SLOPES WITH A RATION GREATER THAN 3:1 WHILE GROUND COVER IS BEING ESTABLISHED.
24. JUTE MATTING INSTALLED TO CONFORM WITH THE RECOMMENDED BEST MANAGEMENT PRACTICE OUTLINED IN VOLUME 3 OF THE NEW HAMPSHIRE STORMWATER MANUAL "EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION" SHALL BE 3.1:1 SLOPES OR GREATER.
25. PERMANENT STABILIZATION MUST BE IN PLACE NO MORE THAN 3 DAYS (72 HOURS) FOLLOWING THE COMPLETION OF FINAL GRADING OF EXPOSED SOIL AREAS.
26. 12. ALL ROADWAYS SHALL BE STABILIZED WITHIN 72 HOURS.
27. 13. ALL SLOPES SHALL BE SEEDDED AND MULCHED WITHIN 72 HOURS.
28. IN THE EVENT THAT, DURING CONSTRUCTION OF ANY PORTION OF THIS PROJECT, A WINTER SHUTDOWN IS NECESSARY, THE CONTRACTOR SHALL STABILIZE ALL INCOMPLETE WORK AND PROVIDE FOR SUITABLE METHODS OF DIVERTING RUNOFF IN ORDER TO ELIMINATE SHEET FLOW ACROSS FROZEN SURFACES. ALSO SEE WINTER CONSTRUCTION NOTES.
29. DRAINAGE SHALL BE CONTROLLED BY THE USE OF WATER AS NECESSARY THROUGHOUT THE CONSTRUCTION PERIOD, IN ACCORDANCE WITH ENV-A 1000.

1. CONTACT DIG SAFE AT LEAST 48 HOURS BEFORE ANY EXCAVATION WORK.
2. CUT AND CLEAR TREES AND BRUSH WITHIN LIMITS OF CLEARING SHOWN ON PLAN.
3. INSTALL ALL APPLICABLE TEMPORARY EROSION CONTROL MEASURES PRIOR TO COMMENCEMENT OF ANY EARTHMOVING OPERATIONS. THE STABILIZED CONSTRUCTION EXIT SHALL BE IN PLACE.
4. REMOVE STUMPS FROM THE SITE FOR ROADWAY GRADING TO COMMENCE. ALL STUMPS AND SIMILAR ORGANIC DEBRIS SHALL BE REMOVED FROM THE SITE. ALL ORGANIC MATERIALS SHALL BE STOCKPILED WITHIN THE PLAN, NATURAL ORGANIC SOIL MATERIALS SUITABLE FOR USE AS TOPSOIL SHALL BE STOCKPILED WITHIN AREAS OUT OF THE WAY OF OTHER CONSTRUCTIONS ACTIVITIES AND DRAINAGE FLOW. STOCKPILES SHALL BE TEMPORARILY SEEDDED WITH WINTER RYE AND BE SURROUNDED BY PERIMETER CONTROLS TO PREVENT EROSION.
5. COMMENCE EARTHWORK OPERATIONS. ALL PERMANENT EROSION CONTROL MEASURES SHOULD BE INSTALLED PRIOR TO GRADING FOR PROJECT.
6. DRAINAGE SYSTEMS AND OTHER UTILITIES SHOULD BE CONSTRUCTED FROM LOW GRADE TO HIGH GRADE. INCOMPLETE FLOW SHALL BE PROTECTED FROM SILTATION BY THE USE OF PERIMETER CONTROLS UNTIL THE SITE HAS BECOME FULLY STABILIZED.
7. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
 - A. IN A ROADWAY, THE VEGETATION GROUND COVER HAS OCCURRED MEETING THE REQUIREMENTS OF NHDOT STANDARD FOR ROAD AND BRIDGE CONSTRUCTION. (0.1616 TYP. 204.2 HAS BEEN INSTALLED)
 - B. A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
 - C. A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIP RAP HAS BEEN INSTALLED; OR EROSION CONTROL BLANKETS HAVE BEEN PROPERLY INSTALLED.
8. ALL STORMWATER FLOWS SHALL NOT BE DIRECTED TO THE STORMWATER MEASURES UNTIL ALL CONTRIBUTING AREAS HAVE BEEN DEEMED STABLE.
9. REPLENISH THE CONSTRUCTION OF GRAVEL AND CRUSHED GRAVEL COURSES OVER PROPOSED ROADWAYS AND DRIVEWAYS AND COMPACT IN SPECIFIED LIFT THICKNESS AND COMPACTION RATES.
10. COMPLETE GRADING ACTIVITIES AND WHEN COMPLETE, BEGIN TOPSOILING PROPOSED TURF AREAS USING STOCKPOILED LOAM BEDDING TO REPLENISH THE BORROW LOAM IF NECESSARY TO LEACH THE SPECIFIED THICKNESS.
11. FINE GRADE ALL TURF AREAS AND COMPLETE PERMANENT SEEDING AND LANDSCAPING BY HYDROSEEDING WITH THE SPECIFIED SEED MIXTURE IMMEDIATELY AFTER FINE GRADING IS COMPLETED. ALL AREAS SHALL BE STABILIZED WITHIN 72 HOURS OF ACHIEVING FINISH GRADE.
12. REMOVE TEMPORARY EROSION CONTROL MEASURES PER EROSION CONTROL NOTES.

1. ALL AREAS TO BE SEEDED SHALL BE PREPARED TO PROVIDE A REASONABLY FIRM BUT FRABLE SEED BED.
2. SLOPED AREAS SHALL NOT BE LEFT TOO SMOOTH; THE SURFACE SHALL BE LEFT IN A RUFFLED CONDITION SUCH AS MAY BE OBTAINED BY THE USE OF A DISK OR WHEELS RAKED AND DOWN THE SLOPES. SMOOTH, COMPACTED SLOPES, SUCH AS FROM BLADING, WHICH MIGHT ALLOW THE FREE FLOW OF WATER DOWN THEM SHALL BE DISKED, HARROWED, DRAGGED WITH A CHAIN OR MAT, MACHINE-RAKED, OR HAND-WORKED TO GIVE THE EFFECT OF MINATURE TERRACES, PARTICULARLY IN SILTY OR CLAYEY SOILS. THE SLOPES SHALL BE LEFT SMOOTH ENOUGH TO ENABLE MOWING.
3. AREAS TO BE SEEDED WITH GRASS SEED SHALL BE PREPARED BY ROLLING THE LOAM SHALL BE SPREAD AND SPREAD UPON THE PREVIOUSLY PREPARED SUBGRADE SURFACE TO THE DEPTH OF $4 \pm 1/2$ INCHES OTHERWISE SPECIFIED AND SHALL BE RAKED CAREFULLY TO REMOVE ALL OBJECTIONABLE MATERIALS. LOAM SHALL BE SPREAD TO A MINIMUM OF ONE INCH DEPTH. THE SEEDING MIXTURE SHALL BE SPREAD TO A MINIMUM OF ONE INCH DEPTH PLACED ADJACENT TO LAWNS OR WHERE DIRECTED SHALL BE COMPACTED WITH A ROLLER WEIGHING APPROXIMATELY 1000 POUNDS PER FOOT OF ROLLER WIDTH. ALL DEPRESSIONS EXPOSED DURING THE ROLLING PROCEDURE SHALL BE FILLED WITH ADDITIONAL LOAM, AND ROLLED.
4. DRAINAGE AREAS SHALL BE COVERED WITH TOPSOIL WITH NO ADMIXTURE OF REFUSE OR MATERIAL TOXIC TO PLANTS OR GROWTH. LOAM SHALL BE FREE OF VIABLE PARTS OF PROHIBITED INVASIVE PLANTS LISTED IN TABLE 3800.1 OF PART 1609.3800. LOAM SHALL BE GENERALLY FREE FROM STONES, LUMPS, STUMPS, OR SIMILAR OBJECTS LARGER THAN 2 INCHES IN ANY DIMENSION. LOAM SHALL BE FREE OF ALL WEED SEEDS. LOAM SHALL BE FREE OF ALL ORGANIC MATTER. LOAM SHALL CONTAIN A MINIMUM OF 3 PERCENT AND A MAXIMUM OF 10 PERCENT OF ORGANIC MATTER AS DETERMINED BY LOSS BY IGNITION. NOT MORE THAN 65 PERCENT SHALL PASS A NO. 20 SIEVE AS DETERMINED BY THE WASH TEST. LOAM SHALL BE FREE OF ALL OBJECTS LARGER THAN 1/4 INCH. LOAM SHALL CONTAIN NO MORE THAN 20% OF THE MATERIAL PASSING THE NO. 40 SIEVE CONSIST OF CLAY-SIZE PARTICLES.
5. AREAS TO BE SEEDED SHALL MEET THE SPECIFIED GRADES AND SHALL BE FREE OF GROWTH AND DEBRIS.
6. AREAS TO BE SEEDED SHALL BE PREPARED TO RECEIVE A LOW PLANTING OF THE SPECIFIED GRASSES AND HERBS.
7. WHERE REYGRASS HAS BEEN PLANTED FOR TEMPORARY EROSION CONTROL AND HAS NOT BEEN ELIMINATED PRIOR TO THE COMPLETION OF THE WORK, SUCH AREAS SHALL BE DISC-HARROWED AT LEAST 3" DEEP AND SEEDED WITH PERMANENT GRASSES TO PREVENT THE REYGRASS FROM RESEEDING AND BECOMING COMPETITIVE WITH AND RETARDING DEVELOPMENT.
8. SEEDING AND INITIAL FERTILIZING SHALL BE DONE BETWEEN APRIL 1 AND JUNE 1, BETWEEN AUGUST 15 AND OCTOBER 14, OR AS PERMITTED. SEEDING SHALL NOT BE DONE DURING WINDY WEATHER OR WHEN THE GROUND IS FROZEN, OR WHEN THE WEEDS OR WEEDS OR WEEDS ARE PRESENT. IF SEEDING IS DONE DURING JULY OR AUGUST, ADDITIONAL MULCH MATERIAL MAY BE REQUIRED BY THE ENGINEER.
9. FERTILIZER SHALL BE UNIFORMLY APPLIED. THE RATE OF APPLICATION SHALL BE A RATE OF 2.0 POUNDS OF NITROGEN PER 1000 SQUARE FEET OF AREA TO BE SEEDING. FERTILIZER SHALL BE APPLIED TO THE ENTIRE AREA TO BE SEEDING. REFERTILIZATION, NO REFERTILIZATION WILL BE ALLOWED BETWEEN NOVEMBER 1, OR WHEN THE GROUND HAS FROZEN, AND THE FOLLOWING APRIL 1, OR BETWEEN JUNE 1 AND THE FOLLOWING SEPTEMBER 1. REFERTILIZATION WILL BE ALLOWED BETWEEN AUGUST 15 AND 31 ONLY WHEN IT IS DETERMINED THAT THE PERMANENT GRASSES HAVE DEVELOPED WELL AND WEEDS HAVE APPEARED, AND SUCH REFERTILIZATION WILL NOT TEND TO PROMOTE THE GROWTH OF NOXIOUS WEEDS.
10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTING AND CARING FOR SEEDED AREAS UNTO PEDESTRIAN OR VEHICULAR TRAFFIC OR OTHER CAUSES.
11. THE SEEDED AREAS SHALL BE CAREFULLY AND SUITABLY WATERED AS NECESSARY TO PRODUCE A SATISFACTORY GROWTH.
12. AREAS SEEDED WITH PARK SEED SHALL BE MOWED WHENEVER NECESSARY TO KEEP THE GROWTH BETWEEN 3 AND 6 INCH ORDER TO ALLOW LIGHT TO PENETRATE TO THE SHORTER, SLOWER GROWING SPECIES IN THE MIXTURE.
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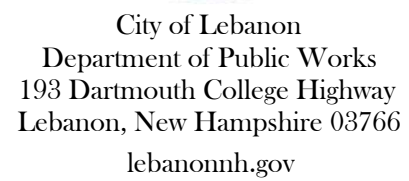
TYPICAL LAWN MIX		
	MINIMUM PURITY (%)	MINIMUM GERMINATION (%)
CREeping RED FESCUE	96	85
PERENNIAL RYEGRASS	98	90
KENTUCKY BLUEGRASS	97	85
REDTOP	95	80

WILDFLOWER SLOPE SEED (3:1 OR GREATER NHDOT TYPE 45)			
KIND OF SEED	MINIMUM PURITY (%)	MINIMUM GERMINATION (%)	POUNDS/ACRE (TOTAL 95 LBS)
CREeping RED FESCUE	96	85	
PERENNIAL RYEGRASS	98	90	35
REDTOP	95	80	30
ALSIKE CLOVER	97	90	5
BIRDSFOOT TREFOIL	98	80	5
LANCE-LEAVED COREOPSIS	95	80	5
OXYEY DAISY	95	80	3
BLACKEYED SUSAN	95	80	3
WILD LUPINE	95	80	4

TYPICAL SLOPE SEED (3:1 OR GREATER NHDOT TYPE 44)			
	MINIMUM PURITY (%)	MINIMUM GERMINATION (%)	POUNDS/ACRE (TOTAL 80 LBS)
CREEPING RED FESCUE	96	85	35
PERENNIAL RYEGRASS	98	90	30
REDTOP	95	80	
ALSIKE CLOVER	97	90	5
BIRDFOOT TREFOIL	98	80	5
			5

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OWNER:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766
APPLICANT:	CITY OF LEBANON DEPARTMENT OF PUBLIC WORKS 193 DARTMOUTH COLLEGE HIGHWAY LEBANON, NEW HAMPSHIRE 03766



STAMP:



LOCATION:

TAX MAP 131, LOT 1
POVERTY LANE
LEBANON, NEW HAMPSHIRE
GRAFTON COUNTY

PROJECT:
**POVERTY LANE
ISOLATION VALVE
BUILDING**

TITLE: **EROSION CONTROL
NOTES &
SPECIFICATIONS**

PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 8 OF 9		

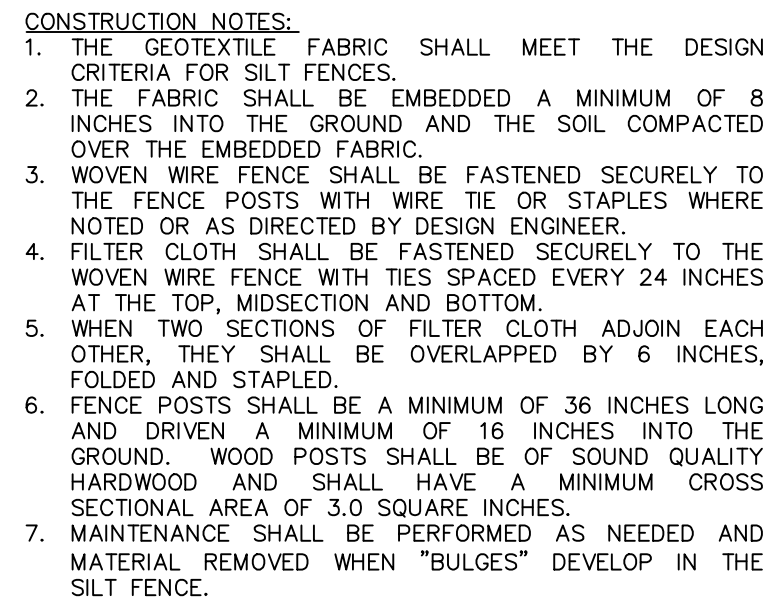
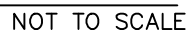
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City of Lebanon
Department of Public Works
193 Dartmouth College Highway
Lebanon, New Hampshire 03766
lebanonnh.gov

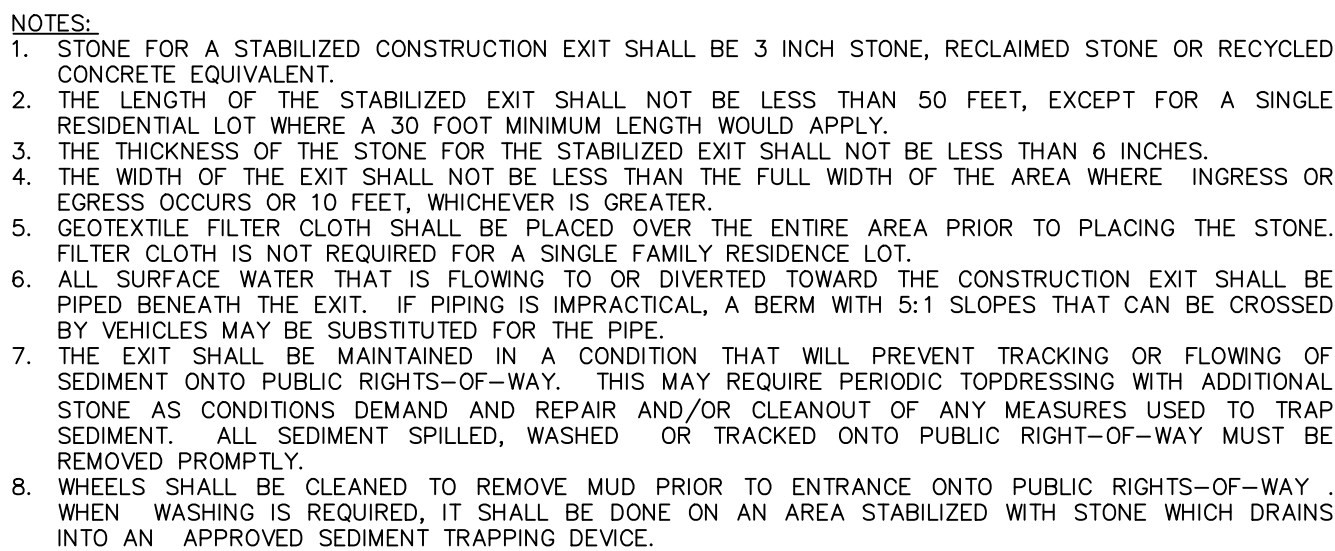
A circular professional engineer seal for the State of New Hampshire. The outer ring contains the text "STATE OF NEW HAMPSHIRE" at the top and "PROFESSIONAL ENGINEER" at the bottom. The inner circle contains the name "RODRICK J. FINLEY", the license number "No. 7466", and the word "LICENSED". The seal is stamped in blue ink and is surrounded by a blue ink scribble.

PROJECT: **POVERTY LANE
ISOLATION VALVE
BUILDING**

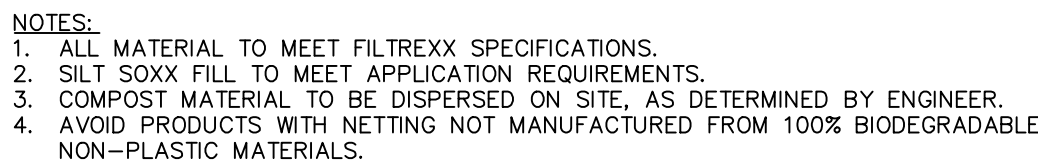
PROJECT No. 25-1015-1	DATE: FEBRUARY 20, 2025	SCALE: AS SHOWN
SHEET: 3 OF 3		



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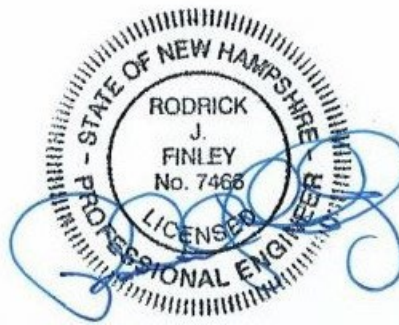
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MATERIAL SPECIFICATIONS
FOR
POVERTY LANE ISOLATION VALVE BUILDING
LEBANON, NEW HAMPSHIRE

PROJECT ID: 2025-RFx-039



March 2026

Prepared By:



City of Lebanon
Department of Public Works
193 Dartmouth College Highway
Lebanon, New Hampshire 03766
603-448-3112

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DIVISION 01

GENERAL REQUIREMENTS

SECTION 01010 - SUMMARY OF WORK

PART 1- GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The project consists of furnishing and installing a 9'-4" x 17'-4" isolation valve building to control the flow of water to the Farnum Hill Water Storage Tank. The isolation valve building will be mounted on a cast-in-place reinforced concrete foundation consisting of frost walls and a slab on grade. Equipment will include a butterfly valve, a flow meter and transmitter, hypochlorite feeding system, chlorine controller, chlorine analyzer, pressure transmitter, telemetry panel, and a power and control panel with a PLC controller. The building will be 2" x 6" wood stud construction, 2" x 8" wood rafters, fiberglass batt insulation, plywood sheathing, red cedar clapboard siding, standing seam metal roof, pine fascia and soffits, and two 36" insulated steel doors with hardware. The isolation valve building will be supplied with two wall mounted heaters, a dehumidifier, ventilation fan and louver, and interior and exterior LED lights.

Additional work includes a primary electric service and transformer, secondary underground electrical service, conduit, and meter box, and communication service and conduit. Site work including interconnections to the existing system, water main, gate valves, copper sampling service, driveway, paved apron, grading, and landscaping.

PART 2 -PRODUCTS

N/A

PART 3 -EXECUTION

3.1 MAINTAIN EXISTING WORKS

A. Continuous Operations Criteria:

1. The Contractor shall conduct operations in such a manner and sequence which shall neither result in a disruption of, nor interfere with, the functional workings of any existing utilities with the exception of scheduled shutdowns to make service connection tie overs.
2. The Owner will operate and maintain all existing systems and equipment not modified or impacted by the project. The Contractor shall notify and coordinate with the Owners whenever Contractor's temporary facilities or construction will interface with existing utilities.
3. The Contractor shall be responsible for the operation and maintenance of all new and temporary facilities until such time as the new facilities are accepted by the Owner.

B. Minimize Interference

1. The Contractor shall at all times conduct operations so as to interfere as little as possible with existing works. The Contractor shall develop a program, in cooperation with the Engineer and interested officials, which shall provide for the construction and putting into service of the

new works in the most orderly manner possible. This program shall be adhered to except as deviations therefrom are expressly permitted.

2. Work of connecting with, cutting into and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time and when the demands on the facilities best permit such interference. It may be necessary to work outside of normal working hours to minimize interference. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all tools, materials, and equipment are made ready and at hand.

C. Emergency Response

1. The Contractor shall respond to emergencies promptly. In the event of an emergency the Contractor shall provide in person response within one hour of the reported emergency.

PART 4 – SCHEDULE

4.1 LIMITATIONS

- A. All construction activities will be prohibited on Saturdays, Sundays, legal holidays and weekdays, before 7:00 AM, and after 7:00 PM except during emergencies and unless the Engineer has specifically granted permission in writing.

END OF SECTION

SECTION 01050

COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Contractor is required to work in close proximity to the Owner's existing facilities. The Contractor, under this Contract, will be responsible for coordinating construction activities with Owner to ensure that services, facilities, and safe working conditions are maintained.
- B. Other Construction Contractors may be interfacing with this Contract and working within the work area and in the vicinity of this Contract. The Contractor, under this contract, shall act as Construction Coordinator and shall coordinate construction activities with other Contractors working for Owner.
- C. Any damage to existing structures, equipment and property, accepted equipment or structures, and property or work in progress by others; as a result of the Contractor's or Contractor's subcontractor's operations shall be made good by the Contractor at no additional cost to the Owner.
- D. The Contractor shall coordinate their schedule with all relevant utility companies. There will be no additional costs to the Owner resulting from delays to the Contractor's schedule due to the utility companies.

1.2 COORDINATION WITH OTHERS

- A. Liberty Utilities
The Contractor shall be responsible for coordination with Liberty Utilities to provide an electrical service and meter to serve the Isolation Control Valve Building.
- B. Consolidated Communications
The Contractor shall be responsible for coordination with Consolidated Communications to provide a communication service to serve the Isolation Control Valve Building.
- C. Lebanon Public Works
The Contractor shall be responsible for coordinating work in the vicinity of water, storm drain, and sewer lines with the Lebanon Public Works Department. The Contractor shall bear all costs associated with Public Works requirements.

END OF SECTION

SECTION 01070

ABBREVIATIONS & SYMBOLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Where any of the following abbreviations are used in these Specifications, they shall have the meaning set forth opposite each.

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
AGA	American Gas Association
AIC	Ampere Interrupting Capacity
AIS	American Iron and Steel
AGMA	American Gear Manufacturers Association
AIEE(IEEE)	American Institute of Electrical Engineers (Institute of Electrical and Electronics Engineers, Inc.)
AISC	American Institute of Steel Construction
amp	Ampere
Amer. Std.	American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class 125 (ASA B16 11960)
ANSI	American National Standards Institute
AoT	Alteration of Terrain
API	American Petroleum Institute
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWG	American or Brown and Sharpe Wire Gage
AWWA	American Water Works Association
BOD	Biochemical Oxygen Demand
CDBG	Community Development Block Grant Program, funded by the Department of Housing and Urban Development
c.f.	Cubic Foot
c.f.m.	Cubic Foot Per Minute
c.f.s.	Cubic Foot Per Second
CI	Cast Iron
CIPRA	Cast Iron Pipe Research Association
CSI	Construction Specifications Institute
c.y.	Cubic Yards
D-B	Davis Bacon
DBE	Disadvantaged Business Enterprise
DC	Direct Current
DEP	Department of Environmental Protection

DI	Ductile Iron
DOT	Department of Transportation
EDR	Equivalent Directional Radiation
EPA	U.S. Environmental Protection Agency
fps	Feet Per Second
ft.	Feet
gal.	Gallons
gpd	Gallons Per Day
gpm	Gallons Per Minute
HP	Horsepower
IBR	Institute of Boiler and Radiator Manufacturers
in.	Inches
inter.	Interlock
ISA	Instrument Society of America
kva	Kilovolt-ampere
kw	Kilowatt
lb.	Pound
max.	Maximum
MCB	Master Car Builders
MGD	Million Gallons Per Day
Min.	Minimum
NBS	National Bureau of Standards
NEC	National Electrical Code, Latest Edition
NEMA	National Electrical Manufacturers Association
NEWWA	New England Water Works Association
NHDES	New Hampshire Department of Environmental Services
NHDOT	New Hampshire Department of Transportation
NH SAG	New Hampshire State Aid Grant Program, administered by New Hampshire Department of Environmental Services
NPT	National Pipe Thread
OS&Y	Outside Screw and Yoke
PCA	Portland Cement Association
ppm	Parts Per Million
%	Percent
psi	Pounds Per Square Inch
psig	Pounds Per Square Inch Gage
PVC	Polyvinyl Chloride
rpm	Revolutions Per Minute
RUS	Rural Utility Service
s.f.	Square Foot
STL. W.G.	U.S. Steel Wire, Washburn and Moen, American Steel and Wire Cos., or Roebling Gage
s.y.	Square yard
TDH	Total Dynamic Head
USAS	Standards of the United States of America Standards Institute (formerly American Standards Association)
USS GAGE	United States Standard Gage
VC	Vitrified Clay
WSP	Working Steam Pressure

Fed. Spec. Federal Specifications issued by the Federal Supply Service of the General Service Administration, Washington, D.C.

END OF SECTION

SECTION 01150 -MEASUREMENT AND PAYMENT

PART I -GENERAL

1.1 DESCRIPTION

- A. For lump sum items, payment shall be made to the Contractor in accordance with an accepted Progress Schedule and Schedule of Values on the basis of actual work completed, unless otherwise stipulated herein.
- B. For unit-price items, payment shall be based on the actual amount of work accepted and for the actual amount of materials in place, as shown by the final measurements.
 - 1. All units of measurement shall be standard United States convention as applied to the specific items of work by tradition and as interpreted by the Engineer.
 - 2. At the end of each day's work, the Contractor's Superintendent or other authorized representative of the Contractor shall meet with the City Engineer and determine the quantities of unit price work accomplished and/or completed during the workday.
 - 3. After the work is completed and before final payment is made, the City Engineer will make final measurements to determine the quantities of various items of work accepted as the basis for final settlement.

1.2 SCOPE OF PAYMENT

- A. Payments to the Contractor will be made for the actual quantities of the Contract items performed and accepted in accordance with the Contract Documents. Upon completion of the construction, if these actual quantities show either an increase or decrease from the quantities given in the Bid Form, the Contract unit prices will still prevail.
- B. The Contractor shall accept in compensation, as herein provided, in full payment for furnishing all materials, labor, tools, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced by the Contract; also for all loss or damage arising from the nature of the Work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the prosecution of the Work and until its final acceptance by the City Engineer, and for all risks of every description connected with the prosecution of the work, except as provided herein, also for all expenses incurred in consequence of the suspension of the work as herein authorized.
- C. The payment of any partial estimate or of any retained percentage except by and under the approved final invoice, in no way shall affect the obligation of the Contractor to repair or renew any defective parts of the construction or to be responsible for all damage due to such defects.

1.3 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

- A. When alterations in the quantities of work not requiring supplemental agreements, as herein before provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract price for the actual quantities of work done. No allowance will be made for anticipated profits. Increased or decreased work involving supplemental agreements and change orders will be paid for as stipulated in such agreements and orders, and is subject to Article 36 of the General Conditions. Indeterminate quantities as indicated in the bid form are not subject to Article 36 of the General Conditions.

1.4 OMITTED ITEMS

- A. Should any items contained in the bid form be found unnecessary for the proper completion of the work contracted, the City Engineer may eliminate such items from the Contract, and such action shall in no way invalidate the Contract, and no allowance will be made for items so eliminated in making final payment to the Contractor.

1.5 PARTIAL PAYMENTS

- A. Partial payments shall be made monthly as the work progresses.

1.6 PAYMENT FOR MATERIAL DELIVERED

- A. When requested by the Contractor and at the discretion of the Owner, payment may be made for all or part of the value of acceptable, non-perishable materials and equipment which are to be incorporated into bid items, have not been used, and have been delivered to the construction site or placed in storage places acceptable to the Owner. Payment shall be subject to the provisions of the General and Special Conditions.
- B. No payment shall be made for fuels, supplies, lumber, false work, or other materials, or on temporary structures or other work of any kind which are not a permanent part of the Contract.

1.7 FINAL PAYMENT

- A. The City Engineer will make, as soon as practicable after the entire completion of the project, a final quantity invoice of the amount of the Work performed and the value of such Work. Owner shall make final payments of the sum found due less retainages subject to the provisions of the General and Special Conditions.

1.8 INCIDENTAL WORK

- A. Incidental work items for which separate payment is not made to include (but are not limited to) the following items. Some of these items are incidental to unit price items and some are incidental to the overall contract and to individual unit price items.
 - 1. Stripping and stockpiling of topsoil.
 - 2. Clean-up and restoration of property including property boundary monuments and markers (by a New Hampshire licensed PLS).
 - 3. Saw cutting and grinding of existing pavement at all driveway intersections, leaving a minimum of a 2'-0" wide overlap strip between the new wearing course and the existing binder.
 - 4. Installation of modified asphalt pavement joint sealer in all pavement joints between existing and new pavement.
 - 5. Restoration of property, and replacement of signs, fences, curbs, structures, and other minor items disturbed by the construction activities, unless payment is otherwise provided for elsewhere. Relocation of mailboxes to a new location within 50' of the existing location. This includes resetting of items to new grades as required.
 - 6. Grading of unpaved areas disturbed during construction.
 - 7. Coordination with the Owner, Utilities and others, including related inspection cost. Utility crossings and relocations, unless payment is otherwise made elsewhere.

8. Materials and compaction testing, for the Contractor's own quality assurance and for purposes of shop drawing submittals.
9. Construction schedules, bid bonds, shop drawings, warranties, guarantees, certifications, and other submittals required by the Contract Documents.
10. Repair and replacement of utilities damaged by construction activities or for Contractor convenience.
11. Temporary utilities for construction and to maintain existing service during construction. This includes any materials, labor, and equipment the Contractor needs to provide regardless of the construction sequence.
12. Maintain existing water, sewer and storm drain flows and repair of existing pipes and appurtenances, and control of sewer flow.
13. Temporary construction, temporary paving, and other facilities not to be permanently incorporated into the Work necessary for construction sequencing and maintenance of operations, including temporary pavement required for winter shutdown.
14. Weather protection.
15. Permits not otherwise paid for or provided by the Owner.
16. Visits to the Project site or elsewhere by personnel or agents of the Contractor, including manufacturer's representatives, as may be required.
17. On-site and other facilities acceptable to Engineer for the storage of materials, supplies and equipment to be incorporated into the Work and providing a temporary site for Contractor's equipment, staging and material stockpiles.
18. Pipe and buried utility markings and location tape.
19. Regrading adjacent to pavement.
20. Earthwork (except ledge).
21. Preconstruction photos and videos.
22. Test pits for the Contractor's benefit.
23. Disinfection, cleaning and testing of installed water mains and blow offs.
24. Temporary resetting or replacement of existing street and traffic signs and temporary traffic signals where necessary.
25. Removal of abandoned and out of service utilities such as, water, sewer, and storm drain, associated appurtenances and replacement backfill, which are encountered within the limits of the trenches excavated for new utilities.
26. Removal of out of service structures, manholes and basins; providing the replacement backfill; and backfilling and compacting the replacement backfill in the voids created when these structures are removed.
27. Raising and lowering of existing frames and covers of buried utilities to grade unless payment is otherwise provided for.
28. Removing and resetting of existing steps, guard rails, fences, walls and non-paved brick or paver walkways disturbed during construction, other than those identified on the Drawings to be replaced.
29. Cross-over channels and underdrains for sewer, storm drain and water excavation pits, and check dams for all excavated channels.
30. Installing temporary pavement markings on binder course that will not be surfaced within 14 days of installation.
31. Installing raised pavement markers and temporary symbols on the binder course within 48 hours of installing any section of the binder course and maintaining these throughout the project duration.
32. Locating and verifying the locations of water and sewer services within the

- limits of work.
33. Removal and subsequent delivery of replaced or obsolete frames, covers, grates, hydrants curbstones and signs to a location within the City limits designated by the Owner.
 34. Removal of temporary or permanent pavement markings, prior to paving. This includes removing markings that are applied on the winter binder layer, prior to installation of the wearing course.
 35. Provide temporary pavement marking paint on the streets as shown in the layout plans on the binder course within two weeks of pavement installation if the wearing course will not be installed until after a winter season.

1.9 DESCRIPTION OF PAY ITEMS

- A. The following sections describe the measurement of and payment for the work to be done under the respective items listed in the Bid Form.
- B. Each unit or lump-sum price stated in the Bid Form shall constitute full compensation, as herein specified, for each item of the work completed.
- C. The estimated quantities of work to be done and materials to be furnished under this contract shown in the documents they are given for use in comparing bids and the right is specifically reserved to increase or decrease them as may be deemed reasonably necessary by the City Engineer to complete the work contemplated by this contract. Such increase or decrease shall in no way invalidate this contract, nor shall any such increase or decrease be cause for claims or liability for damages. Such increases or decreases shall not exceed 25 percent of the estimated quantities of work. An increase or decrease in quantities for subsurface materials (e.g. ledge, unsuitable backfill), which overrun or underrun by 25% or more of the bid quantity may be the basis for a contract price adjustment, at the rate of a negotiated adjusted unit rate. Negotiated unit price rates shall be equitable and shall consider, but not be limited to the following factors; bid unit rate, distribution of rates and bid balance, and the scope of work as affected by the changed quantities.

Item No. 1 - Clearing and Grubbing

- A. Method of Measurement: The quantity of clearing and grubbing shall consist of the actual number of square yards of clearing and grubbing completed at the direction of the Engineer within the limits of work shown on the drawings. This includes removing all trees and stumps within the limits of work shown on the drawings and restoring the resulting void.
- B. Basis of Payment: The square yard unit price shall be full compensation for furnishing all labor, materials, and equipment required to clear all trees, remove stumps, backfilling the void with suitable material compacted in 8" lifts, grading of unpaved areas disturbed during construction, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 2 - Stabilized Construction Entrance

- A. Method of Measurement: The quantity to be paid for under this item shall be the actual number of stabilized construction entrances installed as authorized and required by the City Engineer.
- B. Basis of Payment: Stabilized construction entrances shall be paid for at the unit price per each as stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all labor, tools, and equipment; for excavating,

installing washed crushed stone; maintaining, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 3- Flaggers

- A. Method of Measurement: Flaggers for Traffic Control will be paid for on an hourly basis as approved by the City Engineer daily, by classification of work being performed, as stated in the bid schedule.
- B. Basis of Payment:
 - 1. The payment shall be full compensation for furnishing flaggers for traffic control to the satisfaction of the City Engineer. The payment shall be on an hourly basis per flagger controlling traffic through the work zone, and payment shall be based on hours worked on location. Standby and break time will not be measured for payment.
 - 2. Payment under this item will be made for full-time dedicated flaggers only. Part-time flaggers will not be considered adequate. Payment will only be made if the traffic control effort is satisfactory to the City Engineer. The Contractor will be notified if the daily effort is not satisfactory, so improvements can be made in order that the Contractor may receive full payment under this item. The City reserves the right to make partial payment or no payment under this item if traffic control is not to the City Engineer's satisfaction.

Item No. 4 - Test Pit Excavation and Backfill

- A. Method of Measurement: The quantity to be paid for under this item shall be the actual number of exploratory excavations performed as authorized and required by the City Engineer.
- B. Basis of Payment: Test pit excavations shall be paid for at the unit price per each as stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all labor, tools, and equipment; for excavating, backfilling and compacting; for temporary pavement; providing the test pit result information to the City Engineer; and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 5 -Remove and Dispose of Existing Bituminous Pavement

- A. Method of Measurement: The quantity to be paid for under this item shall be the actual number of square yards of existing bituminous pavement removed and disposed of and accepted as complete by the City Engineer.
- B. Basis of Payment: The contract unit price per square foot for removing and disposing of existing bituminous pavement shall be full compensation for all labor, materials, tools, equipment, trucking, hauling, disposal off-site, and all else incidental thereto for which payment is not provided under other items.

Item No. 6 - Saw-cut Existing Pavement

- A. Method of Measurement: Saw-cut Existing Pavement accepted for payment shall be the actual linear feet of saw-cutting accepted as complete by the City Engineer.
- B. Basis of Payment: The contract unit price per linear foot for Saw-cut Existing Pavement shall be full compensation for all labor, materials, tools and equipment necessary to complete this work and all else incidental thereto for which payment is not provided under other items.

Item No. 7 - Boulder Removal > 1.5 CY

- A. Method of Measurement: Measurement shall be by average end area measured by both the Contractor and the City Engineer on-site. The City Engineer must be present during measurements prior to breaking of boulders for disposal. This item will not be paid unless the City Engineer is notified to measure on-site. Boulders must measure greater than 1.5 CY in volume to be paid under this payment item. Boulders smaller than 1.5 CY are considered incidental to excavation work.
- B. Basis of Payment: Payment shall be at the unit price per cubic yard as stated in the Bid Proposal inclusive of removing large boulders from work limits, hammering to break boulders up, and hauling and disposal off-site. The quantity of boulders included in the contract is an estimate for the purpose of fair bids.

Item Nos. 8-Trench Excavation-Ledge, Water Main

- A. Method of Measurement: Measurement shall be for the actual number of cubic yards of ledge removed within the payment limits as measured and approved by the City Engineer. "Payment Limits" - Measurement shall be made to the nearest 1/2 cubic yard. Depth of ledge shall be measured from original ledge surface to twelve (12) inches below the bottom crown of the pipe. The minimum width measured shall be the sum of the nominal pipe diameter plus four (4) feet for pipelines. The maximum width shall be six (6) feet. **If blasting without removing overburden, the Driller must complete ledge probes spaced no more than 10 foot spacing prior to blasting operations. Ledge probing must be observed by the City Engineer to allow the engineer to create a profile of the work of the existing ledge surfaces for quantities. If this step is not followed, the Contractor will not be paid for this item.**
- B. Basis of Payment: Payment shall be at the unit price per cubic yard as stated in the Bid Proposal and shall be full compensation for the actual number of cubic yards of solid un-excavatable ledge measured and profiled in place by the Engineer. Hydraulic hammering to highest extent possible, drilling and blasting if hammering is not effective, excavation of broken or blasted ledge, disposal off-site, additional fill or flowable fill if over blast occurs. The quantity of ledge included in the contract is an estimate for the purpose of fair bids. Unit cost adjustments or request for additional

reimbursement will not be allowed if the final quantity varies in an amount from the amount estimated in the contract. Removal of rock around existing utilities and protection of work existing utilities is incidental.

Item No. 9 - Excavation of Unsuitable Material and Replacement Backfill

- A. Method of Measurement: The quantity to be paid for under this item shall be the actual number of cubic yards of material removed and replaced with materials from off-site only as authorized by the City Engineer and as measured in place after final compaction. The volume of unsuitable road subgrade excavation and replacement backfill shall be determined by multiplying the average width, depth, and length of the area as excavated and backfilled as determined by the City Engineer. The payment limit for excavation of unsuitable and replacement backfill in a pipe trench shall be between vertical planes that are a distance apart equal to the sum of 18 inches plus 1-1/3 times the nominal outside diameter of pipe to be installed (minimum 3-foot width) extending from the top of the initial backfill layer to the bottom of the aggregate subbase or as approved and directed by the City Engineer.
- B. Basis of Payment:
1. Excavation of unsuitable material and replacement backfill shall be paid for at the unit price per cubic yard stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all materials, labor, tools, and construction equipment for the excavation of unsuitable material including disposal; for placing and compacting road subgrade and pipe trench backfill material; and for all other work and expenses incidental thereto for which payment is not provided under other items.
 2. Material deemed unsuitable for backfill or subgrade due to being worked in the presence of groundwater that could have, in the opinion of the City Engineer, been avoided by adequate dewatering efforts shall be replaced by the Contractor at no additional cost to the Owner.

Item Nos. 10 and 12 -Furnish and Install 12-inch and 6-inch DI Pipe

- A. Method of Measurement: The quantity of DI pipe to be paid for under this item shall be the actual length in feet as measured along the center line of the pipe as laid including all fittings and valves.
- B. Basis of Payment:
1. DI pipe shall be paid for at the unit price per linear foot stated in the Bid Schedule. Said unit price shall be full compensation for furnishing and installing the pipe, bronze wedges, labor, equipment, tools, and other materials required for the installation of the pipelines; for excavating, utility crossings and relocations, laying, setting, and jointing all pipes and fittings; for connections and couplings to existing pipes; for furnishing and placing all bedding, geotextile fabric, haunching and initial backfill; for backfilling; for

thrust blocks and supports; for restraining joints; saddles; for furnishing and placing all temporary sheeting and bracing; for all labor, tools and construction equipment; disinfection, cleaning and testing of installed water mains, temporary utilities for construction and to maintain existing service during construction including any materials, labor, and equipment the Contractor needs to provide regardless of the construction sequence, pipe and buried utility markings and location tape, and for all other work and expenses incidental thereto for which payment is not provided under other items.

2. Payment for this work on interim requisitions shall be according to the following percentages:
 - i. Water main successfully set in place and backfilled - 80 percent.
 - ii. Water main pressure tested and disinfected - 20 percent.

Item Nos. 11 and 13 - Install 8-inch, and 6-inch Gate Valves with Box

- A. Method of Measurement: The quantity of gate valves to be paid for under this item shall be the actual number of valves and valve boxes installed complete in place.
- B. Basis of Payment: Gate valves shall be paid for at the unit price per each stated in the Bid Schedule. Said unit price shall be full compensation for labor, equipment, and tools; for installing, setting, and jointing the valve and valve box; for restraining joints; for thrust blocks and supports; disinfection, cleaning and testing; and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item Nos. 14 - Furnish and Install Ductile Iron Fittings

- A. Method of Measurement: The quantity of ductile iron fittings to be paid for under this item shall be the actual number of pounds of ductile iron fittings installed complete in place.
- B. Basis of Payment: Payment shall be at the unit price per pound as stated in the bid proposal inclusive of installing fittings, thrust blocks, retainer glands, excavation, backfill, and compaction, and all else necessary to complete the item.

Item No 15 – ¾” Type K Copper

- C. Method of Measurement: The quantity of ¾” Type K Copper pipe to be paid for under this item shall be the actual length in feet as measured along the center line of the pipe as laid including all fittings and valves.
- D. Basis of Payment:
¾” Type K Copper pipe shall be paid for at the unit price per linear foot stated in the Bid Schedule. Said unit price shall be full compensation for furnishing and installing the pipe, labor, equipment, tools, and other materials required for the installation of the pipeline; for excavating, laying, setting, and jointing all pipes

and fittings; for connections and couplings to existing pipes; for furnishing and placing all bedding, geotextile fabric, haunching and initial backfill; for backfilling; for all labor, tools and construction equipment; pipe and buried utility markings and location tape, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No 16 – ¾” Corporation Stop

- A. Method of Measurement: The quantity of corporation stops to be paid for under this item shall be the actual number of stops furnished and installed in the main for service connections.
- B. Basis of Payment: Corporation stops shall be paid for at the unit price per each stated in the Bid Schedule. Said unit price shall be full compensation for all fittings, labor, equipment, and tools necessary for the installation of the corporation stops including tapping the main; and for all work and expenses incidental thereto for which payment is not provided under other items.

Item No 17 - Furnish and Install ¾” Curb Stops with Box

- A. Method of Measurement: The quantity of curb stops with boxes to be paid for under this item shall be the actual number furnished and installed for service connections.
- B. Basis of Payment: Curb stops and boxes shall be paid for at the unit price per each curb stop stated in the Bid Schedule. Said unit price shall be full compensation for all fittings, labor, equipment, tools, and other materials required for the installation of the curb stop and box; for excavating and backfilling, raising to grade, for replacing or rebuilding shrubs, fences, lawns, trees, and other materials except other such items specifically included in the Bid Schedule; and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item Nos. 18, 19, & 20 - Coarse Crushed Stone NHDOT 304.5, Fine Crushed Stone NHDOT 304.4, Crushed Aggregate for Shoulders NHDOT 304.33

- A. Method of Measurement: Measurement shall be by in-place compacted section and average end-area calculation to limits depicted on the drawings as measured by the City Engineer. Base thickness shall be as shown on the Drawings. Material weight slips and conversion calculations will not be accepted. Measurement will be made to the nearest cubic yard.
- B. Basis of Payment: Payment shall be at the unit price per cubic yard as stated in the Bid Proposal inclusive of furnishing and installing specified materials in accordance with the drawings and specifications. Payment shall include, but not limited to, furnishing and installing approved base layers as required on the Drawings, compacting, dewatering, and all other work required for or incidental to the satisfactory completion of this item.
- C. All work shall comply with NHDOT standards.

Item No. 21 - Cast-in-place Concrete

- A. Method of Measurement: Cast-in-place concrete will be paid for at the lump sum unit price as stated in the Bid Schedule.
- B. Basis of Payment: The lump sum price shall be full compensation for

excavation, installing forms, installing rebar reinforcing, chairs, finishing, labor, equipment, tools, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 22- Site Work

- A. Method of Measurement: Site work will be paid for at the lump sum unit price as stated in the Bid Schedule.
- B. Basis of Payment: The lump sum price shall be full compensation for excavating, grading, labor, equipment, tools, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 23 – Isolation Valve Building

- A. Method of Measurement: The isolation valve building will be paid for at the lump sum unit price as stated in the Bid Schedule.
- B. Basis of Payment: The lump sum price shall be full compensation for a complete isolation valve building as shown and specified on the plans, pipe, connections, start up, O&M Manuals, labor, equipment, tools, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 24 – Isolation Valve, Flow Meter, Piping, and Equipment

- A. Method of Measurement: The isolation valve, flow meter, piping, and equipment will be paid for at the lump sum unit price as stated in the Bid Schedule.
- B. Basis of Payment: The lump sum price shall be full compensation for the isolation valve, flow meter, piping, and equipment as shown and specified on the plans, labor, equipment, tools, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 25 – Isolation Valve Building – Electrical, Panels, SCADA, Lights

- A. Method of Measurement: The isolation valve building – electrical, panels, SCADA, lights will be paid for at the lump sum unit price as stated in the Bid Schedule.
- B. Basis of Payment: The lump sum price shall be full compensation for the isolation valve building – electrical, panels, SCADA, lights as shown and specified on the plans, labor, equipment, tools, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 26 - Electric and Communication Services

- A. Method of Measurement: The electric and communication services will be paid for at the lump sum unit price as stated in the Bid Schedule.
- B. Basis of Payment: The lump sum price shall be full compensation for installing the transformer, conductors, conduits, meter box, meter, sand backfill, concrete encasement, pull tape, labor, equipment, tools, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 27 - Stone Headwalls

- A. Method of Measurement: Stone headwalls will be paid for the actual number of headwalls installed.
- B. Basis of Payment: Stone headwalls shall be paid for at the unit price per each as stated in the Bid Schedule. Said unit price shall be full compensation for furnishing all stone, mortar, labor, tools, equipment, and for all other work and expenses incidental thereto for which payment is not provided under other items.

Item No. 28- Screened Loam (Assume 4-inch depth)

- A. Method of Measurement: Measurement shall be for the actual number of cubic yards install as measured by method of average-end-area by the City Engineer not exceeding the limits allowed unless otherwise approved by the City Engineer. Measurement will be made to the nearest ½ cubic yard.
- B. Basis of Payment: Payment shall be at the unit price per cubic yard as stated in the Bid proposal. Item includes furnishing and installing approved screened loam free of invasive species or weeds. Testing soil for required amendments, amending soil for optimum growth of lawns, fertilizer, lime, placing loam to required thickness, fine grading loam, rolling loam, maintenance of lawns until vegetation is established, and all else necessary to complete the work.

Item No. 29 - Seed

- A. Method of Measurement: Measurement shall be based on the percentage of work completed as determined by the City Engineer. The final 30% of the item will not be paid until vegetation is established to a minimum of 70% as determined by the City Engineer.
- B. Basis of Payment: Payment shall be at the lump sum price as stated in the Bid Proposal. Payment shall be full compensation for furnishing and installing specified grass seed in accordance with the specifications.

Item No. 30 - Straw Mulch

- A. Method of Measurement: Measurement shall be per square yard of surface area covered and approved by the City Engineer.
- B. Basis of Payment: Payment shall be at the unit price per square yard as stated in the Bid Proposal.

Items No. 31 & 32 - Furnish and Install Bituminous Pavement

- A. Method of Measurement:
 - 1. The quantity of bituminous pavement to be paid for under this item shall consist of the number of tons of temporary, binder and wearing course paved at the direction of the City Engineer within the payment limits shown on the drawings.
- B. Basis of Payment:
 - 1. Pavement shall be paid for at the Contract Unit Prices per ton stated in the Bid Schedule. Pay factor adjustments in section SC-24.7 will be based on square yardage converted to tonnage using .057 tons per square yard inch of thickness.
 - 2. Said unit price shall be full compensation for furnishing all materials, labor, equipment and tools necessary for saw cutting and

milling of the existing pavement to the depths shown on the plans, tack coat of the vertical faces of the saw cuts and milled faces, furnishing and placement of a 2" thick layer of binder course, furnishing and placement of a 1.5" thick layer of the wearing course. No additional payment will be made to the contractor for repair work done by him in maintaining bituminous concrete pavement.

Item No. 33 - Tapered Grind Pavement Joint from Existing to New Pavement

- A. Method of Measurement: The quantity of tapered grind pavement joint to be paid for under this item shall consist of the square feet of tapered shiplap joint installed within the payment limits shown on the Drawings.
- B. Basis of Payment: The contract unit price per square foot of tapered shiplap joint shall be full compensation for all labor, materials, tools and equipment necessary to complete this work including HMA, grinding existing pavement and disposal of existing roadway materials at a site as designated by the City, tack coating surfaces, broom cleaning existing grinded surfaces prior to paving, and all else incidental thereto for which payment is not provided under other items.

Items Nos. 34 - Furnish and Install Retroreflective 4" Striping for Fogline (white)

- A. Method of Measurement. The quantity of 4-inch wide pavement stripes to be paid for under this item shall consist of the actual number of linear feet of 4" single width markings placed at the direction of the Engineer within the payment limits shown on the Drawings. Temporary pavement marking is incidental.
- B. Basis of Payment:
 - 1. Payment for retroreflective stripes shall be paid for at the Contract Unit Prices per linear feet stated in the Bid Schedule.
 - 2. Said unit price shall be full compensation for furnishing all materials, labor, equipment and tools necessary for furnishing and placement striping and for furnishing all materials, labor and equipment as directed by the City Engineer.

Item No. 35 - As-Built Survey

- A. Method of Measurement: The As-built Survey will be paid for at the lump sum unit price as stated in the Bid Schedule. The minimum required bid for this item is \$3,000.00.
- B. Basis of Payment:
 - 1. Payment for the As-built Survey shall constitute full compensation for all field survey and processing, recording and delivery of data, including all labor, materials, equipment and supervision required to provide a complete as-built survey and complete GIS database in the specified format.
 - 2. Payment for this Lump Sum work on interim requisitions shall be according to the following proceedings:
 - a. Electronic version of the draft (ninety percent (90%) complete) survey and GIS database submitted and approved by the Engineer - thirty percent (30%) payment.
 - b. Electronic and paper versions of the final survey and GIS database submitted and approved by the Engineer - seventy

percent (70%) payment.

Item Nos. 36 & 37 - Silt Fence and Erosion Control Sock

- A. Method of Measurement: Measurement shall be the actual length of silt fence or erosion control sock installed to the nearest foot.
- B. Basis of Payment: Payment shall be at the unit price per linear foot as stated in the Bid Proposal inclusive of furnishing and installing the item in accordance with the manufacturer's specifications, stakes, supports, observation and maintenance, relocation as needed for work, and removal after work is complete. Silt fence and erosion control sock will not be paid for if not installed correctly and approved by City Engineer.

Item No. 38 - Mobilization and Demobilization

- A. Method of Measurement: Lump sum (total not to exceed four percent 5% of Total Amount of the Base Bid).
- B. Basis of Payment: Mobilization/demobilization costs are those costs of initiating and ending the contract, exclusive of the cost of material, providing a temporary site for Contractor's equipment, staging and material stockpiles.
- C. Payment for mobilization/demobilization shall be a lump sum at the price as stated in the Bid F01m. Seventy-Five percent (75%) of the lump sum will be payable when the Contractor is operational on the site and the remaining 25% of the lump sum will be payable when the Contractor leaves the site following the completion of all contract work. For purposes of payment on this item, "Operational" shall mean the Contractor has provided all required and properly executed bonds and insurance certificates and the owner has approved the following: Construction Schedule, Traffic Control Plan, and the pre-construction photographs. Only one lump sum payment divided into the two partial payments described herein shall be made to cover all mobilization/demobilization costs throughout the entire contract.

Item No. 39-Miscellaneous Work and Cleanup

- A. Method of Measurement: Miscellaneous work and cleanup will be paid for at the lump sum unit price as stated in the Bid Schedule.
- B. Basis of Payment: The lump sum shall be paid in partial payments over the course of the project, where the percentage paid is equal to the percentage of completion of the entire Contract.

END OF BASE BID ITEMS

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: To enable orderly review during progress of the work, and to provide for systematic discussion of problems, the Engineer will conduct project meetings throughout the construction period.
- B. Related work described elsewhere: The Contractor's relations with their subcontractors and materials suppliers and discussions relative thereto, are the Contractor's responsibility and are not part of project meetings content.

1.2 QUALITY ASSURANCE

- A. Persons designated by the Contractor to attend and participate in the project meetings shall have all required authority to commit the Contractor to solutions agreed upon in the project meetings.

1.3 SUBMITTALS

- A. Agenda items: To the maximum extent practicable, advise the Engineer or the Owner at least 24 hours in advance of project meetings regarding all items to be added to the agenda.
- B. Minutes: The Engineer will compile minutes of each monthly project meeting and will furnish a copy to the Contractor. The Contractor may make and distribute such other copies as he wishes.

PART 2 - PRODUCTS

(No products are required in this Section.)

PART 3 - EXECUTION

3.1 MEETING SCHEDULE

- A. Except as noted below for Preconstruction Meeting, Engineer's project meetings will be held bimonthly. Coordinate as necessary to establish mutually acceptable schedule for meetings.

3.2 MEETING LOCATION

- A. To the maximum extent practicable, meetings will be held at the job site.

3.3 PRECONSTRUCTION MEETING

- A. A preconstruction meeting will be scheduled within twenty days after the Effective Date of the Agreement, but before the Contractor starts work at the site. Provide attendance by authorized representatives of the Contractor and all major subcontractors. The Engineer will advise other interested parties and request their attendance.
- B. Minimum agenda: Distribute data on, and discuss:
 - 1. Identification of key project personnel for Owner, Engineer, Contractor, funding/regulatory Agencies.
 - 2. Responsibilities of Owner, Engineer, and Contractor.
 - 3. Channels and procedures for communications.

4. Construction schedule, including sequence of critical work.
5. Contract Documents, including distribution of required copies of original documents and revisions.
6. Processing of Shop Drawings and other data submitted to the Engineer for review.
7. Processing of field decisions and Change Orders.
8. Rules and regulations governing performance of the Work, including funding/regulatory Agency requirements.
9. Procedures for safety and first aid, security, quality control, housekeeping, and other related matters.

3.4 PROJECT MEETINGS - BIMONTHLY

- A. Attendance: To the maximum extent practicable, assign the same person or persons to represent the Contractor at project meetings throughout progress of the Work. The Superintendent shall attend. Subcontractors, materials suppliers, and others may be invited to attend those project meetings in which their aspects of the Work are involved.
- B. Minimum agenda:
 1. Review progress of the Work since last meeting, including status of submittals for approval.
 2. Review schedule of work to be accomplished prior to next meeting.
 3. Discuss monthly partial payment request.
 4. Review status of change order requests and work directive changes.
 5. Identify problems which impede planned progress.
 6. Develop corrective measures and procedures to regain planned schedule.
 7. Complete other current business.

END OF SECTION

SECTION 01310

CONSTRUCTION SCHEDULES

PART 1 - COMPREHENSIVE SCHEDULE

1.1 DESCRIPTION

- A. Work Included: Within ten (10) days after the effective date of the Agreement between Owner and Contractor submit to the Engineer a schedule as specified herein.
- B. Form of Schedules:
 - 1. Network Analysis System:
 - a. Provide a separate horizontal schedule line for each trade or operation and show concurrent and preceding activities.
 - b. Present in chronological order the beginning of each trade or operation showing duration and float time.
 - c. Scale: Identify key dates and allow space for updating and revision.
 - OR:
 - 2. Calendar:
 - a. Provide a calendar to indicate locations and activities of planned work.
 - b. The calendar shall include the type and number of work crews for each activity.
- C. Content of Schedules:
 - 1. Provide complete sequence of construction by activity:
 - a. Shop Drawings, Project Data and Samples:
 - (1) Submittal dates.
 - (2) Dates reviewed copies will be required.
 - b. Decision dates for:
 - (1) Products specified by allowances.
 - (2) Selection of finishes.
 - c. Estimated product procurement and delivery dates.
 - d. Dates for beginning and completion of each element of construction.
 - 2. Identify work of separate phases and logically grouped activities.
 - 3. Show the projected percentage of completion for each item of work as of the first day of each month.
 - 4. Provide separate sub-schedules, requested by the Engineer, showing submittals, review times, procurement schedules, and delivery dates.
- D. Updating:
 - 1. Show all changes occurring since previous submission.
 - 2. Indicate progress of each activity, show completion dates.
 - 3. Include:
 - a. Major changes in scope.
 - b. Activities modified since previous updating.
 - c. Revised projections due to changes.
 - d. Other identifiable changes.
 - 4. Provide narrative report, including:
 - a. Discussion of problem areas, including current and anticipated delay factors.
 - b. Corrective action taken or proposed.

- c. Description of revisions that may affect schedules.
- 5. An updated schedule is required at each monthly progress meeting and prior to a recommendation for the current progress payment.

1.2 SUBMITTALS

- A. Submit updated schedules with each progress payment request.

PART 2 - TWO WEEK LOOK AHEAD SCHEDULE

2.1 DESCRIPTIONS

- A. Work included - Contractor's Superintendent will maintain a 2 week forecast of Contractor's planned work and make that available to the Owner and Resident at their biweekly meetings.
- B. The form of the schedule is up to the Superintendent, but it must be reproducible (for distribution).
- C. Content of Schedule
Who, what, where, when, how relative to the work the Contractor will be doing.
- D. The schedule will serve as a coordination and notification tool for the Resident, the City and the Contractor. Review of the schedule is critical to ensuring the people who will be affected by the work receive proper notification.

END OF SECTION

SECTION 01320

SAFETY AND HEALTH PLAN

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the work, as outlined herein and in the General and Supplementary Conditions of the Construction Documents. Within ten (10) days after the effective date of the Agreement between Owner and Contractor, submit to the Engineer a Safety and Health Plan as specified herein.
2. Contractor shall comply with all applicable Laws and Regulations related to the safety of persons or property, or for the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
3. Contractor shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and maintaining and supervising of safety precautions and programs.

B. Content of Safety and Health Plan:

1. Prepare complete safety and health plan in accordance with the requirements of 29CFR1926 Safety and Health Regulations for Construction.
 - a. Provide documentation that Contractor's Hazardous Communication Program is up to date.
 - b. Provide documentation that Contractor's safety training is up to date.
 - c. Prepare project specific safety plan addressing confined space entry and egress considerations among other factors.

C. Updating: Contractor shall be responsible for updating the Safety and Health Plan as appropriate throughout the course of the construction period.

1.2 SUBMITTALS

- A. Submit a copy of the initial and updated Safety and Health Plan to the Engineer. The safety and health plan shall be provided for information only to document to Engineer and Owner that a complete plan has been developed. Contractor shall be responsible for all aspects of construction site safety.
- B. Submit updated Safety and Health Plans as necessary during the course of the project.

1.3 ON-SITE COORDINATION MEETINGS

- A. Contractor shall review key aspects of Safety and Health Plan at Pre-construction Meeting.
- B. Contractor shall report to Engineer and Owner at each progress meeting concerning compliance with the Safety and Health Plan for the most recent construction period and new considerations and requirements for the upcoming period.

- C. Contractor shall hold biweekly on-site coordination meetings with Resident Project Representative and Owner to ensure that Owner's staff is aware of key Safety and Health Plan requirements of the current phase of construction.

END OF SECTION

SECTION 01340

SUBMITTALS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Submit to the Engineer, Shop Drawings, Operation and Maintenance Manuals, Manufacturers' Certificates, Project Data, and Samples required by the Specification Sections.
- B. Related Work Specified Elsewhere:
 - 1. Construction Schedules: Section 01310
 - 2. Project Record Documents: Section 01720
 - 3. General Conditions: Section 00700.

1.2 SHOP DRAWINGS

- A. Shop Drawings are required for each and every element of the work. Each shop drawing shall be assigned a number consisting of the Specification Section number followed by a dash and then a sequential number beginning with 01 (e.g., 16000-01) for purposes of easy identification. Resubmittals shall include an alphabetic suffix after the corresponding sequential number (e.g., 16000-01A).
- B. Shop Drawings are generally defined as all fabrication and erection drawings, diagrams, brochures, schedules, bills of material, manufacturers data, spare parts lists, and other data prepared by the Contractor, Contractor's subcontractors, suppliers, or manufacturers which illustrate the manufacturer, fabrication, construction, and installation of the work, or a portion thereof.
- C. The Contractor shall submit Shop Drawings and approved data to the Engineer for review. The Engineer shall return a PDF to the Contractor for duplication and distribution to subcontractors, suppliers and manufacturers. All shop drawing comments will be summarized on the Submittal Review Form and must be retained with each submittal. The Contractor shall provide a completed Contractor Submittal Certification Form (copy provided for Contractor's use at the end of this Specification Section) which shall be attached to each shop drawing. Shop Drawings shall show the principal dimensions, weight, structural and operating features, space required, clearances, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the drawing. When it is customary to do so, when the dimensions are of particular importance, or when so specified, the drawings shall be certified by the manufacturer or fabricator as correct for the work.
- D. The Contractor shall be responsible for the prompt and timely submittal of all shop and working drawings so that there shall be no delay to the work due to the absence of such drawings.
- E. No material or equipment shall be purchased or fabricated especially for the Contract until the required shop and working drawings have been submitted as hereinabove provided and reviewed for conformance to the Contract requirements. All such materials and equipment and the work involved in their installation or incorporation into the Work shall then be as shown in and represented by said drawings.
- F. Until the necessary review has been made, the Contractor shall not proceed with any portion of the work (such as the construction of foundations), the design or details of which are dependent upon the design or details of work, materials,

- equipment or other features for which review is required.
- G. All shop and working drawings shall be submitted to the Engineer by and/or through the Contractor, who shall be responsible for obtaining shop and working drawings from their subcontractors and returning reviewed drawings to them.
 - H. Only drawings which have been checked and corrected by the fabricator should be submitted to the Contractor by their subcontractors and vendors. Prior to submitting drawings to the Engineer, the Contractor shall check thoroughly all such drawings to satisfy himself that the subject matter thereof conforms to the Drawings and Specifications in all respects. All drawings which are correct shall be marked with the date, checker's name, and indication of the Contractor's approval, and then shall be submitted to the Engineer.
 - I. If a shop drawing shows any deviation from the Contract requirements, **the Contractor shall make specific mention of the deviations in a letter of transmittal.** Shop Drawings that contain significant deviations that are not brought to the attention of the Engineer may be subject to rejection.
 - J. Should the Contractor submit equipment that requires modifications to the structures, piping, electrical conduit, wires and appurtenances, layout, etc., detailed on the Drawings, he shall also submit details of the proposed modifications. If such equipment and modifications are accepted, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications.
 - K. **A maximum of two submissions of each Shop Drawing and Certified Payroll Reports will be reviewed, checked, and commented upon without charge to the Contractor.** Any additional submissions which are ordered by the Engineer to fulfill the stipulations of the Drawings and Specifications, and which are required by virtue of the Contractor's neglect or failure to comply with the requirements of the Drawings and Specifications, or to make those modifications and/or corrections ordered by the Engineer in the review of the first two submissions of each Shop Drawing, will be reviewed and checked as deemed necessary by the Engineer, and the cost of such review and checking, as determined by the Owner, and based upon Engineer's documentation of time and rates established for additional services in the Owner-Engineer Agreement for this Project, may be deducted from the Contractor to make all modifications and/or corrections as may be required by the Engineer in an accurate, complete, and timely fashion. Resubmittals for the sole purpose of providing written responses to review comments will not be considered a resubmittal counting towards the two submission limit.

1.3 SAMPLES

- A. The Contractor shall submit samples when requested by the Engineer to establish conformance with the specifications, and as necessary to define color selections available.

1.4 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall furnish the Engineer two(2) hardcopies and 1 electronic PDF of a complete instruction manual for installation, operation and maintenance and cleaning of each item specified, transmitted using e-mail, File Transfer Protocol (FTP), Compact Disc (CD) or approved submittal sharing software. At least 3 months prior to the expected substantial completion date, the Contractor shall submit to the Engineer all manuals in accordance with the requirements specified

herein.

- B. Manuals shall include operating and maintenance information on all systems and pieces of equipment. The manual shall contain sufficient data to install, operate, maintain, repair and rebuild all components of the equipment, design data specific to the project. Descriptions of operation should include procedures for both normal and emergency operation. All information required by the Operations and Maintenance Manual Certification Form described herein and any additional information deemed necessary by the Owner and Engineer for proper installation, operation and maintenance. Also include model numbers and serial numbers, as well as rated capacities and motor data, where applicable.
- C. Attached to every hardcopy and electronic PDF of each Operations and Maintenance Manual submitted, the Contractor shall provide a copy of the complete Operations and Maintenance Manual Certification Form (copy provided for the Contractor's use at the end of this Specification Section) signed by both the Contractor and the Manufacturer.
- D. The submittal shall also include details of all replacement parts; "Nameplate" data for all equipment; detailed instructions for start-up, normal operation, shutdown procedures, and control techniques; and a guide to troubleshooting the system.

1.5 MANUFACTURER'S CERTIFICATES

- A. Prior to accepting the installation, the Contractor shall submit manufacturer's certificates for each item specified.
- B. Such manufacturer's certificates shall state that the equipment has been installed under either the continuous or periodic supervision of the manufacturer's authorized representative, that it has been adjusted and initially operated in the presence of the manufacturer's authorized representative, and that it is operating in accordance with the specified requirements, to the manufacturer's satisfaction. All costs for meeting this requirement shall be included in the Contractor's bid price.

1.6 SUBMISSION REQUIREMENTS

- A. Accompany submittals with transmittal letter, containing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name and address.
 - 4. The sequential shop drawing number for each shop drawing, project data and sample submitted shall be:
 - i. Specification Section number followed by a dash and then a sequential number beginning with 01 (e.g., 16000-01).
 - ii. Resubmittals shall include decimal point and an alphabetic suffix after the corresponding sequential number (e.g., 16000-01A).
 - iii. O&M submittals shall be numbered with the Specification Section number followed by a dash, the letters "OM", another dash, and then a sequential number beginning with 01 (e.g. 16000-OM-01). Resubmittals of O&Ms shall include an alphabetic suffix after the corresponding sequential number (e.g., 16000-OM-01A).
 - 5. Notification of deviations from Contract Documents.
 - 6. Other pertinent data.
- B. A completed Contractor Submittal Certification Form shall be attached to each hardcopy and electronic PDF of each shop drawing and must include:
 - 1. Project name

2. Specification Section and sequential number with alphabet suffix for resubmittal
 3. Description
 4. Identification of deviations from Contract Documents.
 5. Contractor's stamp, initialed or signed, certifying review of the submittal, verification of field measurements and compliance with Contract Documents.
 6. Where specified or when requested by the Engineer, manufacturer's certification that equipment, accessories and shop painting meet or exceed the Specification requirements.
 7. Where specified, manufacturer's guarantee.
- C. Requirements for Electronic Submittals:
1. Each individual shop drawing or O&M submittal shall be contained in one PDF.
 2. The first page of the PDF shall be the Contractor Submittal Certification Form as described above.
 3. Subject lines for e-mails transmitting PDF submissions and subsequent correspondence referring to specific submittals shall identify the submittal's Specification Section, sequential number, appropriate alphabet suffix for resubmittals, and a brief description (e.g. 16010-01-Electrical General).
 4. Electronic PDF submittals that are not submitted in accordance with the requirements stated above will not be reviewed by the Engineer.

1.7 RESUBMISSION REQUIREMENTS

- A. Revise initial drawings as required and resubmit as specified for initial submittal.
- B. Indicate on drawings any changes which have been made other than those required by Engineer. All renumbering of shop drawings, relabeling of individual pieces or assemblies or relocating of pieces or assemblies to other Drawings within the submittal shall be clearly brought to the attention of the Engineer.

1.8 ENGINEER'S REVIEW

- A. The review of shop and working drawings hereunder will be general only, and nothing contained in this specification shall relieve, diminish or alter in any respect the responsibilities of the Contractor under the Contract Documents and in particular, the specific responsibility of the Contractor for details of design and dimensions necessary for proper fitting and construction of the work as required by the Contract and for achieving the result and performance specified thereunder.
- B. The Engineer's review comments will be summarized on a Submittal Review Form, which includes an action code. A description of each action code is provided below.
 1. **No Exceptions Taken (Status 0 on shop drawing log).** The shop drawing complies with the Contract Document requirements. No changes or further information are required. Where appropriate, the submittal review form will be used to alert the Contractor, Owner and Field personnel of remaining items within that specification section that still needs to be submitted.
 2. **Make Corrections Indicated (Status 1 on shop drawing log).** The shop drawing complies with the Contract Document requirements except for minor changes, as indicated. Resubmittal is not required unless it is specifically called for; however, Engineer requires that all comments will be

addressed by the Contractor, unless otherwise notified in writing prior to execution of the relevant work.

3. **Conditional to Remarks (Status 2 on shop drawing log).** The shop drawing potentially complies with the Contract Document requirements, contingent upon satisfactory resolution of review comments. Remarks will explicitly list what information needs to be resubmitted. Resubmittal from the Contractor should include a cover letter or summary which indicates how each review comment has been addressed.
4. **Revise and Resubmit (Status 3 on shop drawing log).** The shop drawing does not comply with the Contract Document requirement as submitted, but may with changes indicated and/or submission of additional information. The entire package must be resubmitted with the necessary information and a cover letter which indicates how each review comment has been addressed and where to find the information in the resubmittal.
5. **Rejected (Status 4 on shop drawing log).** The shop drawing does not comply with the Contract Document requirements, for the reasons indicated in the remarks, and is unacceptable.
6. **In Review (Status 5 on shop drawing log).** The shop drawing is currently under review.
7. **For Information Only (Status 6 on shop drawing log).** The shop drawing review was informational only. No comments are provided.

CONTRACTOR SUBMITTAL CERTIFICATION FORM

PROJECT: _____ CONTRACTOR'S PROJ. NO: _____

CONTRACTOR: _____ ENGINEER'S PROJ. NO: _____

ENGINEER: _____

SHOP DRAWING NUMBER:	_____ SPECIFICATION SECTION OR DRAWING NO:	_____ SEQUENTIAL NUMBER (& ALPHA SUFFIX FOR RESUBMITTAL)
----------------------------	--	--

DESCRIPTION: _____

MANUFACTURER: _____

The above referenced submittal has been reviewed by the undersigned and I/we certify that the material and/or equipment meets or exceeds the project specification requirements with

☐ NO DEVIATIONS

or

☐ A COMPLETE LIST OF DEVIATIONS AS FOLLOWS^a:

By: _____
Contractor^b

By: _____
Manufacturer^c

Date: _____ Date: _____

^a Any deviations not brought to the attention of the Engineer for review and concurrence shall be the responsibility of the Contractor to correct, if so directed.

^b Required on all submittals

^c When required by specifications Page ____ of ____

General Contractor's Stamp

OPERATIONS AND MAINTENANCE MANUAL CERTIFICATION FORM

PROJECT: _____ CONTRACTOR'S PROJ. NO: _____

CONTRACTOR: _____ ENGINEER'S PROJ. NO: _____

ENGINEER: _____

O&M	- OM -	
NUMBER: _____	SPECIFICATION SECTION OR DRAWING NO: _____	SEQUENTIAL NUMBER (& ALPHA SUFFIX FOR RESUBMITTAL)

DESCRIPTION: _____

MANUFACTURER: _____

The above referenced operations and maintenance manual has been reviewed by the undersigned and I/we certify that the manual is customized as needed for this project, is suitable for mounting in a 3-ring binder, and contains the following items:

- | | |
|--|---|
| ☐ Table of Contents
☐ Maintenance Schedule and Summary
☐ Lubrication Schedule
☐ Troubleshooting Information
☐ Warranty Information
☐ Rebuild Information for All Components/
Systems
☐ Startup, Operation, Shutdown Procedures
☐ Safety Procedures
☐ Shop Drawings corrected to As-Built
Conditions | ☐ Project-Related Design Data
☐ Wiring Diagrams
☐ Equipment Layout Drawings & Schematics
☐ Equipment Performance Curves
☐ Parts and Service Contact Information
☐ Manufacturer's Contact Information
☐ Emergency Operations Plan
☐ List of Part Numbers for all Components
☐ List of Spare Parts Supplied and Cost
☐ Other System Specific Information |
|--|---|

By: _____	By: _____
Contractor ^a	Manufacturer ^b

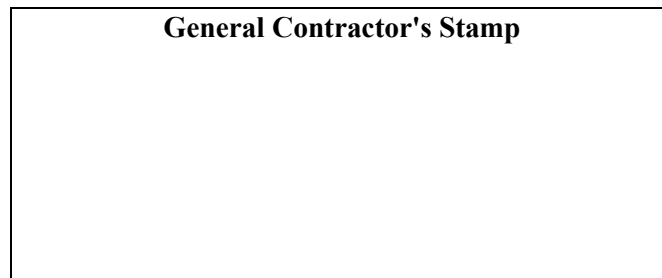
Date: _____	Date: _____
-------------	-------------

^a Contact information shall include name, address and telephone number.

^b Required on all Operation and Maintenance Manuals.

^c When required by Specifications.

Page ____ of ____



END OF SECTION

SECTION 01380

PRE-CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Contractor may select either still digital photographs or digital video to obtain a visual record of the project area, two (2) copies of same shall be given to Engineer.
2. Provide a description for each photograph or video and an index by street and house number for easy reference.
3. Notify Engineer at least three (3) working days prior to photographing or videotaping the project area so Engineer may, at Engineer's option, observe.

1.2 QUALITY

- ###### A.
- Quality shall be such that the condition of existing pavement, curbing, driveway entrances, sidewalks, walls, vegetation, etc. can be readily determined.

1.3 SUBMITTAL OF PRINTS

- ###### A.
- Submit all prints or video discs to the Engineer prior to any construction work.
- ###### B.
- The quality of the photos and video discs are subject to approval by the Engineer prior to the start of construction work in the areas shown by the photos.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

- A. General Quality Control
- B. Workmanship
- C. Manufacturer's Instructions
- D. Manufacturer's Certificates
- E. Manufacturer's Field Services
- F. Testing Laboratory Services

1.2 RELATED REQUIREMENTS

- A. Division 0 - Section C - General Conditions: Inspection and testing required by governing authorities
- B. Section 01340 - Submittals
- C. Section 01715 - Testing, Cleaning and Disinfection
- D. Section 02200 - Earthwork
- E. Section 02675 – Cleaning, Testing and Disinfection of Water Mains
- F. Section 03300A - Cast-in-Place Concrete

1.3 QUALITY CONTROL

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.4 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.5 MANUFACTURERS' INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence. If instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.6 MANUFACTURERS' CERTIFICATES

- A. When required by individual Specifications Section, submit manufacturer's certificate that products meet or exceed specified requirements.

1.7 MANUFACTURERS' FIELD SERVICES

- A. When specified in respective Specification Sections, require supplier and/or manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to make appropriate recommendations.

- B. Representative shall submit written report to Engineer listing observations and recommendations.

1.8 TESTING LABORATORY SERVICES

- A. Owner will employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services wherever an Independent Testing Laboratory is required by individual specification sections listed in paragraph 1.2 above, unless otherwise indicated.
- B. Services will be performed in accordance with requirements of governing authorities and with specified standards.
- C. Reports will present observations and test results and indicate compliance or non-compliance with specified standards and with Contract Documents. Independent Testing Laboratory will submit one copy of each report directly to each of the following: Engineer, Resident Project Representative, Contractor. Reports will be mailed within 5 days of obtaining test results. If test results indicate deficiencies, Independent Testing Laboratory shall telephone, email, or FAX results to Engineer and the Resident Project Representative and Contractor within 24 hours.
- D. Contractor shall cooperate with Independent Testing Laboratory personnel; furnish tools, samples of materials, design mix, equipment, storage and assistance as requested.
- E. Contractor shall coordinate all testing work and shall notify Engineer and Independent Testing Laboratory at least 24 hours prior to performing work requiring testing services. If scheduled tests or sampling cannot be performed because the work is not ready as scheduled, testing costs associated with the delay will be determined by Engineer and invoiced by Owner to Contractor. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price. If adequate notice is not provided, Contractor shall suspend work on that portion of the Project until testing can be performed. Such suspension will not be grounds for a claim against the Owner for delay, nor will it be an acceptable basis for an extension of time.
- F. Payment for Independent Testing Laboratory services shall be as follows:
 - 1. General: Where testing is the Owner's responsibility, payment will be made as stated below unless other requirements are given in Specification Sections. Testing which is the responsibility of the Contractor will be considered an incidental item unless otherwise indicated in Section 01150, Measurement and Payment.
 - 2. Initial Testing: Owner will pay for initial tests.
 - 3. Retesting: Costs of retesting due to non-compliance will be paid by Owner. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price.
 - 4. Contractor's Convenience Testing: Inspections and tests performed for Contractor's convenience will be paid for by Contractor.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide and pay for all temporary applicable utilities required to properly perform the Work at no additional cost to the Owner including the placement and removal of the utilities.
2. Completely remove all temporary equipment and materials upon completion of the Work and repair all damage caused by the installation of temporary utilities.
3. Make all necessary applications and arrangements for electric power, light, water and other utilities with the local utility companies. Notify the local electric power company if unusually heavy loads, such as welders, will be connected. **Notify the power and phone companies as soon as possible after notice of award.**

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Obtain permits as required by local governmental authorities.
2. Obtain easements, when required, across private property other than that of the Owner for temporary power service.
3. Comply with the latest National Electrical Code.
4. Comply with all local, State and Federal codes, laws, and regulations.

B. All temporary utilities are subject to the approval of the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Electrical: The General Contractor shall make necessary arrangements with the local power company for connection to the existing power supply and shall provide and pay for all temporary light and power requirements except as otherwise specified hereunder.
- B. Heating: The General Contractor shall furnish, install, and maintain temporary heating system, including fuel therefore, which will provide heat as required by the trades and for the protection of stored and installed materials from injury as can be caused by dampness and cold.
- C. Water:
1. The General Contractor shall make necessary arrangements for connection to the municipal water supply and shall provide, at General Contractor's own expense, any extensions as required for the operation of this project. The General Contractor shall bear all costs incurred for the temporary water services, including the costs of the water itself.

2. All lines, temporary or permanent, shall be protected and maintained by the General Contractor. Temporary lines shall be removed by the General Contractor when the temporary service is no longer required.
3. The General Contractor shall provide an adequate drinking water supply, satisfactorily cooled, for General Contractor's employees.
4. The General Contractor shall furnish, install, maintain and pay for adequate temporary chemical type toilet accommodations, for all persons employed on the work and located where approved by the Engineer. The accommodations shall be in proper enclosures and in accordance with Municipal Ordinances and shall be maintained in proper, safe and sanitary conditions and suitably heated when requested.
5. Relocate temporary toilet facilities as required to facilitate the construction.
6. Remove all temporary facilities at completion of work when directed by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

N/A

END OF SECTION

SECTION 01546

USE OF EXPLOSIVES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide all materials and perform all work necessary to ensure safe use and storage of explosives.
2. Contractor shall be responsible for any and all damage resulting from use of explosives.
3. Perform a pre-blast survey of all structures in the proximity of the blasting area to determine pre-blast conditions. Include exteriors and interiors of all structures.
4. Perform monitoring, documentation and record keeping during blasting.

1.2 QUALITY ASSURANCE

A. Requirements of regulatory agencies: Conduct all blasting in accordance with all applicable local and state laws, ordinances and code requirements.

B. Qualifications:

1. The Subcontractor utilized for the blasting operations shall be licensed specialty drilling and blasting contractor with 5-years experience. The Contractor shall submit qualifications and references of the proposed Subcontractor for review and no exceptions shall be taken by the Engineer. All blasting operations completed on this project shall be performed by a single firm.
2. A seismologist or blasting consultant shall be retained to monitor, record, analyze and report the seismic vibrations caused by the blasting operation. The Contractor shall submit qualifications and references of the proposed Subcontractor for review and approval. The seismologist or blasting consultant shall not be an employee of the Contractor, subcontractor, explosives manufacturer or explosives distributor and shall have a minimum of 5 years of experience monitoring blasting operations.

1.3 INDEMNITY

Notwithstanding full compliance with these Specifications, the Contractor shall be solely responsible for any damage, direct or indirect, arising from blasting and shall hold the Owner, Engineer, and their consultants harmless from any costs, liens, charges, claims or suits, including the costs of defense, arising from such damage, real or alleged. The Owner, Engineer and their consultants shall be additionally-named insured on any insurance policy covering blasting carried by the Contractor, and this requirement shall also be enforced on any subcontractor.

1.4 SUBMITTALS

A. **Prior to substantial completion, an electronic copy of all logs and vibration records shall be delivered to the Owner.**

B. Blast logs and vibration measurement records shall be made available to Owner and/ or Engineer upon request during the project and shall be maintained on site for the duration of the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Explosive charges and detonation devices shall be of a type suitable for the intended use.
- B. Store all explosives in a secure manner, in compliance with all State and local laws and ordinances, and legibly mark all such storage places. Storage shall be limited to such quantity as may be needed for the work underway and shall not be stored on-site during non-working hours.

PART 3 - EXECUTION

3.1 PERFORMANCE - GENERAL

- A. Designate as a BLASTING AREA all sites where electric blasting caps are located and where explosive charges are being placed.
- B. Mark all blasting areas with signs as required by law.
- C. Place signs, as required by law, at each end of the blasting area and leave in place while the above conditions prevail. Immediately remove signs after blasting operations or the storage of caps is over.
- D. Perform a pre-blast survey of structures in the proximity of the blasting area to determine pre-blast conditions. The Contractor shall employ the services of an independent firm to conduct a pre-blast survey of the condition of adjacent structures. The pre-blast survey shall include a video and photographic record of the interior and exterior of all structures within a 500-foot radius of the work area. The Contractor shall provide the Owner and Engineer with 72-hours written notice prior to the initiation of the pre-blast survey and shall allow for the Owner and/or Engineer to be present during the survey. The pre-blast survey records shall be made available to the Owner and Engineer upon request. The cost of the pre-blast survey shall be incidental to the unit price bid item.
- E. The locations of known buried water lines, sewer lines, telephone cables, oil pipelines, storm drains, culverts, gas mains, electric conduits and other utilities are shown on Drawings. No guarantee is made as to the correctness of the locations shown and to the completeness of the information provided. The Contractor shall use manual excavation methods to locate utilities.
- F. Notify each property owner and public utility company having structures within a 500-foot radius of the site of the blast work sufficiently in advance to enable the owners and companies to take such steps as they may deem necessary to protect their property. Notice shall be published in a local paper no more than 30 days, nor less than 10 days prior to the initiation of the blasting. Notice shall be given to property owners within the 500-foot radius at least 10 days prior to blasting that pre-blast surveys are available. Such notice shall not relieve the Contractor of any of Contractor's responsibility for damage resulting from Contractor's blasting operation.
- G. Warn all persons within the danger zone of blasting operations and do not perform blasting work until the area is cleared. Provide sufficient flagmen outside the danger zone to stop all approaching traffic and pedestrians.
- H. Provide watchmen during the loading period and until charges have been exploded.
- I. Provide adequate protective covering over all charges prior to explosion.

- J. Prepare and submit a blasting plan a minimum of seven (10) business days prior to the commencement of the blasting operations. The blasting plan shall include proposed sketches of the location of each blast, drill patterns, delay periods, and decking. The plan should also indicate the type and amount of explosives to be used, including weight of explosives per delay, stemming, critical dimensions and the location and general description of structures to be protected.
- K. Contractor shall complete any blasting within 100 feet of any proposed structure prior to the start of any structure work.
- L. Control blasting by limiting the charge weight per delay to that which produces limited levels of ground vibrations as herein specified. The Contractor shall hire a qualified seismologist or blasting consultant to measure particle velocities and frequencies using seismograph. Peak particle velocity (PPV) and frequency shall be the measures of the level of vibration. Vibration monitoring shall be performed at all structures within 100 feet of the blast.
 - 1. The PPV and frequency limits for structures shall meet the following NH DOT requirements or any additional, more stringent requirements of private utility companies owning and operating utilities within the blasting area.

Type of Structure	Maximum PPV, in/sec	
	Frequencies Below 40 Hz	Frequencies 40 Hz or Greater
Modern Home - Drywall Interior	0.75	2.0
Older Home - Plaster on Wood Lath for Interior Walls	0.50	2.0
Non-residential Structures		2.0
Underground Utilities		2.0

- 2. The Contractor shall not perform blasting within 20 feet of newly placed concrete (within 14 days) without written approval from the Engineer. Blasting greater than 20 feet from newly placed concrete shall meet the following PPV ground vibration limits:

Age of Concrete	Maximum PPV, in/sec
Less than 3 days	No blasting
After 3 days	1.0 in/sec
After 5 days	1.8 in/sec
After 7 days	2.0 in/sec

- 3. If PPV ground vibration limits are exceeded due to blasting operations, an alternate method of rock removal may be required. Any alternate method of rock removal shall be subject to approval by the Engineer.
- M. Drilling and blasting operations are limited to the hours from 7am to 5pm and shall be limited to Monday through Friday. No drilling and/or blasting operation shall occur on federal Holidays.

3.2 PERFORMANCE - CONTROLLED BLASTING AREAS

- A. Blasting in "Controlled Blasting" areas shall meet all of the criteria identified above in addition to the additional criteria identified below. Controlled blasting shall be performed in areas where residences or businesses are within 100 feet of the blast area or as shown on the Drawings or specified herein.
- B. Controlled blasting shall consist of more closely spaced holes with lesser amount of explosives to reduce rock overbreak and vibration.

3.3 DOCUMENTATION AND RECORD KEEPING

- A. Prepare and maintain copies of all blasting logs which shall include, but not be limited to, the following information:
 - 1. Date, time and location of blast.
 - 2. Diagram of blast pattern showing the number of holes with delay number and charge by weight per hole.
 - 3. Blast evaluations.
 - 4. Weather and cloud conditions.
- B. Prepare and maintain vibration measurement records which shall include, but not be limited to, the following information:
 - 1. Identification of instrument and calibration sticker date of < 1 year.
 - 2. Name of instrument operator.
 - 3. Structure at which the geophone is located.
 - 4. Distance and direction of geophone from blast site.
 - 5. Date and time of reading.
 - 6. Type of ground at recording station.
 - 7. Peak particle velocity and frequency for all components as well as resultant.
 - 8. Copies of seismograph readings.
- C. Blast logs and vibration measurement records shall be made available to Owner and/ or Engineer upon request during the project. **Prior to substantial completion, an electronic copy of the logs and vibration records shall be delivered to the Owner.**

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. Work Included:

1. Furnish and apply water or calcium chloride on the road surfaces within the project site, when required to control dust and when directed by the Engineer.
2. When dust control is not included as a separate item in the Contract, the work shall be considered incidental to the appropriate items of the Contract.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Water for sprinkling shall be clean, free of salt, oil, and other injurious matter.
- B. Calcium Chloride shall meet the requirements of AASHTO M144.

PART 3 - EXECUTION

3.1 APPLICATION

A. Water:

1. Apply water with a self-propelled water tanker truck, by methods approved by the Engineer.
2. Use approved equipment including a tank with gauge equipped pump and spray bar.

B. Calcium Chloride:

1. Apply at a rate sufficient to maintain a damp surface but low enough to assure non-contamination of water courses.
2. Apply water prior to calcium chloride addition.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION AND CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide all materials and perform all work necessary to completely regulate traffic in the area of Work.
 - 2. Perform all work in such a manner as to provide safe passage at all times for the public and with a minimum of obstruction to traffic.
 - 3. Do not close roads or streets to passage of the public without the permission of the Owner.
 - 4. When any portion of a travel lane will be obstructed, provide adequate flaggers to ensure safe passage of traffic.
- B. The local police department will decide if safe passage is being maintained and shall have the authority to require the Contractor to take any additional steps necessary to maintain safe passage.

1.2 SCHEDULING WORK

- A. Any proposed detour must be approved by the Lebanon Department of Public Works and the Lebanon Police Department.
- B. Schedule all work so that two adjacent parallel streets are not closed to passage by the public at any one time.
- C. Revise the plan of work if it will create a traffic hazard or an unreasonably long detour.
- D. Do not start work in any new location without the permission of the Engineer.
- E. Notify all police and fire departments of all scheduled detours and when streets are reopened.

1.3 SUBMITTALS

- A. Contractor shall submit a detailed Traffic Control Plan to the Engineer. Approval from the Engineer and Owner is required prior to receiving Notice to Proceed.

PART 2 - PRODUCTS

2.1 WARNING SIGNS AND BARRICADES

- A. Provide adequate warning signs, barricades, signal lights, watchmen and take other necessary precautions for the safety of the public.
- B. Provide and illuminate suitable warning signs to show where construction, barricades or detours exist.
- C. Provide barricades of substantial construction and painted with a finish that increases visibility at night.
- D. Keep signal lights illuminated at all barricades and obstructions from sunset to sunrise.
- E. Maintain all necessary signs, barricades, lights, watchmen and other safety precautions during authorized suspension of the Work, weekends, holidays or other times when the Work is not in progress.

- F. Traffic control signs for construction work shall be located and of the size and type as outlined in Manual on Uniform Traffic Control Devices for Streets and Highways as published by U. S. Department of Transportation.

2.2 FLAG PERSON

- A. A flag person is an individual assigned specifically to the task of directing traffic and is outfitted in the necessary high visibility vest and apparel needed for traffic control. Flag persons shall have STOP/SLOW paddles, wear hardhats and be equipped with two-way radios. Flag persons shall be trained and certified. Flag persons shall be dedicated full-time to that duty and not assigned to any other job, unless traffic control is not needed as determined by the City Engineer.
- B. Flag persons shall be provided by the Contractor.
- C. It is anticipated that flag persons will be required on all streets.

PART 3 - EXECUTION

3.1 DETOURS

- A. Provide, identify and maintain suitable detours when the project, or any part thereof, is closed to public travel.
- B. When the closed part of the project is reopened, restore the detour area and any other disturbed areas to the original condition.

3.2 INCONVENIENCE TO RESIDENTS OF VICINITY

- A. Whenever a traveled way is closed, perform the Work in such a manner that local travel and residents in the vicinity of the Work will be inconvenienced as little as possible.
- B. Allow access to residents and abutting landowners along the project to driveways and other normal outlets from their property.
- C. Lane Closures will be limited to 500' long.

END OF SECTION

SECTION 01710

PROJECT CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Maintain premises, public and private properties free from accumulations of waste, debris, and rubbish, caused by operations.
2. At completion of work, remove waste materials, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces. Leave project clean and ready for use.

1.2 QUALITY ASSURANCE

- ###### A. Requirements of Regulatory Agencies:
- Conduct cleaning and disposal operations in accordance with all applicable local and state laws, ordinances, and code requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- ###### A. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.
- ###### B. Use cleaning materials only on surfaces recommended by cleaning material manufacturers.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Cleaning During Construction:

1. Execute cleaning operations to ensure that buildings, grounds, and public properties are maintained free from accumulations of waste materials and rubbish.
2. Entirely remove and dispose of material or debris during the progress of the work that has washed into or has been placed in watercourses, ditches, gutters, drains, catch basins, or elsewhere as a result of the Contractor's operations.
3. Wet down dry materials and rubbish to lay dust and prevent blowing dust.
4. At reasonable intervals during the progress of work, clean the site and dispose of waste materials, debris, and rubbish.
5. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw material from heights.
6. Vacuum streets at reasonable intervals or as directed by the Engineer.

B. Control of Hazards:

1. Store volatile wastes in covered metal containers, and remove from premises daily.
2. Prevent accumulation of wastes which may create hazardous conditions.
3. Provide adequate ventilation during use of volatile or noxious substances.

- C. Disposal:
1. Do not burn or bury rubbish and waste materials on project site.
 2. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.
 3. Do not dispose of wastes into streams or waterways.
 4. Contractors will require a City issued permit to dispose of material at the City landfill. Disposal and Permit fees are the responsibility of the Contractor. An application is included as Section 01710B.
- D. Final Cleaning:
1. Employ experienced workmen, or professional cleaners, for final cleaning.
 2. Remove grease, dust, dirt, stains, labels, and other foreign materials, from all sight-exposed interior and exterior finished surfaces.
 3. Repair, patch and touch up marred surfaces to specified finishes.
 4. Clean paved surfaces with a vacuum truck.
 5. Rake clean non-paved surfaces of the project site.
 6. Restore to their original condition those portions of the site not designated for alterations by the Contract Documents.

END OF SECTION



CITY OF LEBANON
DEPARTMENT OF PUBLIC WORKS

Solid Waste Division

193 Dartmouth College Highway
Lebanon, NH 03766

Commercial Solid Waste Hauler Permit Application

Hauler Information

Hauler's Name: _____

Business Name: _____

Employer ID: _____

Mailing Address: _____

Phone Number: _____ Fax Number: _____ Email: _____

Vehicle Information (additional vehicles can be attached on separate sheet)

Make: _____ Model: _____ Year: _____

Vehicle Plate Number: _____

Waste Information

Anticipated Service Area: _____

Collection Services Offered: _____

Signature: _____ Date: _____

SW Facility Permit Number (assigned by City Solid Waste Manager): _____

SW Manager Comments: _____

SW Manager Signature: _____ Date: _____

Form Complete: Y/N

Fee: Y/N

Copy Returned to Applicant: Y/N

SECTION 01715

TESTING, CLEANING AND DISINFECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included - Furnish all materials, labor and equipment required to test, clean and disinfect all new facilities to be in contact with potable water. These include:
 - 1. Permanent Services.
 - 2. Temporary water mains and services.
- B. Related Work Specified Elsewhere:
 - 1. Pipe and Pipe Fittings - Section 02610.
 - 2. Cleaning, Testing and Disinfection of Water Mains - Section 02675

1.2 REFERENCE SPECIFICATIONS

- A. AWWA Standard for Disinfecting Water Mains (AWWA C651).
- B. AWWA Standard for Hypochlorites (AWWA B300).

PART 2 - PRODUCTS

2.1 MATERIALS FOR DISINFECTION

- A. Sodium hypochlorite shall meet the requirements of AWWA B300 and shall be suitable for use in potable water.
- B. Water used for cleaning, mixing chlorine solutions and washing down shall be taken from the well on site.

2.2 EQUIPMENT

- A. All equipment used to mix, pump, and convey the chlorine solution for disinfecting shall be dedicated for that purpose. Equipment shall be thoroughly cleaned beforehand and shall not have been used for or in contact with sewage, hazardous chemicals or wastes, etc.

PART 3 - EXECUTION

3.1 CLEANING

- A. All surfaces shall be cleaned by high pressure water jet, sweeping, scrubbing or other equally effective means. All water, dirt and foreign material accumulated in this cleaning operation shall be removed.

3.2 TESTING

- A. All piping, etc. shall be pressure tested as per Section 02610 and checked for proper operation and function.

END OF SECTION

SECTION 01720

PROJECT RECORD DOCUMENTS AND AS-BUILT SURVEY

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. The Contractor is responsible for preparation of project record documents. The Contractor shall keep accurate record documents for all additions, substitutions of material, variations in work, and any other additions or revisions to the Contract.
 - 2. The Contractor shall provide an as-built survey of the project area, including the location and elevation of all utilities and related appurtenances. This includes survey conducted during construction to obtain information for buried items installed and existing infrastructure to remain in place.
 - 3. The Contractor shall provide record documents in digital AutoCAD and ESRI GIS in accordance with this specification.
- B. Related Work Specified Elsewhere:
 - 1. Shop Drawings, Project Data, and Samples are specified in Division 0 and Section 01340, Submittals.

1.2 MAINTENANCE OF DOCUMENTS

- A. Maintain at job site, one copy of:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Reviewed Shop Drawings
 - 5. Change Orders
 - 6. Any other modifications to the Contract
 - 7. Field Test Reports
- B. Store documents in files and racks specifically identified for this use, which are apart from documents used for construction.
- C. File documents in a logical manner indexed for easy reference.
- D. Maintain documents in clean, dry, legible condition.
- E. Do not use record documents for construction purposes.
- F. Make documents available at all times for inspection by the Engineer and Owner, and by the end of the project, transmit these documents to the Engineer.
- G. Documents (redlines) shall be updated at least weekly, prior to the weekly coordination meeting.

1.3 RECORDING

- A. General Field Recording Issues:
 - 1. All ties should be taken from existing, permanent features such as utility poles, corners of houses and hydrants. Porches, sheds or other house additions should be avoided for they could be torn down. A minimum of two ties should be taken.
 - 2. Stations should be recorded to the nearest foot.
 - 3. Inverts should be recorded to the nearest hundredth of a foot.

4. Elevations should be recorded to the nearest hundredth of a foot.
- B. Legibly mark Contract Drawings to record existing utilities and actual construction of all work, including but not limited to the following (where applicable):
 1. Existing Utilities

Water mains and services, water main gate valves, sewer mains and services, storm drains, culverts, steam lines, gas lines, tanks and other existing utilities encountered during construction must be accurately located and shown on the Drawings. In congested areas supplemental drawings or enlargements may be required.

 - a. Show any existing utilities encountered in plan and profile and properly labeled showing size, material and type of utility. Ties should be shown on plan. Utility should be drawn to scale in section (horizontally and vertically) and an elevation should be called out to the nearest hundredth of a foot.
 - b. When existing utility lines are broken and repaired, ties should be taken to these locations.
 - c. If existing water lines are replaced or relocated, document the area involved and pipe materials, size, etc. in a note, and with ties.
 2. Manholes, Catch Basins and other structures.
 - a. Renumber structure stationing to reflect changes.
 - b. Show ties to center of structure covers or hatches.
 - c. In general, show inverts at center of structures. However, for manholes with drop structures, or steep channels (greater than 0.2' change on slope), show inverts at face of manhole.
 - d. Show inverts for other structures at the face of the structure.
 - e. Draw any new structures that are added on plan and profile.
 - f. Show any field or office redesigns.
 - g. Redraw plan if the structure's location is moved more than 5 feet in any direction. [Note: It is important to show existing utilities, as outlined in Paragraph 1 above, especially if they were one reason for relocating the sewer, manholes and other structures.]
 - h. Redraw profile if inverts changed by more than 6 inches.
 3. Gravity Sewer Line
 - a. Change sewer line slopes indicated on Drawings if inverts are changed.
 - b. Draw any new gravity lines that are added on plan and profile.
 - c. Show any field or office redesigns.
 - d. Redraw the sewer line profile if manhole inverts are redrawn.
 - e. Redraw the sewer line on plan corresponding to relocated manholes.
 4. Water Mains and Force Mains
 - a. Show the location of all valves, bends (horizontal and vertical), tees and other fittings. The use of thrust blocks should be recorded.
 - b. Revise elevations indicated on the Drawings to reflect actual construction.
 5. House Services
 - a. Draw all house services (even to empty lots) on plan, and show ties.
 - b. Show ties or distances to wyes from manhole.
 - c. Show riser heights in the profile.
 - d. The Wright-Pierce "Sanitary Sewer Service Location" forms shall be used to record sewer service information. The Wright-Pierce

Water Service Location" forms shall be used to record water service information. A copy of these forms should be provided to the Owner, along with the Record Drawing Set. The information on these forms shall agree with the information provided in the as-built survey.

6. Ledge
 - a. Ledge profiles are to be shown. Note whether the plotted ledge profile reflects undisturbed or expanded conditions.
 7. Roads
 - a. Show centerline road profile and level spot elevations.
 - b. Show pavement widths.
 - c. On road cross sections, show the pavement cross slope.
 - d. Show all deviations from the design plans.
 8. Other
 - a. Additional utility information not included in paragraphs 1.3.B.1-7 but required to be shown on the record drawings and included in the digital AutoCAD and ESRI GIS format are listed in Tables 1, 2 and 3.
- C. Specifications and Addenda - Legibly mark up each section to record:
1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 2. Changes made by Change Order, Field Order, or other method.

1.4 QUALITY ASSURANCE

- A. The as-built survey will be prepared on NH State Plane Coordinate NAD83 (horizontal) and NAVD88 (vertical).
- B. All dimensions and elevations (horizontal and vertical) shall be accurate to within a one-tenth of a foot.

1.5 SUBMITTALS

- A. At the completion of the project, deliver hard copy record documents to the Engineer.
- B. One copy each to the Owner and Engineer of a paper copy of the as-built survey.
- C. Digital survey data in AutoCAD and ESRI GIS format, as described below.
- D. Accompany submittals with transmittal letter, in duplicate, containing:
 1. Date, project title and number.
 2. Contractor's name and address.
 3. Title and number of each record document with certification that each document is completed and accurate.
 4. Signature of Contractor, or Contractor's authorized representative.
- E. Failure to supply all information as specified in Part 1.3 may result in additional retainage from monthly partial payment requests, and in non-approval of final payments of the Contract and/or if contract time has elapsed, this shall be grounds for the enactment of the liquidated damages as specified.

PART 2 - PRODUCTS

None

PART 3 - EXECUTION

3.1 AS-BUILT SURVEY PERFORMANCE

From established survey control, and construction baseline as shown on the drawings, conduct a survey of the project area during construction as needed to obtain information of buried and above ground items. Survey shall include information outlined in Section 1.3.B and the following:

- A. Actual road alignments; walls; fence and guardrail; existing, new and relocated utility poles; traffic and warning sign locations; crosswalks, parking space and stop bar locations; retaining walls and foundations drains; all underground and overhead utility poles and lines within the project limits, including those installed on private property; all other new features and appurtenances and those existing features and appurtenances changed as a result of this project shall be included in the survey.

3.2 FORMAT FOR DELIVERABLES

- A. AutoCAD digital survey data for the as-built survey shall include:
 - 1. Copy of field notes and sketches of the survey.
 - 2. Paper copy of description of layers.
 - 3. Paper copy of base map.
 - 4. Provide digital information on compact disk with paper copy printout; information shall be provided in .DWG format (AutoCAD 2011 or earlier). Data shall be provided in 3D format (northing, easting, elevation, or Y, X, Z).
 - 5. Drawing scale: Minimum one (1) inch = twenty (20) feet.
 - 6. Preferred layering:
 - a. Repetitive symbols made into blocks, and defined on layer 0.
 - b. All entities shall be drawn “by layer” as opposed to individual properties.
 - c. Use one linetype and one color per layer as opposed to numerous colors/linetypes on a single layer.
 - d. Preface each layer with the initials of the Survey company or Contractor (example, Survey Company: SC “layername”).
 - e. Database text annotation will be coordinated so the text will be right-reading.
 - f. Place text on separate layers.
- B. ESRI GIS digital survey data for the as-built survey shall include:
 - 1. All lines and points shall be accompanied by the attributes listed in Tables 1, 2, and 3 with consistent formatting and punctuation (e.g. 6, 8, 12, not 6”, 8, 10”, 12), and shall be provided in an ESRI geodatabase that may be easily imported by the Owner into their GIS system.

Table 1
Lebanon Contract 12
Sewer - GIS Attribute Table

Field	Description
Casing	
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the asset
MATERIAL	Material the casing is manufactured with
RECORDLENG	Recorded length of the casing
CASEINVUP	Invert elevation of the casing (upstream)
CASEINVDOWN	Invert elevation of the casing (downstream)
Clean - Out	
FACILITYID	Locally assigned Facility Identifier = "CO"
ACCESSMAT	Access material for lid or cover
CORIM	Rim elevation of the clean out
COINV	Invert elevation of the clean out
INTDEPTH	Interior Depth
INSTALLDATE	The date the asset was installed
DEVICETYPE	The type of cleanout
ACCESSDIAM	Access diameter for the clean out
Gravity Main	
	Snap Gravity Lines to Sewer Manholes
FACILITYID	Locally assigned Facility Identifier - US/DS
INSTALLDATE	The date the asset was installed
MATERIAL	Material the asset is manufactured with
DIAMETER	The diameter of the asset
MAINSHAPE	The shape of the gravity main
FROMMH	The upstream manhole
TOMH	The downstream manhole
WATERTYPE	Indicates the type of water in the pipe = "Sewer"
DOWNELEV	The downstream pipe elevation
UPELEV	The upstream pipe elevation
SLOPE	The slope of the pipe from outside face of structure
CALCPIPELENGTH	The pipe length used to calculate slope
Gravity Main Misc Point	
INSTALLDATE	The date the asset was installed
INVERTELEV	Invert elevation
MATERIAL	Material the asset is manufactured with
WATERTYPE	Indicates the type of water in the pipe = "Sewer"
DIAMETER	The diameter of the asset
FACILITYID	Locally assigned Facility Identifier
Lateral Lines (separated & combined)	

Table 1
Lebanon Contract 12
Sewer - GIS Attribute Table

Field	Description
INSTALLDATE	The date the asset was installed
MATERIAL	Material the asset is manufactured with
DIAMETER	The diameter of the asset
WATERTYPE	Indicates the type of water in the pipe = "Sewer"
Lateral Line Points	
INSTALLDATE	The date the asset was installed
MATERIAL	Material the asset is manufactured with
DIAMETER	The diameter of the asset
WATERTYPE	Indicates the type of water in the pipe = "Sewer"
ELEV	Elevation at the top of the asset
TYPE	Type of Asset
Sewer Manholes	
	• Snap Gravity Lines to Sewer Manholes
FACILITYID	Locally assigned Facility Identifier
INSTALLDATE	The date the asset was installed
HIGHELEV	High pipe elevation inside manhole - for drop
DEPTH	The depth of the manhole
INVERTELEV1	Invert elevation 1
INVERTELEV2	Invert elevation 2
INVERTELEV3	Invert elevation 3
RIMELEV	The elevation of the manhole rim
CVTYPE	The type of sewer manhole cover
WALLMAT	The manhole wall material = Brick, Block, or Concrete
MHTYPE	The type of manhole - Size and Shape
CONDITION	The condition of the asset = Excellent
GPSDATE	Date the feature was located with GPS
WATERTYPE	Indicates the type of water in the pipe = "Sewer"

Table 2
Lebanon Contract 12
Water - GIS Attribute Table

Field	Description
Abandoned Line	
LINETYPE	The type of abandoned line = Water
ABANDATE	The date the asset was abandoned
MATERIAL	Material the asset is manufactured with
DIAMETER	The diameter of the pipe

Table 2
Lebanon Contract 12
Water - GIS Attribute Table

Field	Description
Water Casings	
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the asset
MATERIAL	Material the casing is manufactured with
RECORDLENG	Recorded length of the casing
CASEINVUP	Invert elevation of the casing (upstream)
CASEINVDOWN	Invert elevation of the casing (downstream)
Control Valve (control mechanism such as blowoff or relief)	
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the pipe the valve is attached to
VALVETYPE	Type of control valve
ELEV	Elevation at the top nut of valve
Curb Stop Valve (control flow to lateral or service connection)	
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the pipe the valve is connected to
VALVETYPE	Type of curb stop valve
NORMALLYOPEN	Flag to indicate if the device is normally open = Open
TURNSTOCLOSE	TurnsToClose = Left and # of turns
OPERABLE	Indicates if the asset can be operated = Yes
CURROPEN	Flag to indicate if the device is currently open = Open
ELEV	Elevation of top of pipe at curb stop
Fitting (features that connect segments of pipes)	
FACILITYID	Locally assigned Facility Identifier
INSTALLDATE	The date the asset was installed
FITTINGTYPE	The type of fitting
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
LASTUPDATE	The date the feature was last updated in the maintenance database
MAINLATERAL	Indicates whether it is a main, lateral, or hydrant lateral fitting
ELEV	Elevation at the top of fitting
Hydrants	
INSTALLDATE	The date the asset was installed
MANUFACTURER	The manufacturer of the hydrant
OPERABLE	Indicates if the hydrant can be operated = Yes
ACTIVEFLAG	Indicates if the feature is in use/active = Active
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
ELEV	Elevation at the top of vertical bend of hydrant
Lateral Lines	

Table 2
Lebanon Contract 12
Water - GIS Attribute Table

Field	Description
INSTALLDATE	The date the asset was installed
MATERIAL	Material the lateral is manufactured with
DIAMETER	The diameter of the lateral
WATERTYPE	Indicates the type of water in the pipe = Water
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
Lateral Line Points	
INSTALLDATE	The date the asset was installed
MATERIAL	Material the lateral is manufactured with
DIAMETER	The diameter of the lateral
WATERTYPE	Indicates the type of water in the pipe = Water
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
ELEV	Elevation at the top of the asset
Water Mains	
INSTALLDATE	The date the asset was installed
MATERIAL	Material the main is manufactured with
DIAMETER	The diameter of the main
WATERTYPE	Indicates the type of water in the pipe = Water
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
Water Points	
CADID	The CAD Id from the plans
ELEVATION	Elevation of point - Top of Pipe
INSTALLDAT	The date the asset was installed
DOWNELEV	The downstream pipe elevation
MATERIAL	Material the main is manufactured with
DIAMETER	The diameter of the main
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
NOTES	Any information about the point
WATERTYPE	Indicates the type of water in the pipe = Water
Water System Valves	
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the asset
VALVETYPE	Type of system valve = Gate or Butterfly
VALVEMAN	Manufacturer of valve
BYPASSVALVE	Indicates if this is a bypass valve = Yes or No
CLOCKTOCLOSE	Indicates if the valve turn direction = Left to close

Table 2
Lebanon Contract 12
Water - GIS Attribute Table

Field	Description
NORMALLYOPEN	Flag to indicate if the device is normally open = Open
TURNSTOCLOSE	Number of turns to close
OPERABLE	Indicates if the hydrant can be operated = Yes
HYDRFLAG	Indicates if this is a hydrant valve = Yes or No
CURROPEN	Flag to indicate if the device is currently open = Open
MAINLATERAL	Indicates whether the valve is on a main, lateral, or hydrant lateral
ELEV	Elevation at the top nut of valve

Table 3
Lebanon Contract 13
Drainage - GIS Attribute Table

Field	Description
Casing	
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the asset
MATERIAL	Material the casing is manufactured with
RECORDLENG	Recorded length of the casing
CASEINVUP	Invert elevation of the casing (upstream)
CASEINVDOWN	Invert elevation of the casing (downstream)
Culverts	
INSTALLDATE	The date the asset was installed
MATERIAL	Material the asset is manufactured with
DIAMETER	The diameter of the asset
MAINSHAPE	The shape of the culvert
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
DOWNELEV	Downstream invert elevation
UPELEV	Upstream invert elevation
SLOPE	Culvert slope
Discharge Point	
DISCHRGTYP	The type of stormwater discharge = Stormwater
PERMIT	Permit Name
PERMITID	Unique permit identifier
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the asset
Stormwater Gravity Main	
	Snap Stormwater Gravity Lines to Drainage MH
INSTALLDATE	The date the asset was installed

Table 3
Lebanon Contract 13
Drainage - GIS Attribute Table

Field	Description
MATERIAL	Material the asset is manufactured with
DIAMETER	The diameter of the asset
MAINSHAPE	The shape of the gravity main
FROMMH	The upstream structure
TOMH	The downstream structure
OWNEDBY	Indicates which organization owns the asset = City
MAINTBY	Indicates which organization maintains the asset = City
DOWNELEV	The downstream elevation where the pipe meets the structure
UPELEV	The upstream elevation where the pipe meets the structure
SLOPE	The slope of the main from outside face of structure
CALCPIPELENGTH	The pipe length used to calculate slope
Inlet (typically found along side of roads or in drainage swales)	
INSTALLDATE	The date the asset was installed
INLETTYPE	The type of stormwater inlet = Pipe, Beehive, or Headwall
ACCESSDIAM	Access diameter for the inlet
INVERTELEV	Invert elevation
ACCESSMAT	Access material for lid or cover
ACCESSTYPE	Method for accessing the opening = Remove Grate
Manhole and Catch Basin	
	Snap Stormwater Gravity Lines to Drainage MH
FACILITYID	Locally assigned Facility Identifier
INSTALLDATE	The date the asset was installed
HIGHELEV	High pipe elevation inside manhole - for drops
INVERTELEV1	Invert elevation 1
INVERTELEV2	Invert elevation 2
INVERTELEV3	Invert elevation 3
INVERT	The depth of the structure from rim to bottom
RIMELEV	The elevation of the manhole rim
CVTYPE	The type of stormwater structure cover
WALLMAT	Wall Material = Brick, Block, or Precast Concrete
MHTYPE	The type of structure = Concentric, Eccentric, or Flat Slab
CONDITION	The condition of the asset = Excellent
GPSDATE	Date the feature was located with GPS
MAINTBY	Indicates which organization maintains the asset = City
Network Structure - (Pump Stations, etc)	
FACILITYID	Locally assigned Facility Identifier
INSTALLDATE	The date the asset was installed
OPDATE	Date when the facility was put into service

Table 3
Lebanon Contract 13
Drainage - GIS Attribute Table

Field	Description
STRUCTTYPE	Type of Sewer Network structure
Misc Point - Storm	
FACILITYID	Locally assigned Facility Identifier
INSTALLDATE	The date the asset was installed
MATERIAL	Material the asset is manufactured with
DIAMETER	The diameter of the asset
INVERTELEV	Invert elevation
System Valves	
INSTALLDATE	The date the asset was installed
DIAMETER	The diameter of the asset
VALVETYPE	Type of control valve
ELEV	Elevation at the top nut of valve

END OF SECTION

DIVISION 02

SITE WORK

SECTION 02110

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Clearing includes, but is not limited to, removal of trees, brush, stumps, wooded growth, grass, shrubs, poles, posts, signs, fences, culverts and other vegetation and minor structures; the protection of designated wooded growth; the storage and protection of minor structures and materials which are to be replaced; and the disposal of non-salvageable structures and materials, and necessary preliminary grading.

B. Limits of Work:

1. Perform clearing and grubbing work within the areas required for construction, or as shown on the Drawings, to a depth of 12 inches below the existing grade.
2. Perform additional clearing and grubbing work within areas and to depths which, in the opinion of the Engineer, interfere with excavation and/or construction, or are otherwise objectionable.

C. Work Not Included: Clearing and grubbing work performed for the convenience of the Contractor will not be considered for payment.

1.2 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies: Dispose of combustible material by burning only when permitted by and in accordance with all applicable local and state laws, ordinances and code requirements.

B. Remove and dispose of non-salvageable structures and material in accordance with all applicable local and state laws, ordinances and code requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide all materials required to complete the work.

B. All timber and wood shall become the property of the Contractor unless other agreements are made between the Owner and the Contractor.

C. Repair any damage to structures to the complete satisfaction of the Owner and Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Carefully preserve and protect from injury all trees and/or shrubs not to be removed. Prior to removing trees, perform a walk through with the Owner's Representative to identify and mark trees that are to be removed.

B. Right-of-way:

1. Where excavation is required on public or private rights-of-way containing trees, shrubs, other growth, or any structure or construction,

obtain the Engineer's direction concerning the extent to which such obstacles can be cleared or stripped prior to performing the Work.

2. In all rights-of-way, remove only those particular growths or structures which are, in the opinion of the Engineer, essential for construction operations.
3. All other removals or damage shall be replaced or restored at the Contractor's expense.

3.2 PERFORMANCE

A. Clearing:

1. Remove and dispose of all trees, brush, slash, stubs, bushes, shrubs, plants, debris and obstructions within the area to be cleared, except any areas that may be designated as "Selective Clearing", and except as otherwise shown on the Drawings or as directed by the Engineer.
2. Remove all stumps unless otherwise directed by the Engineer.
3. Dispose of material to be removed daily as it accumulates.
4. Take special care to completely dispose of all elm trees and elm tree branches immediately after cutting either by burial in approved locations or, when permitted, by burning in areas well removed from standing elm growth.

B. Protection of Wooded Growth:

1. Fell trees toward the center of the area being cleared to protect trees and shrubs to be left standing.
2. Cut up, remove and dispose of trees unavoidably falling outside the area to be cleared.
3. Employ skilled workmen or tree surgeons to trim and repair all trees that are damaged but are to be left standing.

C. Selective Clearing:

1. When shown on the Drawings and when directed by the Engineer, perform selective clearing work to preserve natural tree cover.
2. Perform selective clearing work only under the direction and supervision of the Engineer.
3. Remove all dead and uprooted trees, brush, roots and other material which, in the opinion of the Engineer, are objectionable.
4. Cut flush with the ground and remove only those trees indicated by the Engineer.
5. Employ skilled workmen or tree surgeons to carefully trim all branches requiring cutting on trees to be left standing and to paint all cut surfaces with an approved bituminous paint.
6. Paint tree roots which are cut and are to be left exposed to the weather with an approved bituminous paint.

D. Grubbing:

1. Perform grubbing work beneath new roads, driveways, walks, seeded areas and other areas and as directed by the Engineer.
2. Grub out all sod, vegetation and other objectionable material to a minimum depth of 12 inches below the existing grade.
3. Completely remove all stumps, including major root systems.

E. Disposal:

1. Remove from the site and dispose of material not being burned.
2. Provide an approved disposal area unless otherwise specified.

- F. Burning:
1. Dispose of combustible materials by burning only if approved by local officials, state officials, and Engineer.
 2. Employ competent workmen to perform burning work in such a manner and at such locations that adjacent properties, trees and growth to remain, overhead cables, wires and utilities will not be jeopardized.
 3. Do not leave fires unguarded.
 4. Do not burn poison oak, poison ivy or other plants of similar nature.
 5. Do not use tires or other combustible waste material to augment burning.
 6. Burn combustible materials daily as the work progresses.
 7. The Contractor shall be responsible for all damage caused by burning and shall be responsible for obtaining all necessary permits for burning.

3.3 REPLACEMENT OF MATERIALS

- A. Paving, Curbing and Miscellaneous Material:
1. Remove all paving, subpaving, curbing, gutters, brick, paving block, granite curbing and minor structures that are over the area to be filled or excavated.
 2. Remove and replace bituminous asphaltic and Portland cement concrete in accordance with the appropriate sections of these Specifications.
 3. Properly store and preserve all material to be replaced in a location approved by the Engineer.
- B. Shrubs and Bushes: Remove, store, and replace ornamental shrubs and bushes to be preserved in accordance with accepted horticultural practices.
- C. Topsoil: When applicable, carefully remove, store, and protect topsoil in accordance with the appropriate section of this division.
- D. Responsibility: Replace, at no additional cost to the Owner, materials lost or damaged because of careless removal or neglectful or wasteful storage, disposal or use of these materials.

END OF SECTION

SECTION 02115

STRIPPING AND STOCKPILING TOPSOIL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Segregate topsoil approved by the Engineer prior to excavation, trenching and grading operations and stockpile it for use in the work.
- B. Related Work Specified Elsewhere (When Applicable): Demolition, clearing, grading, embankment, excavation and landscaping are specified in the appropriate sections in this division.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil shall consist of friable loam of at least two percent decayed organic matter (humus), free of subsoil, and reasonably free of clay lumps, brush, roots, weeds, and other objectionable vegetation, stones and similar objects larger than one (1) inch in any dimension, litter and other materials unsuitable or harmful to plant growth. It shall contain no toxic materials.
- B. The quality of the topsoil material to be used shall be subject to approval by the Engineer.

PART 3 - EXECUTION

3.1 PERFORMANCE

- A. Remove topsoil from the areas that are likely to be disturbed as a result of construction operations to a depth based on the soil profile, as approved by the Engineer.
- B. Remove topsoil from all designated areas prior to the performance of normal excavation.

3.2 STORAGE

- A. Transport topsoil and deposit in storage piles convenient to the areas which are subsequently going to receive the application of topsoil.
- B. Stockpile topsoil separate from other excavated materials in areas approved by the Engineer.
- C. Take all necessary precautions to prevent other excavated material and objectionable material from becoming intermixed with the topsoil before, during and after stripping and stockpiling operations.
- D. Neatly trim and grade stockpiles to provide drainage from surfaces and to prevent depressions where water may become impounded.
- E. Construct temporary erosion control devices for all stockpiled material, subject to the Engineer's approval.
- F. All loam stripped and stockpiled shall be immediately seeded with 70% Domestic/30% Perennial Rye Grass.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The Work described by this Section consists of all earthwork encountered and necessary for construction of the project as indicated in the Contract Documents, and includes but is not limited to the following:
 - 1. Excavation
 - 2. Backfilling and Filling
 - 3. Compaction
 - 4. Embankment Construction
 - 5. Grading
 - 6. Providing soil material as necessary
 - 7. Disposal of excess suitable material and unsuitable materials
 - 8. Protection and fertilizing of existing trees and shrubs that are within the limits of work
- B. Related Work Specified Elsewhere: (When Applicable)
 - 1. The use of explosives is specified in the General Conditions section of this Contract, and in Division 1.
 - 2. Traffic Regulation is specified in Division 1.
 - 3. Clearing and Grubbing, Dewatering, Filter Fabric, Temporary Erosion Control, Stripping and Stockpiling of Topsoil, Sheeting, and Landscaping are specified in the appropriate sections of this Division.
 - 4. Section 01400 - Quality Control.
 - 5. Pipe, fittings and valves are specified in Division 2.
 - 6. Section 02650 Buried Utility Markings.
 - 7. Section 02513, Bituminous Concrete Paving
 - 8. Section 02501, Removal of Pavement

1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 - 1. All work shall be performed and completed in accordance with all local, state and federal regulations.
 - 2. The General Contractor shall secure all other necessary permits, including an excavation permit from the City, unless otherwise indicated from, and furnish proof of acceptance by, the municipal and state departments having jurisdiction and shall pay for all such permits, except as specifically stated elsewhere in the Contract Documents.
- B. Line and Grade:
 - 1. The Contractor shall establish the lines and grades in conformity with the Drawings and maintain same to properly perform the work.
- C. Testing Methods:
 - 1. Gradation Analysis: Where a gradation is specified the testing shall be in accordance with ASTM C117 and ASTM C136 (latest revision).

2. Compaction Control:

- a) Unless otherwise indicated, wherever a percentage of compaction for backfill is indicated or specified, it shall be the in-place density divided by the maximum density and multiplied by 100. The maximum density shall be the density at optimum moisture as determined by ASTM Standard Methods of Test for Moisture-Density Relations of Soil Using 10 lb. Hammer and 18 in. Drop, Designation D1557 (Modified Proctor), latest revision, unless otherwise indicated.
- b) The in-place density shall be determined in accordance with ASTM Standard Method of Test for Density of Soil in Place by the Sand Cone method, Designation D1556, (latest revision) or nuclear method Designation D6938.
- c) Wherever specifically indicated, maximum density at optimum moisture may be determined by ASTM Standard Methods of Test for Moisture Density Relations of Soils, ASTM D698 (Standard Proctor).
- d) An Independent Testing Laboratory will be retained by the Owner to conduct laboratory and field soil sampling and testing, and to observe earth work and foundation construction activities. Laboratory testing will consist of sieve analyses, natural water content determinations, and compaction tests. Field testing will consist of in-place field density tests and determination of water contents.
- e) The Contractor may retain their own testing agency for quality assurance purposes.

1.3 SUBMITTALS

- A. Collection of samples and testing of all materials for submittals shall be performed by the Independent Testing Laboratory and paid for by the Contractor until the materials are approved by the Owner or Engineer.
- B. Submit test results in accordance with the procedure specified in the General and Special Conditions.
- C. Submit test results (including gradation analysis) and source location for all borrow material to be used at least 10 working days prior to its use on the site. Contractor shall identify and provide access to borrow sites.
- D. Submit moisture density curve for each type of soil (on site or borrow material) to be used for embankment construction, trench backfill or fill beneath structures or pavement.
- E. Submit sample of impervious Dam material to the Independent Testing Laboratory for analysis.

1.4 TESTS

The Independent Testing Laboratory shall conform to the following procedures and standards:

- A. Submit test results in accordance with the procedure specified in the General and Supplementary Conditions.
- B. All testing shall be performed by a qualified Independent Testing Laboratory acceptable to the Engineer and Contractor at the Owner's expense unless otherwise indicated (see Section 01400 - Quality Control).

- C. Field density tests on embankment materials shall be taken on every 200 cubic yards of embankment material.
- D. Paved Areas and Structure Subgrade: Make at least one field density test of subgrade for every 5,000 sq. ft. of paved area. In each compacted fill layer, make one field density test for every 5,000 sq. ft. of paved area.
- E. Trenches: A Field density test in trenches shall be taken at 150 linear foot intervals on every third lift.
- F. Foundation Wall Backfill: Take at least one (1) field density test per lift per wall at locations and elevations designated by the Engineer.
- G. In addition to the above tests, the Independent Testing Laboratory will perform additional density tests at locations and times requested by the Engineer.
- H. Additional density testing will be required by the Engineer if the Engineer is not satisfied with the apparent results of the Contractor's compaction operation.
 - 1. If the test results fail to meet the requirements of these specifications, the Contractor shall undertake whatever action is necessary, at no additional cost to the Owner, to obtain the required compaction. The Retesting will be paid for by Owner if the test passes, otherwise the Contractor shall pay for the retests. The cost of retesting will be determined by Engineer and Owner will invoice Contractor for this cost. If unpaid after 60 days, the invoice amount for retesting will be deducted from the Contract Price. No allowance will be considered for delays in the performance of the work.
 - 2. If the test results pass and meet the requirements of these Specifications, the cost of the testing service will be borne by the Owner, but no allowance will be considered for delays in the performance of the work.

1.5 JOB CONDITIONS

- A. Site Information:
 - 1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner and Engineer will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data are made available for the convenience of Contractor.
 - 2. Additional test borings and other exploratory operations may be made by Contractor at no additional cost to Owner.
- B. Existing Utilities and Structures: The locations of utilities and structures shown on the Drawings are approximate as determined from physical evidence on or above the surface of the ground and from information supplied by the utilities. The Engineer in no way warrants that these locations are correct. It shall be the responsibility of the Contractor to determine the actual locations of any utilities or structures within the project area.

PART 2 - PRODUCTS

2.1 SOIL MATERIAL

- A. Aggregate Roadway Base:
 - 1. Shall be crushed stone (NHDOT Item #304.4, Crushed Stone, Fine) of hard durable particles free from vegetable matter, lumps or balls of clay and other deleterious substances. At least 50% of the material retained on the 1-inch sieve shall have a fractured face.

The gradation of the material shall meet the following grading requirements:

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieves</u>
2 inch	100
1-1/2 inch	85-100
3/4 inch	45-75
No. 4	10-45
No. 200	0-5 (in total sample)

2. Reclaimed Stabilized Base. The material shall consist of existing pavement or offsite material, blended with the underlying gravel and/or additional stone as required. Reclaimed Stabilized base shall have a minimum bitumen content of 1.5 percent and conform to the following gradation:

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieves</u>
3 inch	100
1 1/2"	80-100
3/4 "	55-90
No. 4	40-70

Construction shall conform to the requirement of NHDOT STANDARD SPECIFICATION 306.3.1 through 306.3.12.

- B. Aggregate Road Subbase: Shall be crushed stone (NHDOT Item #304.5, Crushed Stone, coarse) consisting of hard durable particles which are free from vegetable matter, lumps or balls of clay and other deleterious substances. The maximum size of stone particles shall not exceed three-fourths of the compacted thickness of the layer being placed but in no case larger than 3.5 inches. The gradation of the material shall meet the grading requirements of the following table:

<u>Sieve Designation</u>	<u>Percentage by Weight Passing Square Mesh Sieves</u>
3-1/2 inch	100
3 inch	85-100
1-1/2 inch	60-90
3/4 inch	40-70
No. 4	10-45
No. 200	0-5 (in total sample)

- C. Crushed $\frac{3}{4}$ -inch Hard Pack: Shall consist of crushed, angular aggregate to be used in gravel driveways and parking areas, and as designated by the Engineer.

Sieve <u>Designation</u>	Percent by Weight <u>Passing Square Mesh Sieves (unwashed)</u>
1 inch (25 mm)	100
$\frac{3}{4}$ inch (19 mm)	97-100
$\frac{3}{8}$ inch (9.5 mm)	69-75
No. 4 (4.75 mm)	47-53
No. 16 (1.18 mm)	23-29
No. 50 (.30 mm)	14-21
No. 200	10-17

- D. Common Borrow: Shall consist of approved material required for the construction of the work where designated. Common borrow shall be free from frozen material, perishable rubbish, peat, organic, and other unsuitable material.

Sieve <u>Designation</u>	Percentage by Weight <u>Passing Square Mesh Sieves</u>
6 inch	100
No. 200	0-50

- E. Granular Borrow: used for Trench backfill material above the initial backfill material and below the roadway sub-base: Shall be a uniform material consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, containing angular pieces, as those are which come from a mechanical crusher. Acceptable sand may be blended as necessary to obtain the proper gradation for the fine aggregate portion. Gradation requirements shall be as follows:

Sieve <u>Designation</u>	Percent by Weight <u>Passing Square Mesh Sieve</u>
6"	100
$\frac{1}{4}$ "	< 70% of that portion passing a 3" sieve
No. 200	< 5% of that portion passing a 3" sieve

- F. Crushed and/or Screened Stone (Pipe bedding and initial backfill): Shall be a well graded stone consisting of clean, hard, and durable particles or fragments, free from vegetable or other objectionable matter, meeting the following gradation requirements (ASTM C33-03, NHDOT #67 graded coarse aggregate):

Sieve <u>Designation</u>	Percent by Weight <u>Passing Square Mesh Sieve</u>
1 inch	100
$\frac{3}{4}$ inch	90-100
$\frac{3}{8}$ inch	20-55
No. 4	0-10
No. 8	0-5

- G. Sand (Fine aggregate for Portland Cement Concrete): Sand for use as concrete aggregate shall conform to the requirement for fine aggregate in ASTM Standard Specifications for Concrete Aggregate, Designation C-33, and will meet the following requirements:

Fineness Modules: 2.6 to 3.0

<u>Sieve Designation</u>	<u>Percent by Weight Passing Square Mesh Sieve</u>
3/8"	100
No. 4	95-100
No. 16	50-85
No. 50	10-30
No.100	2-10
No.200	0-5

- H. Coarse Aggregate (for Portland Cement Concrete) shall consist of a well graded crushed stone or washed gravel conforming to the requirements of ASTM Specification C-33 and the following requirement:

	<u>Percent Passing</u>		
<u>Sieve</u>	<u>No. 67 (3/4")</u>	<u>No. 57 (1")</u>	<u>No. 8 (3/8")</u>
1 1/2"	--	100	--
1"	100	95-100	--
3/4 "	90-100	--	--
1/2 "	--	25-60	100
3/8 "	20-55	--	85-100
No. 4	0-10	0-10	10-30
No. 8	0-5	0-5	0-10

- I. Sand for backfill above the wrapped pipe bedding and pipe, where specified, over pipe shall conform to the following requirements:

<u>Sieve</u>	<u>Percent passing by weight</u>
3/8	100
No. 4	95-100
No. 16	50-85
No. 50	10-30
No. 100	2-10
No. 200	0-5

- J. Impervious Dam Material: The impervious dam material shall be uniform natural or selected cohesive soil with minimum of 30 percent of the material passing a No. 200 sieve. It shall not contain vegetation, masses of roots, individual roots larger than 6 in. long or 1/8 in. in diameter or other porous or organic matter.
- K. Select Fill/Structural Fill: Shall consist of well graded granular material, free of organic material, loam, wood, trash, snow, ice, frozen soil and other objectionable

material and having no rocks with a maximum of over 4" diameter and meeting the following gradation requirements.

<u>Sieve</u>	<u>Percent passing by weight</u>
3"	100
1½"	90-100
½ "	25-90
No. 40	0-30
No. 200	0-5

- L. Underdrain bedding and initial trench Backfill Material:
1. Free from organic matter
 2. Gradations

<u>Sieve</u>	<u>Percent passing by weight</u>
1"	95-100
½ "	75-10
No. 4	50-100
No. 20	15-80
No. 50	0-15
No. 100	0-10

3. Filter Fabric in accordance with SECTION 02260.
4. Shall conform to AASHTO T27.

2.2 CONCRETE

- A. If concrete is required for excess excavation, provide 3,000 psi concrete complying with requirements of Section 03300.

2.3 FILTER FABRIC

- A. If filter fabric is required, refer to Section 02260.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions under which excavating, backfilling, filling, compaction and grading are to be performed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Identify, protect, and fertilize those trees as noted on the plans to be protected.

3.2 EXCAVATION

- A. General:
 1. Excavation consists of removal and disposal of all material encountered when establishing line and grade elevations required for execution of the work.
 2. The Contractor shall make excavations in such manner and to such widths as will give suitable room for building the structures or laying and jointing

the piping; shall furnish and place all sheeting, bracing, and supports; shall do all cofferdamming, pumping, and draining; and shall render the bottom of the excavations firm, dry and acceptable in all respects.

3. All excavation shall be classified as either earth or ledge.
 - a) Earth Excavation shall consist of the removal, hauling and disposal of all earth materials encountered during excavation including but not limited to native soil or fill, pavement (bituminous or concrete), existing sewers and manholes, ashes, loam, clay, swamp muck, debris, soft or disintegrated rock or hard pan which can be removed with a backhoe, or a combination of such materials, and boulders that do not meet the definition of "Ledge" below.
 - b) Ledge Excavation: Shall consist of the removal, hauling, and disposal of all ledge or rock encountered during excavation. "Ledge" and "rock" shall be defined as any natural compound, natural mixture that in the opinion of the Engineer can be removed from its existing position and state only by drilling and blasting, wedging, sledging, boring or breaking up with power operated tools. No boulder, ledge, slab, or other single piece of excavated material less than two cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer it must be removed from its existing position by one of the methods mentioned above.
4. The Contractor shall not have any right of property in any materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. This provision shall in no way relieve the Contractor of their obligations to remove and dispose of any material determined by the Engineer to be unsuitable for backfilling. The Contractor shall dispose of unsuitable and excess material in accordance with the applicable sections of the Contract Documents.
5. Utilize only Engineer pre-approved low ground pressure and lightweight (less than 1000 lbs) excavating equipment or perform excavation and fill work manually in the vicinity of existing trees and shrubs identified on the plans as requiring protection.

B. Additional Excavation: When excavation has reached required subgrade elevations, notify the Engineer and Resident Project Representative who will observe the conditions.

1. If material unsuitable for the structure or paved area or pipeline (in the opinion of the Engineer) is found at or below the grade to which excavation would normally be carried in accordance with the Drawings and/or Specifications, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, screened stone, crushed stone, or concrete as directed by the Engineer.
2. All excavated materials designated by the Engineer as unsuitable shall become the property of the Contractor and disposed of at locations in accordance with all State and local laws and the provisions of the Contract Documents.

C. Unauthorized Excavation: Shall consist of removal of materials beyond indicated subgrade elevations or dimensions without specific authorization of Engineer. Unauthorized excavation, as well as remedial work required by the

Engineer shall be at the Contractor's expense. Remedial work required is as follows:

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation with select fill or screened stone compacted to 95%. Provide 12 inch minimum select fill or screened stone directly under footings. Concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.
2. If the bottom of a trench is excavated beyond the limits indicated, backfill the resulting void with thoroughly compacted screened stone, unless otherwise indicated.
3. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of the same classification, unless otherwise directed by Engineer.

D. Structural Excavation:

1. Shall consist of the removal, hauling, disposal, of all material encountered in the excavation to permit proper installation of structures.
2. Excavations for structures shall be carried to the lines and subgrades shown on the Drawings.
3. Excavate areas large enough to provide suitable room for building the structures.
4. The extent of open excavation shall be controlled by prevailing conditions subject to any limits designated by the Engineer.
5. Provide, install, and maintain sheeting and bracing as necessary to support the sides of the excavation and to prevent any movement of earth which could diminish the width of the excavation or otherwise injure the work, adjacent structures, or persons and property in accordance with all state and OSHA safety standards.
6. Erect suitable fences around structure excavation and other dangerous locations created by the work, at no additional cost to the Owner.
7. Exposed subgrade surfaces shall remain undisturbed, protected, and maintained as uniform, plane areas and shape to receive the foundation components of the structure.
 - a. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10 foot and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.
 - b. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade and trim bottoms to required lines and grades to leave solid base to receive the structure.
 - c. If a structure is to be constructed within the embankment, the fill shall first be brought to a minimum of 3 feet above the base of the footing. A suitable excavation shall then be made as though the fill were undisturbed earth.

E. Trench Excavation: Shall consist of removal, hauling and disposal of all material encountered in the excavation to the widths and depths shown on the Drawings to permit proper installation of underground utilities.

1. Excavate trenches to the uniform width shown on the Drawings sufficiently wide to provide sufficient space for installation, backfilling, and

compaction. Every effort should be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.

2. Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation one foot above the top of the pipe.
3. Grade bottoms of trenches as indicated for pipe and bedding to establish the indicated slopes and invert elevations, notching under pipe joints to provide solid bearing for the entire body of the pipe, where applicable.
4. If pipe is to be laid in embankments or other recently filled material, the material shall first be placed to the top of the fill or to a height of at least two feet above the top of the pipe, whichever is the lesser. Particular care shall be taken to ensure maximum consolidation of material under the pipe location. The pipe trench shall be excavated as though in undisturbed material.
5. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer and storm lines and proceed up grade.
6. Perform excavation for force mains and water mains in a logical sequence.
7. The extent of open excavation shall be controlled by prevailing conditions subject to any limits prescribed by the Engineer.
8. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the state and OSHA safety standards, as outlined in the appropriate section of this Specification.

F. Protection of Persons, Property and Utilities:

1. Barricade open excavations occurring as part of this work and post with warning lights in compliance with local and State regulations.
2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations. Exercise extreme caution and utilize sheeting, bracing, and whatever other precautionary measures that may be required.
3. Rules and regulations governing the respective utilities shall be observed in the execution of all work. Active utilities and structures shall be adequately protected from damage, and removed or relocated only as indicated or specified. Inactive and abandoned utilities encountered in excavation and grading operations shall be removed, plugged or capped only with written authorization of the utility owner. Report, in writing to the Engineer, the locations of such abandoned utilities. Extreme care shall be taken when performing work in the vicinity of existing utility lines, utilizing hand excavation in such areas, as far as practicable.
4. Repair, or have repaired, all damage to existing utilities, structures, lawns, other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility, the property owner, and the Owner.

G. Use of Explosives:

1. Do not bring explosives onto site or use in work without prior written permission from authorities having jurisdiction. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

2. All blasting shall be performed in accordance with all pertinent provisions of the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Inc and in accordance with the appropriate section of these specifications.
- H. Stability of Excavations:
1. Slope sides of excavations to comply with all codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.
 2. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
- I. Shoring and Bracing:
1. Provide materials for shoring and bracing, such as sheet piling, uprights, stringers and cross-braces, in good serviceable condition.
 2. Provide trench shoring and bracing to comply with local codes and authorities having jurisdiction. Refer to Specification Section 02156.
 3. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Install shoring and bracing as excavation progresses.
- J. Material Storage:
1. Stockpile excavated materials which are satisfactory for use on the work until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect with temporary seeding or other acceptable methods to control erosion.
 2. Locate and retain soil materials away from edge of excavations.
 3. Dispose of excess soil material and waste materials as herein specified.
- K. Dewatering:
1. To ensure proper conditions at all times during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdowns) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations (including surface and subsurface waters).
 2. Excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged. Refer to Specification Section 02401.
- L. Cold Weather Protection:
1. Protect excavation bottoms against freezing when atmospheric temperature is less than 35°F.
 2. No frozen material shall be used as backfill or fill and no backfill shall be placed on frozen material.
- M. Separation of Surface Material:
1. The Contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the work.
 2. Prior to excavation, existing pavement shall be cut where in the opinion of the Engineer it is necessary to prevent damage to the remaining road surface.
 3. Where pavement is removed in large pieces, it shall be disposed of before proceeding with the excavation.
 4. From areas within which excavations are to be made, loam and topsoil shall be carefully removed and separately stored to be used again as directed; or, if the Contractor prefers not to separate surface materials, he shall furnish,

as directed, loam and topsoil at least equal in quantity and quality to that excavated.

N. Dust Control:

1. During the progress of the work, the Contractor shall conduct operations and maintain the area of their activities, including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. Refer to Specification Section 01562.
2. If the Engineer decides that it is necessary to use calcium chloride for more effective dust control, the contractor shall furnish and spread the material, as directed.

3.3 BACKFILL AND FILL

A. General:

1. Backfilling shall consist of replacing material removed to permit installation of structures or utilities, as indicated in the Contract Documents.
2. Filling shall consist of placing material in areas to bring them up to grades indicated on the Drawings.
3. The Contractor shall provide and place all necessary backfill and fill material, in layers to the required grade elevations.
4. Backfill excavations as promptly as work permits, but not until completion of the following:
 - a. Acceptance by Engineer of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - b. Inspection, approval, and recording locations of underground utilities.
 - c. Removal of concrete formwork.
 - d. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Temporary sheet piling driven below bottom of structures shall be removed in manner to prevent settlement of the structure or utilities, or cut off and left in place if required.
 - e. Removal of trash and debris.
 - f. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
 - g. Density testing having results meeting requirements specified herein.
5. In general, and unless otherwise indicated, material used for backfill of trenches and excavations around structures shall be suitable excavated material which was removed in the course of making the construction excavation. Unless otherwise specified or allowed by the Engineer the backfill and fill shall be placed in layers **not to exceed 8 inches in thickness.**
6. All fill and backfill under structures and pavement, and adjacent to structures, shall be compacted material as specified or as indicated on the Drawings. The fill and backfill materials shall be placed in layers **not exceeding 8 inches in thickness.**
7. All structures (including manholes) shall be placed on a 6-inch minimum mat of screened stone unless otherwise indicated.
8. Suitable excavated material shall meet the following requirements:
 - a. Free from large clods, silt lumps or balls of clay.

- b. Free from stones and rock fragments with larger than 12 inch max. dimension.
- c. Free from organics, peat, etc.
- d. Free from frozen material.
- 9. If sufficient suitable excavated material is not available from the excavations, and where indicated on the Drawings, the backfill material shall be select fill or common borrow, unless otherwise indicated, as required and as directed by the Engineer.
- 10. Do not backfill with, or on, frozen materials.
- 11. Remove, or otherwise treat as necessary, previously placed material that has frozen prior to placing backfill.
- 12. Do not mechanically or hand compact material that is, in the opinion of the Engineer, too wet.
- 13. Do not continue backfilling until the previously placed and new materials have dried sufficiently to permit proper compaction.
- 14. The nature of the backfill materials will govern the methods best suited for their placement and compaction. Compaction methods and required percent compaction is covered in Compaction section.
- 15. Before compaction, moisten or aerate each layer as necessary to provide the water content necessary to meet the required percentage of maximum dry density for each area classification specified.
- 16. Do not allow large masses of backfill material to be dropped into the excavation in such a manner that may damage pipes and structures.
- 17. Place material in a manner that will prevent stones and lumps from becoming nested.
- 18. Completely fill all voids between stones with fine material.
- 19. Do not place backfill on or against new concrete until it has attained sufficient strength to support loads without distortion, cracking, and other damage.
- 20. Deposit backfill and fill material evenly on all sides of structures to avoid unequal soil pressures.
- 21. Keep stones or rock fragments with a dimension greater than two inches at least one foot away from the pipe or structure during backfilling.
- 22. Leave sheeting in place when damage is likely to result from its withdrawal.
- 23. Completely fill voids left by the removal of sheeting with screened stone which is compacted thoroughly.
- B. Pipe Bedding, Initial Backfill and Trench Backfill
 - 1. Place bedding and backfill in layers of uniform thickness specified herein, and as shown on the Drawings.
 - 2. Thoroughly compact each layer by means of a suitable vibrator or mechanical tamper.
 - 3. Install pipe bedding and initial backfill in layers of uniform thickness **not greater than 8 inches.**
 - 4. Deposit the remainder of the backfill in uniform layers not greater than eight inches.
 - 5. Provide underground sewer marking tape for the full length of sewer trenches as shown on the Drawings. Marking tape shall be as specified in Section 02650.

6. Where soft silt and clay soils are encountered the trench shall be excavated six inches below the normal bedding and backfilled with 6 inches of compacted sand.
7. Backfill trenches with concrete where trench excavations pass within 18 inches of column or wall footings and which are carried below the bottom of such footings, or which pass under wall footings. Place concrete to the level of the bottom of adjacent footings.
8. The following schedule gives the bedding requirements for various types of pipe. Distances refer to vertical thickness below the pipe.

BEDDING REQUIREMENTS

DI (sewer) or Concrete Pipe	6 inches min. screened stone
DI pipe (water)	8 inches min. sand
PVC or PE Pipe minimum	8 inches min. screened stone except in ledge, 12"
Copper Service pipe	6 inches min. sand

9. The following schedule gives the initial backfill requirements for various types of pipes.

INITIAL BACKFILL REQUIREMENTS

DI (sewer) or Concrete Pipe	Screened stone 6 inches min. over top of pipe.
DI Pipe (water)	6 inches min. sand over top of pipe
PVC or PE Pipe	6 inches min. screened stone over the top of pipe
Copper	6 inches min. sand over top of pipe

10. Special bedding and backfill requirements shown on the Drawings supersede requirements of this section.
 11. Where pipes or structures pass through or under the impervious core of the lagoon embankments, bedding and backfill material shall consist of the impervious embankment material. Extra care should be given to properly and thoroughly compact the bedding material around the pipe.
- C. Improper Backfill:
1. When excavation and trenches have been improperly backfilled, and when settlement occurs, reopen the excavation to the depth required, as directed by the Engineer.
 2. Refill and compact the excavation or trench with suitable material and restore the surface to the required grade and condition.

3. Excavation, backfilling, and compacting work performed to correct improper backfilling shall be performed at no additional cost to the Owner.
- D. Ground Surface Preparation:
 1. Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, scarify or break-up sloped surface steeper than 1 vertical to 4 horizontal.
 2. When existing ground surface has a density less than that specified under "compaction" for the particular area classification, break up the ground surface, pulverize, moisture-condition to the optimum moisture content, and compact to required depth and percentage of maximum density.

3.4 COMPACTION

- A. General:
 1. Control soil compaction during construction to provide not less than the minimum percentage of density specified for each area classification.
- B. Percentage of Maximum Density Requirements:
 1. Compact soil to not less than the following percentages of maximum dry density determined in accordance with ASTM D1557 as indicated.
 - a. Structures: Compact each layer of backfill or fill material below or adjacent to structures to at least 95% of maximum dry density (ASTM D1557).
 - b. Off Traveled Way Areas: Compact each layer of backfill or fill material to at least 90% of maximum dry density (ASTM D1557).
 - c. Walkways: Compact each layer of backfill or fill material to at least 93% of maximum dry density (ASTM D1557).
 - d. Roadways, Drives and Paved Areas: Compact each layer of fill, subbase material, and base material to at least 95% of maximum dry density (ASTM D1557).
 - e. Pipes: Compact bedding material and each layer of backfill to at least 90% maximum dry density (ASTM D1557). Where backfilling with excavated material, compact to native field density.
 - f. Embankments: Compact each layer of embankment material to at least 95% of maximum dry density (ASTM D1557).
- C. Moisture Control:
 1. Where subgrade or a layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, in quantities controlled to prevent free water appearing on surface during or subsequent to compaction operations.
 2. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.
 3. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory level.
- D. Embankment Compaction:
 1. After each embankment layer has been spread to the required maximum 8-inch thickness and its moisture content has been adjusted as necessary, it shall be rolled with a sufficient number of passes to obtain the required compaction. One pass is defined as the required number of successive trips

which by means of sufficient overlap will insure complete coverage and uniform compaction of an entire lift. Additional passes shall not be made until the previous pass has been completed.

2. When any section of an embankment sinks or weaves excessively under the roller or under hauling units and other equipment, it will be evident that the required degree of compaction is not being obtained and that a reduction in the moisture content is required. If at any place or time such sinking and weaving produces surface cracks which, in the judgment of the Engineer are of such character, amount, or extent to indicate an unfavorable condition, he will recommend operations on that part of the embankment to be suspended until such time as it shall have become sufficiently stabilized. The ideal condition of the embankment is that attained when the entire embankment below the surface being rolled is as firm and hard as to show only the slightest weaving and deflection as the roller passes.
 3. If the moisture content is insufficient to obtain the required compaction, the rolling shall not proceed except with the written approval of the Engineer, and in that event, additional rolling shall be done to obtain the required compaction. If the moisture content is greater than the limit specified, the material of such water content may be removed and stockpiled for later use or the rolling shall be delayed until such time as the material has dried sufficiently so that the moisture content is within the specified limits. No adjustment in price will be made on account of any operation of the Contractor in removing and stockpiling, or in drying the materials or on account of delays occasioned thereby.
 4. If because of insufficient overlap, too much or too little water, or other cause attributable to defective work, the compaction obtained over any area is less than that required, the condition shall be remedied, and if additional rollings are ordered, they will be done at no cost to the Owner. If the material itself is unsatisfactory or if additional rolling or other means fails to produce satisfactory results, the area in question shall be removed down to material of satisfactory density and the removal, replacement, and re-rolling shall be done by the Contractor, without additional compensation.
 5. Material compaction by hand-operated equipment or power-driven tampers shall be spread in layers not more than 6 inches thick. The degree of compaction obtained by these tamping operations shall be equal in every respect to that secured by the rolling operation.
- E. Compaction Methods: The Contractor may select any method of compaction that is suitable to compact the material to the required density.
1. General: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. All voids left by the removal of sheeting shall be completely backfilled with suitable materials and thoroughly compacted.
 2. Tamping or Rolling: If the material is to be compacted by tamping or rolling, the material shall be deposited and spread in uniform, parallel layers not exceeding the uncompacted thicknesses specified. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. Care shall be taken that the material close to the excavation side slopes, as well as in all other portions of the fill area, is thoroughly compacted. When the excavation width and the depth to which

backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe or structure, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping or rolling, the rate at which backfilling material is deposited shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

- F. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.
- G. Utilize only Engineer pre-approved low ground pressure and lightweight (less than 1000 lbs) compaction equipment or perform the work manually in the vicinity of existing trees and shrubs identified on the plans as requiring protection.

3.5 GRADING

- A. General:
 - 1. Grading shall consist of that work necessary to bring all areas to the final grades.
 - 2. Uniformly grade areas within limits of work requiring grading, including adjacent transition areas.
 - 3. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grading Outside Building Lines:
 - 1. Grade areas adjacent to building to drain away from structures and to prevent ponding.
 - 2. Grade surfaces to be free from irregular surface changes, and as follows:
 - a. Lawn or Unpaved Areas: Finish grade areas to receive topsoil to within not more than 1 inch above or below the required subgrade elevations.
 - b. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/2 inch above or below the required subgrade elevation.
 - c. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 3/8 inch above or below the required subgrade elevation.
- C. Grading Surface of Fill Under Retaining Walls:
 - 1. Grade surface to be smooth and even, free of voids, and compacted as specified, to the required elevation.
 - 2. Provide final grades within a tolerance of 1/2 inch when tested with a 10-foot straight edge.
- D. Compaction:
 - 1. After grading, compact subgrade surfaces to the depth and percentage of maximum density for each area classification.
- E. Protection of Graded Areas:
 - 1. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - 2. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

3.6 BASE COURSE AND LEVELING COURSE

- A. General:
 - 1. Base course consists of placing the specified materials in layers to support a leveling course or paved surface, as indicated in the Drawings.
- B. Grade Control:
 - 1. During construction, maintain lines and grades including crown and cross-slope of base course and leveling course.
- C. Placing:
 - 1. Place base course on prepared subbase conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting base materials.
 - 2. Place leveling course or paved surface materials on prepared base course, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compaction.
- D. Shaping and Compacting:
 - 1. All layers of aggregate base course and leveling course shall be compacted to the required density immediately after placing. As soon as the compaction of any layer has been completed, the next layer shall be placed.
 - 2. The Contractor shall bear full responsibility for and make all necessary repairs to the base leveling courses and the subgrade until the full depth of the base leveling courses is placed and compacted. Repairs shall be made at no additional cost to the Owner.
 - 3. If the top of any layer of the aggregate base or leveling course becomes contaminated by degradation of the aggregate or addition of foreign materials, the contaminated material shall be removed and replaced with the specified material at the Contractor's expense.

END OF SECTION

LOAMING & SEEDING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, place, and test topsoil, seed, lime, and fertilizer where shown on the drawings and protect and maintain seeded areas disturbed by construction work, as directed by the Engineer.
- B. Related Work Specified Elsewhere: (When Applicable)
 - 1. Stripping and Stockpiling Topsoil, Section 02115
 - 2. Earthwork, Section 02200
 - 3. Temporary Erosion Control, Section 02270
 - 4. Landscaping, Section 02480

1.2 SUBMITTALS AND TESTING

- A. Seed:
 - 1. Furnish the Engineer with duplicate signed copies of a statement from the vendor, certifying that each container of seed delivered to the project site is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements.
 - 2. This certification shall appear in, or with, all copies of invoices for the seed.
 - 3. The certification shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the Contractor has submitted the certificates and certificates have been approved.
 - 4. Each lot of seed shall be subject to sampling and testing, at the discretion of the Engineer, in accordance with the latest rules and regulations under the Federal Seed Act. Seed may be tested after it has been delivered to the project. Testing of the seed will be at the Contractor's expense and shall be performed by a NHDOT approved testing facility.
- B. Topsoil:
 - 1. Inform the Engineer, within 30 days after the award of the Contract, of the sources from which the topsoil is to be furnished.
 - 2. Obtain representative soil samples, taken from several locations in the area under consideration for topsoil removal, to the full stripping depth.
 - 3. Have soil samples tested by an independent soils testing laboratory, approved by the Engineer, at the Contractor's expense.
 - 4. Have soil samples tested for physical properties and pH (or lime requirement), for organic matter, available phosphoric acid, and available potash, in accordance with standard practices of soil testing.
 - 5. Approval, by the Engineer, to use topsoil for the work will be dependent upon the results of the soils tests.
- C. Lime & Fertilizer:
 - 1. Furnish the Engineer with duplicate copies of invoices for all lime and fertilizer used on the project showing the total minimum carbonates and minimum percentages of the material furnished that pass the 100 and # 8 mesh sieves and the grade furnished.
 - 2. Each lot of lime and fertilizer shall be subject to sampling and testing at the discretion of the Engineer.

3. Sampling and testing shall be in accordance with the official methods of the Association of Official Agricultural Chemists.
 4. Upon completion of the project, a final check may be made comparing the total quantities of fertilizer and lime used to the total area seeded. If the minimum rates of application have not been met, the Engineer may require the Contractor to distribute additional quantities of these materials to meet the minimum rates.
- D. Contractor shall provide a one page instruction summary that the Owner can distribute to residents that explains the recommendations the sub contractor has for maintaining the new grass, after the Contractor has fulfilled the requirements of this specification.

1.3 DELIVERY, STORAGE & HANDLING

- A. Seed:
1. Furnish all seed in sealed standard containers, unless exception is granted in writing by the Engineer.
 2. Containers shall be labeled in accordance with the United States Department of Agriculture's rules and regulations under the Federal Seed Act in effect at the time of purchase.
 3. Percent germination and purity of each seed type in the mixture and weed seed content of the mixture shall be clearly stated on the label.
 4. Seed shall be subject to the testing provisions of the Association of Official Seed Analysts. The month and year of test shall be clearly stated on the label.
- B. Fertilizer:
1. Furnish all fertilizer in unopened original containers.
 2. Containers shall be labeled with the manufacturer's statement of analysis.

1.4 JOB CONDITIONS

- A. Topsoil: Do not place or spread topsoil when the subgrade is frozen, excessively wet or dry, or in any condition otherwise detrimental, in the opinion of the Engineer, to the proposed planting or to proper grading.
- B. Seeding:
1. Planting Seasons: Seeding and initial fertilizing shall be done between May 1 and June 1, between August 15 and September 15, or as permitted. If seeding is done during July or August, additional mulch material may be required by the Engineer. The Contractor may seed at other times as permitted by the Engineer. Regardless of the time of seeding, the Contractor shall be responsible for each seeded area until it is accepted.
 2. Weather Conditions:
 - a. Do not perform seeding work when weather conditions are such that beneficial results are not likely to be obtained, such as drought, excessive moisture, or high winds.
 - b. Stop the seeding work when, in the opinion of the Engineer, weather conditions are not favorable.
 - c. Resume the work only when, in the opinion of the Engineer, conditions become favorable, or when approved alternate or corrective measures and procedures are placed into effect.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Seed:

1. Grass seed shall meet the requirements of the New Hampshire Agricultural and Vegetable Seeds Law. As specified in the law, the mixture shall include no "primary noxious weed seeds".
2. Seed which has become wet, moldy, or otherwise damaged will not be acceptable.
3. NHDOT Park seed Type 15 shall normally be used on loam areas. This seed mixture shall conform to Table 1.

Table 1 - Park Seed Type 15

Kind of Seed	Minimum Purity (%)	Minimum Germination (%)	Pounds/Acre (Kilograms/Hectare)
Creeping Red Fescue ^c	96	85	40 (45)
Perennial Ryegrass ^a	98	90	50 (55)
Kentucky Bluegrass ^b	97	85	25 (30)
Redtop	95	80	5 (5)
			TOTAL 120 (135)

NOTES TO TABLE 1:

- ^a Ryegrass shall be a certified fine-textured variety such as Pennfine, Fiesta, Yorktown, Diplomat, or equal.
- ^b Bluegrass shall be a certified variety such as Merion, Baron, Majestic Touchdown, Nugget, Ram One, or equal.
- ^c Fescue varieties shall include -Creeping Red and/or Hard Reliant, Scaldis, Koket, or Jamestown.

4. NHDOT Slope Seed Type 45 shall be used on slopes that exceed 2:1. This seed mixture shall conform to Table 2.

Table 2 – Slope Seed Type 45

Kind of Seed	Minimum Purity (%)	Minimum Germination (%)	Pounds/Acre (Kilograms/Hectare)
Creeping Red Fescue ^c	96	85	40 (45)
Perennial Ryegrass ^a	98	90	50 (55)
Redtop	95	80	5 (5)
Alsike Clover	97	90 ^e	5 (5)
Birdsfoot Trefoil ^d	98	80 ^e	5 (5)
Lance-Leaved Coreopsis	95	80	4 (4.5)
Oxeye Daisy	95	80	3 (3)
Blackeyed Susan	95	80	4 (4.5)
Wild Lupine	95	80	4(4.5)
			TOTAL 95 (106.5)

NOTES TO TABLE 2:

^a Ryegrass shall be a certified fine-textured variety such as Pennfine, Fiesta, Yorktown, Diplomat, or equal.

^c Fescue varieties shall include -Creeping Red and/or Hard Reliant, Scaldis, Koket, or Jamestown.

^d Empire variety preferred) Inoculum specific to birdsfoot trefoil must be used with this mixture. The inoculum shall be a pure culture of nitrogen-fixing bacteria selected for maximum vitality and the ability to transform nitrogen from the air into soluble nitrates and to deposit them in the soil. The inoculum shall not be used later than the date indicated on the container or later than specified. The inoculum shall be subject to approval.

^e Includes not more than 10 percent hard seed for alsike clover and not more than 25 percent hard seed for birdsfoot trefoil. If necessary, to meet this requirement, extra seed shall be supplied at no expense to the Owner

5. A New England wetland seed mix shall be used to restore temporarily impacted wetland areas.

B. Topsoil:

1. Topsoil shall consist of loose friable loam with no admixture of refuse or material toxic to plant growth. Topsoil shall be free of viable parts of prohibited invasive plants listed in Table 3800.1 of part AGR 3800. The term as used herein shall mean that portion of the soil profile defined technically as the "A" horizon by the Soil Science Society of America. The minimum and maximum pH value shall be from 5.5 to 7.6. Topsoil shall contain a minimum of 3 percent and a maximum of 10 percent of organic matter as determined by loss by ignition. Not more than 65 percent shall pass a No. 200 (0.075 mm) sieve as determined by the wash test in accordance with ASTM D 1140. In no instance shall more than 20% of that material passing the No. 4 (4.75 mm) sieve consist of clay size particles.
2. Free of stumps, roots, heavy of stiff clay, stones, lumps, coarse sand, larger than 1 inch in diameter and weeds, sticks, brush or other deleterious matter.

C. Lime:

1. Paragraph 2, Materials, of section 642 of NHDOT Standard Specifications shall apply.

D. Fertilizer:

1. Paragraph 2, Materials, of section 643 of NHDOT Standard Specifications shall apply

PART 3 - EXECUTION

3.1 PREPARATION

A. Equipment:

1. Provide all equipment necessary for the proper preparation of the ground surface and for the handling and placing of all required materials.
2. Demonstrate to the Engineer that the equipment will apply materials at the specified rates.

B. Soil: Perform the following work prior to the application of lime, fertilizer or seed.

1. Scarify the subgrade to a depth of 2 inches to allow the bonding of the topsoil with the subsoil.
2. Remove all objectionable material and form a finely graded bed to receive the topsoil

3.2 PERFORMANCE

- A. Grading:
 - 1. Grade the areas to be seeded as shown on the Drawings or as directed by the Engineer.
 - 2. Leave all surfaces in even and properly compacted condition.
 - 3. Maintain grades on the areas to be seeded in true and even conditions, including any necessary repairs to previously graded areas.
- B. Placing (Loam) Topsoil:
 - 1. Uniformly distribute and evenly spread topsoil on the designated areas a minimum of 4 inches.
 - 2. Spread the topsoil in such a manner that planting work can be performed with little additional soil preparation or tillage.
 - 3. Correct any irregularities in the surface resulting from top soiling or other operations to prevent the formation of depressions where water may stand, and unless otherwise specified, the topsoil shall be raked carefully to remove all objectionable materials.
 - 4. Thoroughly till the topsoil to a depth of at least 3 inches by plowing, harrowing, or other approved method until the condition of the soil is acceptable to the Engineer. The surface shall be cleared of all debris and or stones one inch or more in diameter.
 - 5. Topsoil placed adjacent to lawns or where directed shall be compacted with a roller weighing approximately 100 pounds per foot (150 kilograms per meter) of roller width. All depressions exposed during the rolling procedure shall be filled with additional loam, and rolled.
- C. Placing Lime:
 - 1. Paragraph 3, Construction Requirements, of Section 642 of NHDOT Standard Specifications shall apply.
 - 2. Uniformly distribute lime immediately following or simultaneously with the incorporation of fertilizer.
 - 3. Distribute lime at a rate determined from the pH test, to a depth of at least 3 inches by discing, harrowing, or other methods acceptable to the Engineer.
 - 4. Fine rake and level out any undulations or irregularities in the surface resulting from tillage, fertilizing, liming or other operations before starting seeding operations.
- D. Placing Fertilizer
 - 1. Paragraph 3, Construction Requirements, of section 643 of NHDOT Standard Specifications shall apply.
- E. Seeding:
 - 1. General
 - a. Paragraphs 3.1.1, 3.1.3, 3.1.4 of NHDOT Standard Specifications Section 644 shall apply.
 - 2. Seeding Methods
 - a. Dry Method
 - 1) Power equipment: Mechanical seeders, seed drills, landscape seeders, cultipacker seeders, fertilizer spreaders, or other approved mechanical seeding equipment or attachments may be used when seed, limestone, and fertilizer are to be applied in dry form.

- 2) Manual equipment: On areas which are inaccessible to power equipment, permission may be given to use hand-operated mechanical equipment when the materials are to be applied in dry form. The use of hand shovels to spread the materials will not be allowed.
 - 3) When the dry method is used, limestone and fertilizer may be mixed together prior to their application and shall be worked into the soil to the depth of at least 1 inch (25 mm).
 - 4) Seeding may occur following this procedure.
 - 5) Loamed areas or areas covered with park seed shall be raked, and, unless rolling is ordered omitted, shall be rolled with a roller weighing not more than 100 pounds per foot (150 kilograms per meter) of roller width to firm the soil but not to pack it. The rolling shall be done the same day as the seeding unless otherwise permitted.
 - 6) Unless otherwise ordered, areas covered with park seed, shall be mulched. Private lawns affected by this specification need not be mulched unless it is requested by the landowner.
- b. Hydraulic Method
- 1) The application of grass seed, fertilizer, limestone, and suitable wood fiber mulch shall be accomplished in one operation by use of an approved spraying machine.
 - 2) The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water.
 - 3) The spraying equipment shall be so designed that when the solution is sprayed over an area, the resulting deposits of limestone, fertilizer and grass seed shall be equal in quantity to the required rates.
 - 4) Prior to the start of work, the Engineer shall be furnished with a certified statement for approval as to the number of pounds (kilograms) of materials to be used per 100 gallons (100 liters) of water. This statement shall also specify the number of square feet (square meters) of seeding that can be covered with the quantity of solution in the hydro seeder.
 - 5) The hydro seeder shall be completely flushed and cleaned each day before seeding is to be started.
 - 6) If the results of the spray operations are unsatisfactory, the Contractor will be required to abandon this method and apply the materials in accordance with E.2.a.
 - 7) When inoculum is required, if the inoculum is left in solution with fertilizer longer than 30 minutes, a fresh charge of inoculum (4 times normal) shall be added to the mixture.
 - 8) When the hydraulic method is used, compaction or rolling will not be required.
 - 9) Unless mulch material required is applied during the seeding operation or within 1/2 hour following the seeding

operation, temporary and satisfactory measures to protect the seed from sunlight and heat shall be taken, such as the use of a light brush drag over the seeded areas to stir the seed into the soil. Care shall be taken not to carry the seed ahead.

- F. Compacting:
1. Seeded areas must be raked lightly after sowing unless seeding is to be directly followed by application of approved mulch.
 2. Compact the entire area immediately after the seeding operations have been completed.
 3. Compact by means of a cultipacker, roller, or other equipment approved by the Engineer weighing 60 to 90 pounds per linear foot of roller.
 4. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, use a pneumatic roller (not wobbly wheel) that has tires of sufficient size to obtain complete coverage of the soil.
 5. When using a cultipacker or similar equipment, perform the final rolling at right angles to the prevailing slopes to prevent water erosion, or at right angles to the prevailing wind to prevent dust.

3.3 PROTECTION & MAINTENANCE

- A. Protection:
1. Protect the seeded area against traffic or other use.
 2. Erect barricades and place warning signs as needed.
- B. Maintenance:
1. At the time of the first cutting, set mower blades 2 inches high. All lawns shall receive at least two mowings before acceptance. Coordinate schedule for mowing with Engineer.
 2. Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance.
 3. Maintain grass areas until a full stand of grass is indicated, which will be a minimum of 45 days after all seeding work is completed and shall not necessarily related to Substantial Completion of the General Contract.
 4. Protection and maintenance of grass areas shall consist of watering, weeding, cutting, repair of any erosion, reloaming and reseeded as necessary to establish a uniform stand for the specified grasses and shall continue until Acceptance by the Engineer of the work of this section. It shall also include the furnishing and applying of such pesticides as are necessary to keep grass areas free of insects and disease. All pesticides shall be approved by the Engineer prior to use.

3.4 ACCEPTANCE

- A. At final acceptance of the project all areas shall have a close stand of grass with no weeds present and no bare spots greater than 3 inches in diameter over greater than five percent (5%) of the overall seeded area.

END OF SECTION

SECTION 02501

REMOVAL OF PAVEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Remove bituminous and/or Portland cement pavement, and replace aggregate base and subbase, pavement binder course and surface course, including temporary pavement, within the area(s) shown on the Drawings and as directed by the Engineer.
 - 2. Keep pavement removal to a minimum width suitable for the required construction.
- B. Related Work Specified Elsewhere:
 - 1. Section 02200, Earthwork
 - 2. Section 02513, Bituminous Concrete Paving
- C. Work Not Included: Removal and replacement of paving for the convenience of the Contractor will not be considered for payment.

2.1 PERFORMANCE

- A. Use construction methods as specified in the appropriate sections of these contract documents or in section 417 of NHDOT Standard Specifications.
- B. Subject to the Owner's approval and section 02200, Removed bituminous concrete pavement may be used as a component or reclaimed stabilized base.
- C. Pavement Removal:
 - 1. General:
 - a. Exercise extreme care in the removal of pavement so that pavement will not be unnecessarily disturbed or destroyed.
 - b. Mechanically cut pavement to be removed to a straight, vertical line, unless otherwise directed in writing by the Engineer.
 - c. Concrete pavement will be removed and disposed of at a state approved disposal facility.
 - 2. Joints between old and new pavement for street intersections that have not been identified on the plans to have milled tapered ship laps with existing bituminous pavement shall be mechanically cut. Cut the wearing course at the old pavement a minimum of 2 feet beyond the cut of the binder and wearing course. Grind the wearing course strip off, leaving the binder strip. The binder strip will be paved with an overlap of the final wearing course.
 - 3. Tapered shiplaps will be ground and paved as shown in the detail.
- D. Reset all manholes and covers to finished grade as required at no additional cost to the Owner.

END OF SECTION

SECTION 02513

BITUMINOUS CONCRETE PAVING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Furnish all plant, labor, equipment and materials required to install bituminous concrete pavement courses, including walkways, driveways, temporary and permanent trench paving as shown on the Drawings and as specified herein, excluding new porous pavement.
 - 2. Remove bituminous asphaltic and/or Portland cement pavement, and replace bituminous asphaltic pavement, base, binder courses and wearing courses, including temporary pavement, within the area(s) shown on the Drawings and as directed by the Engineer.
 - 3. Keep pavement removal to a minimum width suitable for the required construction.
 - 4. Apply pavement markings to the permanent paving as specified.
 - 5. Install binder course during one construction season. Install wearing course during the following construction season.
- B. Work Not Included: Removal and replacement of paving for the convenience of the Contractor will not be considered for payment.
- C. Related Work Specified Elsewhere (When Applicable): Earthwork and pavement markings.

1.2 QUALITY ASSURANCE

- A. Materials: The NHDOT “Method” specifications shall apply, with some additions. Use only materials furnished by a bulk bituminous concrete producer regularly engaged in the production of hot mixed, hot laid bituminous concrete. Recycled Asphalt Products will not be allowed. Only virgin liquid asphalt and virgin aggregates will be accepted in Asphaltic Concrete Mixes.
- B. Equipment: Provide, maintain and operate pavers, dump trucks, tandem, 3-wheel and pneumatic tired rollers well suited to the mixtures being placed. Provide, maintain and operate hand equipment as required. When applicable, provide, maintain and operate trimming equipment and materials.
- C. Mix Requirements, Method of Placement and Compaction: Standard Specifications for Road & Bridge Construction, State of New Hampshire, Department of Transportation, 2016 or latest edition, hereinafter called NHDOT. Standards for mixing, placing and compacting bituminous concrete surfaces are applicable to this work, using the “Method” method. **Reclaimed and Recycled Asphalt Products shall not be used on this project.**
- D. For purposes of this project, the Owner’s testing agency will be performing the testing and sampling and inspection that is normally performed by NHDOT on NHDOT projects.

1.3 SUBMITTALS AND MEETINGS

- A. A current production season certificate or letter of approval from the State Bureau of Materials and Research shall be required for each mix design submitted for the project. Gradations, abrasion, degradation, angularity, hardness and all other applicable test results for all aggregates to be used in the mixes shall be submitted. The submittal for 19 mm binder course shall be a “Fine Mix” type

specifically designed to be placed in one season and the wearing course placed in the following season.

- B. A Prepave Conference will be held not less than 20 days before the first paving date for each construction season to finalize quality assurance procedures, testing and sampling requirements, pay factors and review and approve equipment the Contractor intends to use during the paving operations.
- C. Delivery slips shall be furnished with each load of mix delivered to the project. Information shall include:
 - 1. Vehicle identification.
 - 2. Date.
 - 3. Project.
 - 4. Identification of material.
 - 5. Gross, tare and net weights.
 - 6. Signed by the bituminous concrete producer.
 - 7. Stamped by a licensed public weighmaster.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Para 2.1-2.6 (all except as modified herein and below) 2.7-2.9, 2.11 and 2.12 of Section 401 NHDOT Standard Specifications shall apply, **except that only virgin liquid asphalt products and virgin aggregates will be accepted on this project.** Recycled Asphalt Products will not be allowed. The 19 mm binder course shall be of a "Fine Mix" type that is will be installed in 2019. The wearing course will be installed in 2020.

2.6.3 Shall be modified as follows:

When Non-compliant test results or other conditions make it necessary, it shall be the responsibility of the Contractor to make all adjustments required to ensure the mix conforms to the JMF.

If ONE non-compliant result occurs, the Engineer may stop production until satisfactory corrective action has been taken. A 5% reduction in unit price will be assessed to all tonnage represented by consecutive gradation failures and a 10% reduction will be assessed to all tonnage represented by consecutive asphalt binder content failures. At the Engineer's discretion, the Contractor may be required to remove non-compliant material (no payment will be made for this material or its removal).

Contractor quality control personnel will not be required to be on site during production of non-quality control projects, but contract information shall be posted in the testing lab.

- B. Tack Coat: Emulsified type, Grade RS-1, CRS-1, HFMS-1, CSS-1
- C. Modified Asphalt Pavement Joint Sealer: Green Crack Filler by RAS-TECH, Inc. or equivalent

PART 3 – EXECUTION AND CONSTRUCTION REQUIREMENTS

3.1 MIXING PLANTS

A. Paragraphs: 3.1.1, 3.1.2, 3.1.4-3.1.7 of Section 401 NHDOT Standard Specifications shall apply.

3.2 STORAGE OF BINDER

A. Paragraph 3.2 of Section 401 NHDOT Standard Specifications shall apply.

3.3 CONTROL OF ASPHALT BINDER

A. Paragraph 3.3 of Section 401 NHDOT Standard Specifications shall apply.

3.4 BATCHING PLANTS

A. Paragraph 3.4 of Section 401 NHDOT Standard Specifications shall apply.

3.5 DRUM MIX PLANTS

A. Paragraph 3.5 of Section 401 NHDOT Standard Specifications shall apply.

3.6 MIXING TEMPERATURES

A. Paragraph 3.6.1 of Section 401 NHDOT Standard Specifications shall apply.

3.7 HOT STORAGE

A. Paragraph 3.7 of Section 401 NHDOT Standard Specifications shall apply.

3.8 WEIGHING AND HAULING

A. Paragraph 3.8 of Section 401 NHDOT Standard Specifications shall apply.

3.9 VEHICLES

A. Paragraph 3.9 of Section 401 NHDOT Standard Specifications shall apply.

3.10 PLACING

A. Paragraphs 3.10.1-3.10.4; 3.10.6.1 – 3.10.6.3; 3.10.7, 3.10.8, 3.10.9 (excluding sub paragraph 3.10.9.1); 3.10.10 of Section 401 NHDOT Standard Specifications shall apply.

3.11 PAVERS

A. Paragraph 3.11.1 and 3.11.2 of Section 401 NHDOT Standard Specifications shall apply.

3.12 COMPACTION

A. Paragraph 3.12.1 of Section 401 NHDOT Standard Specifications shall apply, except that the Owner's agency will take samples for density testing instead of the contractor and the frequency will be determined as needed.

3.13 JOINT CONTROL

A. Paragraph 3.13 of Section 401 NHDOT Standard Specifications shall apply.

3.14 VARIATIONS IN PROFILE AND CROSS SLOPE

A. Paragraph 3. 17.3.4.1 of Section 401 NHDOT Standard Specifications shall apply.

3.15 REPLACEMENT

A. Paragraph 3.15 of Section 401 NHDOT Standard Specifications shall apply.

3.16 FINISHED APPEARANCE and SMOOTHNESS

A. Paragraph 3.16 of Section 401 NHDOT Standard Specifications shall apply.
Smoothness will be accepted based on visual observation and comfort of ride.

3.17 ADDITIONAL PERFORMANCE REQUIREMENTS

A. The following Tests shall be performed by the Owner's testing agency and/or the Engineer using the applicable test methods shown in table 3 under para. 3.17.1.5, and table 4 under para 3.17.1.6 of Section 401 NHDOT Standard Specifications.

PROPERTIES	POINT OF SAMPLING	FREQUENCY
Temperature of Mix	At paver hopper	6 per day
Surface Temperature		As needed
Temperature of Mat		As needed
Gradation	behind paver & before rolling ⁽⁴⁾	Daily, for each mix being used that day
Asphalt Binder Content	behind paver & before rolling ⁽⁴⁾	Daily, for each mix being used that day
Maximum theoretical specific gravity	Compacted Roadway ⁽¹⁾ Core	As needed, based on visual observations of the inspector and Engineer
In Place Air Voids in total mix ⁽⁵⁾⁽⁶⁾	Compacted roadway ⁽¹⁾ core	As needed, based on visual observations of the inspector and Engineer. Minimum per day's paving is 6 per course.
Thickness ⁽²⁾⁽⁵⁾	Compacted roadway ⁽¹⁾ core	As needed based on visual observations of the inspector and Engineer. Minimum per days' paving is 6 per course.

- (1) Excluding bridge pavements.
- (2) Measurements taken from full depth cores obtained for in place air voids determination.
- (3) For leveling course, samples to be taken at the plant.
- (4) Sampling and testing will not be done for leveling course.
- (5) Not Including leveling course.
- (6) When the Contractor is supplying mix to more than one paver simultaneously, Contractor's personnel shall keep a running total of tonnage supplied to each paver on each paver.
- (7) Tier 1 Item only.

B. Acceptance Limits and Pay Factors

The following pay factor adjustments shall be made at the discretion of the Engineer.

1. Gradation and Asphalt Binder Content- para 2.6, as modified.
2. In place Air Voids- 3.17.3.2
3. Thicknesses-para 3.17.3.3

Cores shall be taken by the Owner's agency before opening pavement to traffic, except when location of core is within the last hour of that day's placement. Cores shall be taken within 24 hours after placement. Where cores have been taken, new material shall be placed and compacted to conform to the surrounding area **the same day** the samples are taken. Core samples shall be accompanied by a sample tag containing the following information:

- (a) Project name & number
 - (b) Lot and sub-lot number
 - (c) Material Type
 - (d) Date placed
 - (e) Date sampled
 - (f) Location in station and offset, and/or tonnage
 - (g) Plan thickness
 - (h) Contract Administrator
 - (i) Sampler
 - (j) Item number
- C. Grade Control: The Contractor shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.
- D. Trench areas shall receive initial paving as the work progresses where trenches are in paved streets. Not more than 300 linear feet of backfill trench shall be left unpaved.
- E. Reset all existing and new manholes and catch basins to finished grade as required at no additional cost to the Owner. If the binder course is installed in one construction season and the wearing course in the following season, the Contractor shall reset all existing and new manholes and catch basins to finished grade twice.
- F. Saw cut existing pavement so new wearing course will extend a minimum of 2 feet beyond the saw cut off the binder, providing for a minimum of a 2-foot wide shiplap joint.

3.2 PAVEMENT REMOVAL

Refer to Specification Section 02501.

3.3 SURFACE PREPARATION

- A. All permanent pavement joints, except shiplaps, shall be vertically sawcut and tacked. This includes pavement joints adjacent to granite curb.
- B. Prime and tack coats materials shall conform to the NHDOT Standard Specifications.
- C. Prime Coat: Apply at the rate of 0.50 gallons per square yard over compacted base. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of the dilution agent.
- D. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement, including ground surfaces. Distribute at rate of 0.02 to 0.05 gallons per square yard of surface.
- E. Joint openings between new and existing pavement are to be filled with a modified asphalt pavement joint sealer that is melted into cracks and joints.

END OF SECTION

SECTION 02610

PIPE & PIPE FITTINGS - GENERAL

PART 1- GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, install, support, and test pipe and pipe fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere (When Applicable):
 - 1. Earthwork is specified in the appropriate section of this Division.
 - 2. Pipe materials, valves, gates, couplings, and connectors are specified in the appropriate sections of this Division.

1.2 SUBMITTALS

- A. Submit shop drawings in accordance with Section 01340.
- B. Submit manufacturer's "Certification of Conformance" that pipe and fittings and other piping appurtenances meet or exceed the requirements of these Specifications.
- C. Submit other documents as specified in the appropriate Sections of this Division and Division 0.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Exercise care during loading, transporting, unloading, and handling to prevent damage of any nature to interior and exterior surfaces of pipe and fittings.
- B. Do not drop pipe and fittings.
- C. Store materials on the project site in enclosures or under protective coverings in accordance with manufacturer's recommendations and as required by the Engineer.
- D. Assure that materials are kept clean and dry.
- E. Do not store materials directly on the ground.
- F. Follow manufacturer's specific instructions, recommendations and requirements.
- G. Store in a manner to protect items with epoxy shop coatings from exposure to UV light which can cause chalking of the epoxy. Length of acceptable exposure prior to providing UV protective measures shall be in accordance with coating manufacturer's recommendations. This includes protection from UV light after installation while awaiting covering or filling of tanks, or prior to topcoating with aliphatic polyester polyurethane for items scheduled to be topcoated.

PART 2 - PRODUCTS

2.1 MATERIALS

Materials are specified in the following Sections in this Division.

2.2 COATINGS

- A. Before exposure to the weather and after thorough cleaning to remove all rust, dirt, grease, and other foreign matter, the equipment and appurtenances specified herein shall be painted in the shop as specified hereinafter.
- B. Ferrous surfaces which will be submerged, shall be blast-cleaned to near-white metal in accordance with Steel Structures Painting Council Surface Preparation No. 10, Designation SSPC-SP100-63T, immediately before painting.

- C. Following cleaning, the surfaces shall be painted in the shop as follows:
 - 1. Interior surfaces of all hydrants, iron body piping, valves, the exterior surfaces of buried valves and gates, and miscellaneous piping appurtenances shall be given a shop finish of an asphalt varnish.
 - 2. Parts customarily finished at the shop shall be given coats of paint filler and enamel or other acceptable treatment customary with the manufacturer, all suitable for the intended service.
 - 3. Ferrous surfaces which are not submerged shall be shop primed immediately after blast-cleaning to near-white metal, with one coat of polyamide epoxy applied to a minimum of 4 mils dry film thickness, and which shall be 20-1 Pota-pox made by Tnemec Co., Inc., North Kansas City, Mo.; Sherwin Williams Macropoxy 646, or equal.
 - 4. Ferrous surfaces which are not submerged shall be given two shop coats of Inertol Rustinhibitive Tnemec 77 Chem-Prime made by Tnemec Co., North Kansas City, Mo.; Sherwin Williams Macropoxy 646, or equal.
 - 5. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable protective coating.
- D. Shop coats shall be compatible with and made by the same manufacturer as the field applied coats and shall not require special intercoat preparation for good topcoat bond. All coating surface preparation and coating use, mixing, application, and curing shall be in accordance with the current printed instructions of the coating manufacturer and be as specified herein.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
- B. Carefully inspect all materials at the time of delivery and just prior to installation.
- C. Carefully inspect all pipe and fittings for:
 - 1. Defects and damage.
 - 2. Deviations beyond allowable tolerances for joint dimensions.
 - 3. Removal of debris and foreign matter.
- D. Examine areas and structures to receive piping for:
 - 1. Defects, such as weak structural components that adversely affect the execution and quality of work.
 - 2. Deviations beyond allowable tolerances for pipe clearances.
- E. All materials and methods not meeting the requirements of this Contract will be rejected.
- F. Immediately remove all rejected materials from the project site.
- G. Start work only when conditions are corrected to the satisfaction of the Engineer.

3.2 INSTALLATION

- A. General:
 - 1. Install all pipe and fittings in strict accordance with the manufacturer's instructions and recommendations and as specified herein.
 - 2. Install all pipes and fittings in accordance with the lines and grades shown on the Drawings and as required for a complete installation.
 - 3. Install adaptors, acceptable to the Engineer, when connecting pipes constructed from different materials.

B. Installation in Trenches:

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
6. Set the pipe true to line and grade.
7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
8. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
9. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
10. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
11. Take all necessary precautions to prevent floatation of the pipe in the trench.
12. Bedding and backfill for all pipe materials shall be as specified in the appropriate Sections and as shown on the Drawings.

C. Temporary Plugs:

1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipelines as conductors for trench drainage during construction.

3.3 CLEANING AND TESTING

A. Cleaning & Testing Piping - General:

1. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.
2. When the installation is complete, test all pipelines in the presence of the Engineer and the plumbing or building inspector in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications, at no additional cost to the Owner. All testing shall be performed prior to backfilling or concealing, unless otherwise acceptable to the Engineer.
3. Equipment: Supply all labor, equipment, materials, taps, gages, and pumps required to conduct the tests.
4. Retesting: Perform all retesting required by the Engineer at no additional cost to the Owner.

B. Outside Potable Water Piping:

1. Pressure Test:
 - a. Perform testing in accordance with Section 4 of AWWA Standard C600.
 - b. Pressure and leakage tests are required and will be conducted concurrently.
 - c. Hydrant branch gate valves shall remain open during this test.
 - d. The hydrostatic pressure shall be at the test pressures noted on the Drawings. Test duration shall be 2 hours.
 - e. Leakage, as specified in AWWA C600.
 - f. The Contractor shall furnish and install corporation stops, taps and lengths of line as required to conduct the testing.
2. Disinfection of Pipelines:
 - a. Chlorinate all new potable water lines in accordance with the procedure outlined in AWWA C651. (Section 5.1 deleted)
 - b. Review locations of chlorination and sampling points with the Engineer prior to beginning disinfection.
 - c. Use a dosage which will produce an initial minimum concentration of 25 mg/l and not less than 10 mg/l chlorine residual after a contact period of 24-hours.
 - d. During the chlorination period, exercise care to prevent the contamination of water in the existing water main.
 - e. After chlorination, flush the piping with clean potable water until the residual is that prevailing in the existing system or less than 0.5 mg/l.
 - f. The Contractor shall furnish and install corporation stops, taps, and lengths of pipe as required to conduct testing.
 - g. Dispose of chlorinated water as per AWWA C651, Appendix B.
3. Bacteriological Testing:
 - a. Test all new potable water lines for total coliform bacteria at no additional cost to the Owner.
 - b. The length of pipe to be tested and the time of the test itself shall be as approved in advance by the Engineer.
 - c. The Engineer will observe the taking of samples.
 - d. Have all samples tested by a laboratory certified by the State and submit test results to the Engineer.
 - e. Any segment of a potable water line shall be considered unsuitable for service if a coliform bacteria count is obtained from that sample or if results show a high non-specific bacteria level.
 - f. Re-disinfect all segments of piping considered unsuitable and retest. Continue to disinfect and test until satisfactory results are obtained.
 - g. Place piping into service when it has been successfully tested for pressure, leakage and total coliform bacteria and has been accepted by the Engineer.

PIPE SCHEDULE

DESCRIPTION	SIZE RESTRICTIONS	MATERIAL	JOINT SYSTEM
SEWER	15"Ø OR LESS	SDR 35 (ASTM D3034-04a) PVC, C-900(ASTM D-1784) OR CLASS 50 DI	PUSH-ON
SEWER	18"Ø THROUGH 27"Ø	CLASS 50 DI OR PVC (T-1 & T-2 ASTM F679-03)	PUSH-ON
STORM DRAIN AND PERFORATED STORM DRAIN	ALL SIZES	SMOOTH WALL INTERIOR CORRUGATED PE, CLASS 3 RCP OR SDR 35 PVC*	PUSH-ON
WATER	ALL SIZES	CLASS 52 DI	PUSH-ON
WATER SERVICES	2" OR LESS	TYPE K COPPER	BRASS, SEE 02626

*Storm drain under NHDOT property shall be Class 5 RCP.

END OF SECTION

SECTION 02615

DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide and install ductile iron pipe of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: "Pipe and Pipe Fittings - General" is specified in the appropriate Section in this Division.

1.2 QUALITY ASSURANCE

- A. Standards (As Applicable):
 - 1. Cement-mortar lining for water: ANSI A21.4 (AWWA C104).
 - 2. Rubber gasket joints: ANSI A21.11 (AWWA C111).
 - 3. Ductile iron pipe thickness: ANSI A21.50 (AWWA C150).
 - 4. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A21.51 (AWWA C151).
 - 5. Pipe flanges and fittings: ANSI B16.1 and ANSI A21.10 (AWWA C110).
 - 6. Threaded, flanged pipe: ANSI A21.15 (AWWA C115).
 - 7. Cast and ductile iron fittings: ANSI A21.10 (AWWA C110).
 - 8. Ductile iron fittings: ANSI 21.53 (AWWA C153).

1.3 DELIVERY, STORAGE & HANDLING

- A. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.
- B. Protect the spherical spigot ends and the plain ends of all pipes during shipment by wood lagging securely fastened in place.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe:
 - 1. Unless otherwise shown on the Drawings, the minimum thickness of ductile iron pipe shall be:
 - a. Water main, all sizes: Class 52.
 - b. Sewer, all sizes: Class 50.
 - 2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
 - 3. Pipe shall be double thickness cement lined and seal coated unless noted otherwise on the Drawings.
 - 4. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the manufacturer of the couplings.
 - 5. Factory applied bituminous coatings (in accordance with AWWA C151) shall be furnished on the exterior of all underground piping unless specified otherwise.
 - 6. The outside of all non-buried piping shall not be coated with bituminous coating, but shall be thoroughly cleaned and sleeved in corrosion resistant covering.
 - 7. All pipe and fittings shall be lead-free.

- B. Joints (as shown on Drawings or as specified):
1. Push-on and Mechanical Joint:
 - a. The plain ends of push-on pipes shall be factory machined to a true circle and chamfered to facilitate fitting the gasket.
 - b. Provide gaskets manufactured from a composition material suitable for exposure to the fluid to be contained within the pipe.
 - c. Bolts and nuts for buried mechanical joints shall meet AWWA C-111 requirements.
 2. Grooved split ring couplings, sleeve couplings, flexible joints and couplings, shall be supplied as specified in "Couplings and Connectors" Section.
 3. Joint Bracing:
 - a. Provide joint bracing to prevent the piping from pulling apart under pressure as required and as shown on the Drawings.
 - b. Types of bracing:
 - 1) Pipe and fittings furnished with approved lugs or hooks cast integrally for use with socket pipe clamps, tie rods, or bridles. Bridles and tie rods shall be a minimum of 3/4 inch diameter except where they replace flange bolts of a smaller size, in which case they shall be fitted with a nut on each side of the pair of flanges. The clamps, tie rods, and bridles shall be coated with bituminous paint in buried installations and shall be coated with the same coatings as the piping system in interior installations after assembly or, if necessary, prior to assembly.
 - 2) Mechanical joint follower gland pipe restrainer.
 - (a) Ductile iron gland and restraining ring, or follower gland with multiple gripping action restrainer wedges.
 - (b) Gasket shall be standard MJ gasket - ANSI/AWWA-C111/A21.11
 - (c) Working pressure 350 psi, up to 8 inches; 250 psi for 10 and 12 inch sizes.
 - (d) Wedge style restrainer system (no gripping ring style system):
 - i. MEGALUG
 - ii. Or approved equal
 - 3) Other types of bracing as shown on the Drawings.
 - C. All iron and steel pipe and fitting must comply with the AIS requirements of this project.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets, and other materials.
- B. Carefully inspect all materials at the time of delivery and just prior to installation.
- C. Carefully inspect all pipe and fittings for:
 1. Defects, such as weak structural components, which adversely affect the execution and quality of work.

2. Deviations beyond allowable tolerances for pipe clearances.
- D. Immediately remove all rejected materials from the project site.

3.2 INSTALLATION

A. Assembling Joints:

1. Push-on Joints:

- a. Insert the gasket into the groove of the bell.
- b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
- c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
- d. Two bronze wedges are required for each joint and shall be installed 180° apart.

2. Bolted Joints:

- a. Remove rust preventive coatings from machined surfaces prior to assembly.
- b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.

3. Mechanical Joints:

- a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
- b. Lubricate the gasket, bell, and spigot by washing with soapy water.
- c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly seated.
- d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
- e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joint to the proper tension with a torque wrench.
- f. The correct range of torque (as indicated by a torque wrench) and the length of wrench (if not a torque wrench) shall not exceed:
 - 1) Range or Torque: 60-90 ft.-lbs.
 - 2) Length of Wrench: 10 inches.
- g. If effective joint sealing is not attained at the maximum torque specified above, disassemble, thoroughly clean, and reassemble the joint. Do not overstress the bolts to tighten a leaking joint.

4. Bell and Spigot Joints:

- a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.
- b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

B. Fabrication:

1. Tapped Connections:

- a. Make all tapped connections as shown on the Drawings or as required by the Engineer.
- b. Make all connections watertight and of adequate strength to prevent pullout.
- c. Drill and tap normal to the longitudinal axis of the pipe.

- d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANS A21.51 based on 2 full threads for ductile iron.
- 2. Cutting:
 - a. Perform all cutting as set forth in AWWA C600.
 - b. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.
- C. Pipe Deflection:
 - 1. Push-on and Mechanical Joints: The maximum permissible deflection of alignment at joints shall be limited to that given in AWWA C600.
 - 2. Flexible Joints: The maximum deflection in any direction shall not exceed the manufacturer's instructions and recommendations.

END OF SECTION

SECTION 02616

DUCTILE IRON PIPE FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install cast iron and/or ductile iron pipe fittings of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: "Pipe & Pipe Fittings - General" is specified in this Division.

1.2 QUALITY ASSURANCE

- A. Standards:
 - 1. Cement-mortar lining for water: ANSI A21.4 (AWWA C104).
 - 2. Cast and ductile iron fittings: ANSI A21.10 (AWWA C110).
 - 3. Rubber gasket joints: ANSI A21.11 (AWWA C111).
 - 4. Pipe flange and fittings: ANSI B16.1 and ANSI A21.10 (AWWA C110).
 - 5. Ductile iron compact fittings: ANSI A21.53 (AWWA C153).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Standard Fittings:
 - 1. Pressure rating of 250 psi unless indicated otherwise on the Drawings or as specified.
 - 2. Flange fittings shall be ANSI B16.1, Class 125 unless indicated otherwise.
 - 3. Joints shall be the same material as the pipe with which they are used or as shown on the Drawings.
 - 4. Provide fittings with standard bases where shown on the Drawings.
 - 5. Cement lining and seal coat unless noted otherwise on the Drawings, and except for air piping applications where the fittings shall be unlined.
 - 6. Factory applied bituminous coatings shall be furnished for all underground fittings. All non-buried fittings shall receive coatings in accordance with Section 02610.
 - 7. All pipe and fittings shall be supplied with silicone bronze serrated wedges for conductivity.
- B. Non-Standard Fittings:
 - 1. Fittings having non-standard dimensions shall be subject to the Engineer's review and acceptance.
 - 2. Non-standard fittings shall have the same diameter and thickness as standard fittings and shall meet the specification requirements for standard fittings.
 - 3. The laying lengths and types of joints shall be determined by the particular piping to which they connect.
- C. All fittings shall be lead-free.
- D. All iron and steel pipe and fitting must comply with the AIS requirements of this project.

2.2 MANUFACTURER

- A. Tyler
- B. US Pipe & Foundry, Inc.
- C. Or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install in strict accordance with the pipe and fitting manufacturer's instructions and recommendations and as specified or as shown on the Drawings.
 - 2. Insert 2 serrated wedges 180° apart between the lip of the bell and the plain end to maintain electrical conductivity between joints.
 - 3. Concrete thrust blocks or other acceptable thrust resistant system is required at all fittings on pressure pipe. Where thrust blocks are used, these shall be placed against undisturbed soil or screened gravel compacted to 95 percent and shall be placed so that the joints are accessible for repairs.
- B. Fabrication:
 - 1. Tapped Connections:
 - a. Make all tapped connections as shown on the Drawings and/or as required by the Engineer.
 - b. Make all connections watertight and of adequate strength to prevent pullout.
 - c. Drill and tap normal to the longitudinal axis of the pipe.
 - d. The maximum sizes of taps in pipes and fittings without busses shall not exceed the sizes listed in the appendix of ANSI A21.51 based on 3 full threads for cast iron and 2 full threads for ductile iron.
 - e. Taps in fittings shall be located where indicated by the manufacturer for that particular type of fitting.
- C. Castings in Masonry:
 - 1. Accurately set and align castings to be encased in masonry.
 - 2. Thoroughly clean castings immediately prior to being set in place. Remove all rust, scale and other foreign material.

END OF SECTION

SECTION 02626

COPPER PIPE & FITTINGS (BURIED APPLICATIONS)

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install copper pipe and fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: "Pipe & Pipe Fittings - General" is specified in this Division.

1.2 QUALITY ASSURANCE

- A. Pipe: Seamless copper water tube, ASTM B88.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe Use (When Applicable):
 - 1. Domestic water (buried exterior).
 - a. Type K, soft annealed.
- B. Fittings:
 - 1. Wrought copper and bronze solder joint pressure fittings: ANSI B16.22.
 - 2. Buried Fittings: waterworks brass (85-5-5-5), compression fittings with BUNA-N gasket.
- C. All pipe and fittings shall be lead-free.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Jointing:
 - 1. Flared Joints:
 - a. Ream or file the pipe to remove burrs.
 - b. Slip the fittings over the tube ends to be flared.
 - c. Expand the ends of the tube using flaring tools.
 - d. Inspect the flared ends for cracks, splits and other damage.
 - e. If inspection reveals damage, cut the flare off and make a new flare.
 - f. Squarely seat the flared ends on the fittings and tighten the nuts.
- B. Bending Pipe:
 - 1. Bend pipe by the method and to the radius to comply with the manufacturer's recommendation.
 - 2. Bends shall be free of any cracks or buckles.

END OF SECTION

SECTION 02630

COUPLINGS & CONNECTORS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install couplings and connectors of the type(s) and size(s) in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: "Pipe & Pipe Fittings - General" is specified in this Division.

1.2 QUALITY ASSURANCE

- A. Minimum pressure rating equal to that of the pipeline in which they are to be installed.
- B. Couplings and connectors, other than those specified herein, are subject to the Engineer's approval.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All Couplings and Connectors:
 - 1. Gasket Materials: Composition suitable for exposure to the liquids to be contained within the pipes.
 - 2. Diameters to properly fit the specific types of pipes on which couplings and connectors are to be installed.
- B. Sleeve Type Couplings (When Applicable):
 - 1. Buried Couplings (For joining pipe of dissimilar diameters):
 - a. Cast iron or epoxy coated steel middle rings with pipe stops removed,
 - b. Two malleable iron or epoxy coated steel follower rings with ribbed construction,
 - c. Two wedge-section gaskets,
 - d. Sufficient AWWA C-111 or stainless-steel nuts and bolts to properly compress the gaskets,
 - e. Acceptable Manufacturers:
 - 1) Dresser Manufacturing Co. - Style 38 and/or 153,
 - 2) Rockwell - Style 431, and/or 441,
 - 3) Or equivalent.
 - 2. Buried Couplings (for joining pipe of similar diameters):
 - a. Constructed from malleable or ductile iron.
 - b. Solid sleeve with M.J. ends conforming to AWWA C110 or AWWA C153.
 - c. Bolts - A558
 - d. Acceptable Manufacturers:
 - 1) Tyler
 - 2) Or equivalent
- C. All fittings, couplings and connections shall be lead-free and if iron or steel, conform to the AIS requirements of this project.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Sleeve Type Couplings (When Applicable):
 - 1. Thoroughly clean pipe ends for a distance of 8 inches from the ends prior to installing couplings, and use soapy water as a gasket lubricant.
 - 2. Slip a follower ring and gasket (in that order) over each pipe and place the middle ring centered over the joint.
 - 3. Insert the other pipe length into the middle ring the proper distance.
 - 4. Press the gaskets and followers evenly and firmly into the middle ring flares.
 - 5. Insert the bolts, finger tighten and progressively tighten diametrically opposite nuts uniformly around the adapter with a torque wrench applying the torque recommended by the manufacturer.
 - 6. Insert and tighten the tapered threaded lock pins.
- B. Buried Epoxy Coated Steel Couplings: Thoroughly coat all exterior surfaces, including nuts and bolts after assembly and inspection by the Engineer with a coal tar approved by the Engineer. Prior to coating, roughen the epoxy with emery paper and follow with a solvent cleaner (aromatic similar to xylol). Dry film thickness of the coal tar is to be 12-16 mils.
- C. Install thrust rods, supports, and other provisions to properly support pipe weight and axial equipment loads.

END OF SECTION

SECTION 02641

GATE VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish, install and test gate valves of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified.
- B. Related Work Specified Elsewhere: "Valves and Specialties - General" is specified in this Division.

1.2 QUALITY ASSURANCE

- A. All gate valves of same type and style shall be manufactured by one manufacturer.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Waterworks type NRS valves (AWWA):
 - 1. Valve Body, bonnet and stuffing box - Ductile iron, coated inside and out with fusion bonded epoxy meeting AWWA C550.
 - 2. Resilient Wedge - Ductile iron wedge with bonded Nitrile elastomer or EPDM covering.
 - 3. Stem - Manganese bronze, ASTM B584.
 - 4. Stuffing box O-rings
 - a. Two O-rings, each nitrile rubber.
 - b. Capable of changing under pressure.
 - 5. Wedgenut - Bronze, ASTM B62.
 - 6. Bolting - stainless steel Type 18-8, ASTM F593, GP1.
 - 7. End Connections for buried valves - mechanical joints.
 - 8. Operation
 - a. Buried valves - 2-inch square nut, cast iron, ASTM A126, C1B
 - b. Opening Direction – counterclockwise (left)
 - 9. Manufacturer
 - a. Mueller
 - b. Kennedy Valve Manufacturing
 - c. Waterous
 - d. American Flow Control
 - e. Or equivalent
 - 10. Standards - valves shall meet or exceed AWWA C509, latest edition.
- B. All valves shall be lead-free.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install valves with stem position vertical.
- B. Valve box vertical and centered over operating nut.
- C. Valve box supported during backfilling and maintained vertical.
- D. Install and test in accordance with AWWA C500 and AWWA C509 latest revision.

END OF SECTION

SECTION 02642

CORPORATION STOPS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install corporation stops of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

- A. All corporation stops shall be manufactured by one manufacturer.
- B. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Constructed of brass.
- B. Outlet shall have compression connection.
- C. Acceptable Manufacturers:
 - 1. Mueller
 - 2. Ford Meter Box Co.
 - 3. Or equal.
- D. Working pressure shall be 150 psi.
- E. All stops shall be lead-free.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install at locations shown on the Drawings and as specified in accordance with manufacturer's instructions.
- B. Check and adjust all corporation stops for smooth operation.

END OF SECTION

SECTION 02643

CURB STOPS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install curb stops of the type(s) and size(s) and in the location(s) indicated in the General Notes, on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

- A. All curb stops shall be manufactured by one manufacturer.
- B. Qualifications of Manufacturer: Products shall have proven reliable in similar installations over a reasonable number of years.
- C. Acceptable Manufacturers:
 - 1. Ford
 - 2. Mueller
 - 3. Hayes
 - 4. Or equivalent

PART 2 - PRODUCTS

2.1 PRODUCT CONSTRUCTION

- A. Constructed of brass.
- B. Inlet and outlet shall have compression connection.
- C. Working pressure of 150 psi shall be required.
- D. Shall have a quarter turn plug type valve and O-ring type seal.
- E. Shall have a positive stop.
- F. All stops shall be lead-free.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install at locations indicated in the General Notes and on the Drawings in accordance with manufacturer's instructions.

3.2 ADJUSTMENTS

- A. Check and adjust all curb stops for smooth operation.

END OF SECTION

SECTION 02645

CURB BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install curb boxes at all new curb stops of type (s) and size (s) and as detailed on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: Pipes, trench excavation and backfill, and valve boxes are specified in this Division.

1.2 QUALITY ASSURANCE

- A. All curb boxes shall be manufactured by one manufacturer.
- B. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.
- C. Acceptable Manufacturers:
 - 1. Quality Water Products.
 - 2. Ford Meter Box Company.
 - 3. Or equal.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

- A. Cast iron base piece, steel upper, castiron lid, and threaded bronze plug with pentagon nut (Rope Thread).
- B. Extension type and arch pattern base.
- C. Adjustable upper section shall be 1-inch diameter for 3/4-inch curb stops and 1-1/4 inches diameter for curb stops larger than 3/4-inch.
- D. Valve box shall be as specified elsewhere in this Division and conform to the AIS requirements for this project.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install as shown on the Drawings and/or as requested by the Engineer.
 - 1. When installation is complete no pressure shall be exerted by the curb box on either the curb stop or the service pipe.
 - 2. Be of such a length as required.

END OF SECTION

SECTION 02646

VALVE BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install valve boxes of type(s) and size(s) detailed in the Drawings and as specified herein. Valve Boxes shall be provided at each new gate valve.

1.2 QUALITY ASSURANCE

- A. All valve boxes shall be manufactured by one manufacturer.
- B. Qualifications of Manufacturer: Products to have been proven reliable in similar installations over a reasonable number of years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The valve box shall be cast iron, slip type two-piece integral base, 5-1/4 inch inside diameter shaft.
- B. Cast or ductile iron, with the word "Water" cast in covers and conform to the AIS requirements of this project.
- C. Buffalo Type with flange on top section.
- D. Covers shall be made with a directional arrow cast into them indicating which direction the operator is to turn the valve to open it. (open counter-clockwise, left)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation as shown on the Drawings and/or as specified herein.
 - 1. When installation is complete, no pressure shall be exerted by valve box on the water main or on the valve.
 - 2. Be of such length as required without full extension. Minimum lap 6 inches.

END OF SECTION

SECTION 02650

BURIED UTILITY MARKINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: This work shall consist of providing detectible utility line markings installed above all buried lines installed as part of this contract as indicated on the Drawings and replacing existing markings disturbed as part of this contract.
- B. Related Work Specified Elsewhere: Pipe, earthwork, and trench insulation are specified in the appropriate Sections in this Division.

1.2 QUALITY ASSURANCE

- A. Acceptable manufacturers:
 - 1. Seton Identification Products, New Haven, CT.
 - 2. Empire Level Manufacturing Co., Mukwonago, WI.
 - 3. Pro-Line Safety Products, West Chicago, IL
 - 4. or Equal.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials and color shall be in accordance with latest AASHTO specifications for pipe and utility marking.
- B. For ferrous pipe material use 0.004-inch minimum polyethylene film; 6-inch wide clearly marked with the type of buried utility
- C. For non-ferrous pipe material (e.g. Concrete, PVC, PE, aluminum or plastic conduit, cable, etc.) use a composite detection tape such as polyethylene with a metallic core, 6-inch wide with the type of buried utility clearly marked on the tape.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Marking tape shall be installed over utility lines centerline and buried 24-inch below grade.
- B. Markings damaged during opening of trench shall be reinstalled with 2-foot overlap at broken sections.

END OF SECTION

SECTION 02675

CLEANING, TESTING AND DISINFECTION OF WATER MAINS

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work of this section includes the furnishing of all labor, tools, equipment and materials and performing all operations necessary for the flushing, pressure testing, leakage testing and chlorination of water mains as specified herein and as required to complete the work.

1.2 QUALITY ASSURANCE

- A. Standards (as applicable):
 - 1. All work shall be in accordance with this specification and AWWA C651. Where conflicts appear between these specifications and AWWA C651 the more stringent requirement shall apply.
 - 2. Chlorine solution for disinfecting water mains and appurtenances shall be made from either liquid sodium hypochlorite, or solid calcium hypochlorite, which shall conform to the latest AWWA B300 Standard for Hypochlorite.
 - 3. Chlorine test kits shall be as described in the current edition of AWWA M12 - Simplified Procedures for Water Examination.
 - 4. Disposal of chlorinated water as per AWWA C651, Appendix B.

1.3 COORDINATION

- A. Use of water will only be as approved and coordinated by the Owner.
- B. All flushing, pressure and leakage testing and chlorinating shall be done by the Contractor in the presence of the Engineer and in the presence of the Owner or Owner's Representative in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications, at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Each temporary blow-off shall consist of a corporation cock, type K copper tubing and a curb stop, each of not less than 2-inch diameter.
- B. A pumping unit or proportionate feeder suitable for delivering a hypochlorite solution to the isolated main shall be provided. The unit used shall prevent chlorine solution from flowing back into the existing system.

PART 3 - EXECUTION

3.1 GENERAL

- A. Thoroughly clean all piping prior to testing. Remove all dirt, dust, oil, grease and other foreign material. Exercise care while cleaning to avoid damage to linings and coatings.
- B. Supply all labor, equipment, materials, gages, and pumps required to conduct the tests. The drawings do not detail taps, gages, plugs and other related materials required to perform testing. These materials are the responsibility of the Contractor.

- C. Flushing, testing and chlorinating of the mainline shall closely follow main laying work. As the mainline is installed, it shall be tested approximately every 1,000 feet, or between line valves, whichever is less. Should the mainlines fail to be flushed, tested, and chlorinated as specified, the main laying work shall be suspended until the flushing, testing and chlorinating is done.
- D. Final acceptance of the water main shall be based on successful (negative) results of bacteriological tests, which shall be done on samples taken from the main following chlorination and final flushing. Locations of samples shall be determined by the Engineer.
- E. The testing and related procedures described herein, shall be performed in the order listed.
- F. The Contractor, with the assistance of the Owner, shall fill mains as slowly as practicable so as not to cause dirty water and serious pressure drops within the existing system.

3.2 FLUSHING

- A. All new water mains, and existing water mains that have been drained and cut-into for making connections, shall be thoroughly flushed prior to pressure or leakage testing or final chlorination. Flushing shall be accomplished by partially opening and closing valves, hydrants, and blowoffs, several times, under expected line pressure, with flow velocities of not less than 2.5 feet per second, in the main. The size and number of hydrant outlets and/or main taps to provide the required flow (at 40 psi residual pressure) is as follows:

Minimum Required Flow and Openings Required to Flush Water Mains
(Assuming 40 psi Residual Pressure in Water Mains)

Main Diameter (in.)	Flow Required to Produce 2.5 fps in Main (gpm)	Minimum Size of Taps (in.)	Hydrant Outlets Number	Size (in.)
4	100	15/16	1	2-1/2
6	220	1-3/8	1	2-1/2
8	390	1-7/8	1	2-1/2
10	610	2-5/16	1	2-1/2
12	880	2-13/16	1	2-1/2
16	1565	3-5/8	2	2-1/2

- 1. If less than a 40 psi residual is available in the main, with the size tap shown above then a larger, or more tap(s) or hydrant outlets will be required, as determined by the Engineer.
- 2. The length of time for flushing, at or above the minimum allowable velocity, shall be computed to allow a minimum of 3 times the total volume of water in the main to be flushed to waste. Flushing shall be done in the presence of the Engineer.

3.3 AIR REMOVAL

- A. Following flushing, and before applying the specified test pressure, air shall be completely expelled from the mains, valves, and hydrants. After all air has been expelled, the air blowoffs can be closed, and the test pressure applied.

3.4 PRESSURE TEST

- A. All new water mains, or any sections thereof, shall be subjected to a hydrostatic pressure of at least 1.5 times the working pressure that will exist at the point of testing, or 150 psi, whichever is greater. Test pressures shall meet the following requirements:
1. Be of at least 2-hour duration.
 2. Be not less than 1.25 times the expected system working pressure at the highest point along the test section.
 3. Not exceed main or thrust-restraint design pressures.
 4. Not vary by more than + 5 psi for the duration of the test.
 5. Not exceed 2 times the rated pressure of the valves or hydrants when the pressure boundary includes closed valves or hydrants. Valves shall not be operated in either direction at differential pressure greater than the rated pressure.
 6. Not exceed 1.5 times the rated pressure of the valves when the pressure boundary of the test section includes closed butterfly valves or resilient seated gate valves.
- B. Each section of main shall be slowly raised to the specified test pressure for two separate periods. The first period shall be for 15 minutes, after which the pressure shall be allowed to drop slowly back to system pressure. The pressure shall then be slowly raised again to the specified test pressure and maintained for 2 hours. The test pressure shall be based on the elevation of the lowest point of the main, in the test section and shall be corrected to the elevation of the test gauge, as directed by the Engineer. The test pressure shall be applied by means of a pump connected to the main, in an approved manner, and which will prevent any backflow into the existing system. Valves shall not be operated in either the closing or opening direction, at differential pressure greater than the rated pressure.
- C. Any exposed main, fittings, valves, hydrants and joints shall be carefully examined during the test. Any damaged or defective main, fittings, hydrants, or valves discovered following, or as a result of the pressure test shall be repaired or replaced with sound material. If faulty materials are removed and replaced, the pressure testing procedure shall be repeated.

3.5 LEAKAGE TEST

- A. Leakage testing shall be conducted concurrently with the pressure test.
- B. Leakage is defined as the quantity of water that must be pumped into the new main during the test, or any section thereof, required to maintain pressure within 5 psi of the starting test pressure. Leakage shall be recorded to the nearest one-tenth of a gallon. The Contractor shall employ qualified personnel throughout the testing. Leakage shall not be measured by a drop in pressure over a period of time.
- C. Leakage in the test section must be less than an amount determined as follows:

$$L = \frac{SD(P^{0.5})}{148,000}, \text{ where}$$

L = allowable gallons of leakage per hour

S = the length of main tested, in feet

D = the nominal main diameter in inches

P = the average test pressure during the test, in psi

- D. The leakage formula is based allowable leakage of 11.65 gallons per day, per mile of main, per inch (nominal) of main diameter, at a pressure of 150 psi. Allowable leakage under various conditions is shown below.

Average Test Pressure(psi)	Allowable Leakage per 1,000 Feet of Mainline						
	Nominal Diameter (inches)						
	6	8	10	12	16	20	24
250	0.64	0.85	1.07	1.28	1.71	2.14	2.56
225	0.61	0.81	1.01	1.22	1.62	2.03	2.43
200	0.57	0.76	0.96	1.15	1.53	1.91	2.29
175	0.54	0.72	0.89	1.07	1.43	1.79	2.15
150	0.50	0.66	0.83	0.99	1.32	1.66	1.99
125	0.45	0.60	0.76	0.91	1.21	1.51	1.81
100	0.41	0.54	0.68	0.81	1.08	1.35	1.62

1. If the mainline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
 2. When testing against closed metal seated valves, an additional leakage shall be allowed per closed valve of 0.0078 gallons per hour, per inch of nominal valve diameter.
 3. When hydrants are in the test section, the test shall be made against the closed hydrant(s).
- E. Acceptance shall be determined on the basis of allowable leakage. If leakage in any test is greater than that specified, the Contractor shall locate and make repairs as necessary until the leakage is within the specified allowance.
1. All visible leaks are to be repaired regardless of the amount of leakage.
 2. All water mains shall be pressure and leakage tested in the presence of the Engineer, in order to qualify for acceptance.

3.6 CHLORINATION

- A. The method of chlorination shall be the *Continuous Feed Method* as described hereinafter. Chlorination procedures will not be allowed until acceptable flushing and pressure testing has been performed and accepted. The continuous feed method consists of the following steps:
1. Prior to the application of chlorine, confirm that valves are closed to prevent back-feeding chlorine solution into the existing system.
 2. At a point not more than 10 feet downstream from the beginning of the new main, fill the main with chlorinated potable water, having an initial concentration of 25 mg/l free chlorine residual.
 - a. Water from the existing distribution system or other approved source of supply shall flow at a constant measured rate, into the new main. In the absence of a meter, the rate may be approximated by measuring the discharge rate at the end of the test section with a pito-gauge or by measuring the time to fill a container of known volume.
 3. The application of chlorine solution shall continue until the entire main is filled with water having 25 mg/l of free available chlorine. To assure that

10 mg/l free chlorine residual concentration is achieved throughout the test section, the Contractor shall measure chlorine concentration at regular intervals.

- B. The amount of chlorine required to obtain a concentration of 25 mg/l per 100 feet of various diameter mains is as follows.

Chlorine Required to Obtain 25 mg/l per 100 feet of Various Diameters

Main Diameter (inches)	Sodium Hypochlorite (gallons)				Calcium Hypochlorite (ounces)
	5% Available Chlorine	10% Available Chlorine	12.5% Available Chlorine	15% Available Chlorine	65% Available Chlorine
4	0.03	0.02	0.02	0.01	0.02
6	0.08	0.04	0.03	0.03	0.75
8	0.13	0.07	0.06	0.06	1.30
10	0.20	0.10	0.09	0.07	2.10
12	0.28	0.15	0.12	0.10	2.90
16	0.50	0.25	0.22	0.17	5.30
20	0.80	0.40	0.34	0.28	8.40
24	1.30	0.60	0.50	0.40	12.00

1. The above quantities are to be added to a sufficient quantity of water, dissolved, and mixed. The solution shall be injected into the main as specified.
 2. The quantities shown are based on concentrations of available chlorine by volume. Extended or improper storage may have caused a loss of available chlorine.
- C. The chlorinated water shall be retained in the main for a minimum of 24 hours. At the end of this 24 hour period, retest portions of the main to confirm that a minimum of 10 mg/l free available chlorine residual exists in the main. If the residual chlorine is less than 10 mg/L, acceptable bacteria results may not be obtained.

3.7 FINAL FLUSHING OF CHLORINATED WATER

- A. After the initial 24-hour period, the heavily chlorinated water shall be flushed from the main until chlorine measurements show the concentration in water leaving the main is no higher than that generally prevailing in the system.
- B. The Contractor shall obtain approval of location(s) for discharging the heavily chlorinated water, which will result from the chlorination procedures. Great care shall be exercised in the selection of the rate of flow and the discharge points, in order to minimize complaints, and damage to public or private property.
- C. The heavily chlorinated water shall be suitably and thoroughly neutralized prior to disposal into the environment. In no case shall chlorinated or neutralized water be discharged directly into a water body. If necessary, state, federal, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.

3.8 BACTERIOLOGICAL TESTS

- A. After final flushing and before the water main is placed in service, water samples shall be collected twice (24 hours apart) by the Engineer or Owner and tested for bacteriological quality in accordance with standard methods. Water samples shall show the absence of coliform organisms and background bacteria.
- B. If, during construction, trench water has entered the main, or if in the opinion of the Engineer excessive quantities of dirt or debris have entered the main, bacteriological samples shall be taken at intervals of approximately 200 feet and shall be identified as to location. Samples shall be taken of water that has stood in the main for at least 24 hours after final flushing has been completed.
- C. Samples shall be obtained through a corporation cock and copper tubing installed by the Contractor.
- D. The Engineer or Owner shall deliver samples to a laboratory approved by the Department of Health Services for bacterial analysis. The Owner shall pay for the cost of analysis. Only after each consecutive sample is approved shall the mains be incorporated into the water system. In the event that positive reports of contamination are received, the mains shall be flushed and chlorinated as many times as may be necessary to obtain approved (negative) results.

3.9 RE-CHLORINATION

- A. If the initial chlorination fails to produce satisfactory bacteriological samples, the main shall be re-flushed and re-sampled.

3.10 CHLORINATION PROCEDURES WHEN CUTTING INTO OR REPAIRING EXISTING MAINS

- A. Trench Treatment. If during excavation the trench is either wet or filled with water, it is recommended that liberal quantities of hypochlorite tablets be applied to open trench areas to lessen the danger from pollution.
- B. The interior of all main and fittings used in making a repair shall be swabbed or sprayed with a 1% hypochlorite solution before they are installed.
- C. If valve and hydrant locations permit thorough flushing toward the work location from both directions, it shall be done. Flushing shall be started as soon as the repairs are completed and shall be continued until discolored water is eliminated.
- D. Slug Chlorination. Where practical and in addition to the procedures above, a section of main in which the break is located shall be isolated. All service connections shall be shut off, and the section flushed and chlorinated by the *Slug Chlorination* method. This method allows the chlorine dose to be increased to as much as 300 mg/l, and the contact time reduced to as little as 1 hour. After chlorination, the section shall be properly flushed until discolored water is eliminated and the water is free of noticeable chlorine odor.
- E. Bacteriological samples shall be taken after repairs. If the direction of flow is unknown, samples shall be taken on each side of the main break. If positive samples are recorded, daily sampling shall be continued until two consecutive negative samples are recorded.

END OF SECTION

DIVISION 03

CONCRETE

SECTION 03300A

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cast-In-Place Concrete
- B. Formwork
- C. Concrete reinforcement and accessories
- D. Modifications and/or Repairs to concrete
- E. Concrete curing
- F. Concrete finishing
- G. Concrete repairs
- H. Concrete testing
- I. Non-Shrink Grout

1.2 RELATED SECTIONS

- A. Section 01340 - Submittals
- B. Section 01400 - Quality Control

1.3 REFERENCES

All references shall be the most current version of the standard, unless otherwise indicated.

- A. ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
- B. ACI 301 Standard Specifications for Structural Concrete
- C. ACI 302.1R Guide for Concrete Floor and Slab Construction
- D. ACI 304.2R Placing Concrete by Pumping Methods
- E. ACI 305R Hot Weather Concreting
- F. ACI 306.1 Standard Specification for Cold Weather Concreting
- G. ACI 308R Guide to Curing Concrete
- H. ACI 308.1 Standard Specification for Curing Concrete
- I. ACI 309R Guide for Consolidation of Concrete
- J. ACI 318/318R Building Code Requirements for Structural Concrete and Commentary
- K. ACI 347R Guide to Formwork for Concrete
- L. ASTM A82 Specification for Steel Wire, Plain, for Concrete Reinforcement
- M. ASTM A185 Specification for Steel Welded Wire Fabric, Plain for Concrete Reinforcement
- N. ASTM A615/Specification for Deformed and Plain Billet - Steel Bars A615M for Concrete Reinforcement
- O. ASTM A775/Specification for Epoxy-Coated Reinforcing Steel -A775M Bars
- P. ASTM C31/C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field
- Q. ASTM C33 Specification for Concrete Aggregates
- R. ASTM C39/C39M Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- S. ASTM C94/C94M Specification for Ready Mixed Concrete
- T. ASTM C150 Specification for Portland Cement
- U. ASTM C172 Practice for Sampling Freshly Mixed Concrete

- V. ASTM C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- W. ASTM C260 Specification for Air Entraining Admixtures for Concrete
- X. ASTM C309R Guide for Consolidation of Concrete
- Y. ASTM C1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with ACI 301, ACI 318 and ACI 350R as modified herein.
- B. Maintain copies of ACI 301, ACI 318, and ACI 350R on site.

1.5 QUALIFICATIONS OF INDEPENDENT TESTING LABORATORY

- A. Independent Testing Laboratory shall conform to concrete testing requirements of ASTM E329.
- B. Key personnel must be qualified and experienced in concrete quality assurance.
- C. Perform concrete field quality control testing with personnel certified as an ACI Concrete Field Testing Technician, Grade 1 according to the American Concrete Institute (ACI).

1.6 SUBMITTALS

- A. Submit layout drawings showing the location and extent of all joint waterstops, the type and size of all waterstops to be used and splice locations for each joint. Submit these layout drawings for review prior to the submittal of the reinforcing shop drawings and the start of concrete work.
- B. Submit shop drawings for concrete reinforcement prior to fabrication, showing bar bends, details and placement.
- C. Submit Concrete Mix designs including past field performance test results.
- D. Submit sieve analysis and soundness tests for fine and coarse aggregates taken within the last 3 months.
- E. Submit Cement Manufacturer's Certificates of conformance with ASTM C150 taken during the last 3 months.
- F. Submit sample concrete mix delivery slip.
- G. Submit product data for concrete curing, sealing and hardening compounds.
- H. Independent Testing Laboratory will submit one copy each of all test reports to each of the following: Engineer, Resident Project Representative, Contractor and Concrete Supplier.
- I. Independent Testing Laboratory will submit reports within 5 days of testing or inspection.
- J. Independent Testing Laboratory will telephone the Engineer within 24 hours if tests indicate deficiencies.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Plywood: APA, B-B Plyform Class I exterior.
- B. Lumber: Southern pine, No. 2 grade or equal.
- C. Steel: Minimum 16 ga. sheet, well matched, tight fitting, stiffened to resist loads without excess deflection.

- D. Form Liner: Plywood conforming to PS-1, Grade B-B exterior (concrete form) not less than 1/4 inch thick.
- E. Form Ties: Factory fabricated assembly providing at least 1.5 inch break back dimension with at least a 1-inch diameter conical wood or plastic cones to leave a uniform hole for patching. Single rod ties require a tightly fitted waterstop washer at the mid point. Multi rod ties do not require washers.
- F. Form release agent: non-staining colorless, compatible with finishes. CRETE-LEASE 727 Release Agent by Cresset Chemical Co., Super-X Emulsive by A.H. Harris & Sons, Inc. or equivalent.
- G. Conform to ACI 301 and ACI 347

2.2 REINFORCING STEEL

- A. Bars: ASTM A615 Grade 60; deformed new materials.
- B. Welded wire fabric: ASTM A185
- C. Tie wire: ASTM A82, annealed.
- D. Bolsters, chairs and supports: plastic coated, stainless steel, or epoxy coated.
- E. Conform to CRSI Code of Standard Practice-Fabrication.

2.3 CAST-IN-PLACE CONCRETE

- A. Concrete Materials
 - 1. Portland cement: ASTM C150; Type II. Tricalcium Aluminate (C₃A) content in cement less than 8%.
 - 2. Aggregates:
 - a. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM Specification C-33.
 - b. Coarse aggregate shall consist of a well graded crushed stone or washed gravel conforming to the requirements of ASTM Specification C-33.
 - 3. Water: potable from municipal water supply or equal.
 - 4. Admixtures: All from one common manufacturer.
- B. Admixtures
 - 1. Low Range Water Reducer: Pozzolith 122-N by Master Builders; WRDA with HYCOL by Grace Construction Products Division; or equivalent meeting ASTM C494 Type A.
 - 2. High Range Water Reducer (superplasticiser): Rheobuild 1000 by Master Builders; Daracem 100 by W.R. Grace; or equivalent meeting ASTM C494 Type F.
 - 3. Air entraining agent: Micro-Air by Master Builders, DAREX 11 AEA by Grace Construction Products; or equivalent meeting ASTM C260.
 - 4. Non-corrosive non-chloride accelerator: Pozzutec 20 by Master Builders; or equivalent meeting ASTM C494 type C or E.
 - 5. Not permitted: Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions.
- C. Concrete
 - 1. Concrete Class
 - a. Reinforced concrete sections: Class A
 - b. Concrete fill: Class B
 - 2. Concrete proportioning shall conform to ACI 318, Chapter 5 except as modified below:

Class	Minimum Compressive Strength (f_c)	Coarse Aggregate Size	Min.- Max. % Air	Min.- Max. Slump	Min.- Max. Cem.Fac.	Max. W/C	High Range Water Reducer
A	4000 PSI	No. 67 ($\frac{3}{4}$ ")	4-7	3-5	564-620	0.42	Yes
B	3000 PSI	No. 8 ($\frac{3}{8}$ ")	3-6	2-5	517-564	0.488	No

3. The maximum slump as indicated in the above table will be as measured at the batch plant. See comments about the HRWC below.
 4. Pumped Concrete: Conform to Chapter 4 - ACI 304.2
 5. High range water reducer shall be added on site to obtain 4 – 8 inch slump.
 6. No water shall be added on site.
 7. Concrete shall be furnished from one source during the project.
- D. Selection of Concrete Proportions
1. The Concrete producer shall select the concrete mix proportions on the basis of past field performance or the use of trial mixes in accordance with ACI 318 Sections 5.2, 5.3 and 5.4.

2.4 ACCESSORIES

- A. Joint filler and slab perimeters: J-Joint polyethylene foam with tear off strip for sealant or approved equal; joint filler to be slab thickness in depth less 0.5 inch for sealant.
- B. Expansion joint filler: Self expanding cork by W.R. Meadows or W.R. Grace or equal, size as indicated on the Drawings.
- C. PVC water-stops shall be extruded polyvinylchloride with virgin resin and shall be the flat ribbed type:
 1. Construction and Control Joints: 0.375 inch thick by 9 inches wide. Type R9-38 by Vinylex Corporation, Style 786 by Greenstreak Plastic Products or equivalent.
 2. Expansion Joints: 0.375 inch thick by 9 inches wide with a center bulb. Type RLB9-38 by Vinylex Corporation, Horn/Durajoint Type 7C by A.C. Horn or equivalent.
- D. Use prefabricated vinyl corners, tees and crosses.
- E. Surface applied waterstops: Waterstop-RX by Colloid Environmental Company, Swellseal Plus by de Neef America, or equal.
- F. Structural inserts: of type and size shown on the drawings; Richmond Screw Anchor or Heckman Building Products, Hohman and Barnard, Dayton Sure-Grip or equal.
- G. Sand Cement Slurry: specified concrete mix Class A without coarse aggregate.
- H. Bond Breaker: Thompson's Water Seal, Edoco (Dayton Products), Form Oil, or equivalent.
- I. Concrete Anchorage Fasteners:
 1. Expansion Anchors - Stainless steel AISI Type 316. Kwik-Bolt by Hilti Fastening Systems or Tru Bolt by Ramset Fastening System or equivalent.
 2. Anchor Rods - ASTM F1554 Grade 55.
 3. Adhesive Anchors. Non-expanding chemical type, 6" minimum projection and nut; Parabond Capsule Anchor by Molly Fastener or HVA Adhesive Anchor by Hilti Fastening Systems or equivalent.

2.5 NON-SHRINK GROUT

- A. Conform to ASTM C1107.
- B. Install in accordance with manufacturer's recommendations, using appropriate grout for intended use.

2.6 LIQUID CURING COMPOUND MATERIALS

- A. Curing and Sealing Compound; ASTM C309 Type 1 Class B. Super Kurseal by A.H. Harris & Sons, Inc. Emulsion Kurseal 309 by A.H. Harris & Sons, Inc. or equivalent.
- B. Dissipating Resin Curing Compound: ASTM C1315 type 1; Film must break down in two to four weeks. Kurez-DR by Euclid Chemical Company, Emulsion Super KonKure 309 clear by A.H. Harris & Sons, Inc., or equivalent.
- C. Curing/Hardening Compound: Sodium Silicate Type. Eucosil by Euclid Chemical Company, Super KurHard 309 by A.H. Harris & Sons, Inc., or equivalent.

2.7 FINISHING MATERIALS

- A. Slab Sealer: Siloxane based 96% chloride ion screen, Euclid Chemical, Okon, or equal.
- B. Bonding Admixture: Latex, non-rewettable type SBR Latex or Flex-con by Euclid Chemical, Daraweld C by W.R. Grace or equivalent.
- C. Patching Mortar: 1 part of a mixture of white and grey portland cement to 2.5 parts of damp loose sand. Cement type to match substrate.

2.8 REPAIR MATERIALS

- A. Epoxy Adhesive: Water Based epoxy resin/portland cement building agent by Sika Corporation, Eco-polymer or equal.
- B. Repair Mortar: polymer improved, cementitious, dual component, trowel grade mortar equal to Concrete Coat by Euclid Chemical; Sikatop 122 by Sika Corp. or equivalent.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Conform to ACI 301 and ACI 347
- B. Erect plumb and straight. Maintain rigid. Brace sufficiently.
- C. Allow no concrete leakage. Provide continuous, straight, smooth exposed surfaces.
- D. Treat forms with form release agent. Protect reinforcing from contact with form release agent.
- E. Earth forms not permitted.
- F. Chamfer all exposed outside corners and edges 0.75 inch unless otherwise noted.
- G. Clean out inside of forms of all foreign materials prior to concrete placement.
- H. Maintain forms and shores supporting the cast concrete for the time periods indicated:
 - 1. Walls and Vertical Surfaces *36 Hours

* These periods represent cumulative number of days or hours during which the temperature of the air surrounding the concrete is above

50°F and the concrete has been damp and no loss of moisture has occurred.

- I. Form pressures increase with the use of concrete with High Range Water Reducers. Design forms accordingly.
- J. All concrete formwork, including reinforcing steel and embedment items, shall have a temperature greater than or equal to 35°F at the time of concrete placement.

3.2 REINFORCEMENT

- A. Conform to the CRSI Code of Standard Practice - Field Erection for surface condition, bending, spacing and placement tolerance.
- B. Splicing reinforcement: conform to ACI 318; welded wire fabric to be lapped 1-1/2 courses or 12 inches; tie fabric at 24 inches on center maximum spacing.
- C. Provide bar supports: on grade use concrete brick; elsewhere use manufactured wire supports.
- D. Do not bend reinforcing partially embedded in the concrete.

3.3 EMBEDDED ITEMS

- A. Coordinate installation of embedded items.
- B. Pipes or Conduits for embedment within a slab, wall or beam, other than those merely passing through, shall satisfy the following:
 - 1. Shall not be larger in outside diameter than 1/3 the thickness of the slab, wall or beam.
 - 2. Shall not be spaced closer than 3 diameters on center.
 - 3. Shall not impair significantly the strength of the concrete.

3.4 WATERSTOPS

- A. Nail surface applied waterstops to concrete at 12 inches on center. Protect from contact with water.
- B. Splice vinyl waterstops as recommended by manufacturer; form continuous seal at joint intersections; terminate with 2 inches concrete cover where designed to discontinue.
- C. Secure waterstops on both sides at 12 inches on center maximum spacing.
- D. Thoroughly vibrate concrete around waterstop to avoid honeycombing and voids in concrete and to insure complete contact between waterstop and concrete.
- E. Use prefabricated vinyl corners, tees and crosses.

3.5 PLACING CONCRETE

- A. Notify Engineer and Independent Testing Laboratory 24 hours minimum prior to each placement.
- B. Place no concrete on frozen ground.
- C. Place concrete within 90 minutes of batching.
- D. Freefall: 4 feet maximum.
- E. Do not place partially hardened concrete.
- F. Consolidate concrete by vibrating. Conform to ACI 309.
- G. Conform to ACI 306R for cold weather concreting.
- H. Conform to ACI 305R for Hot Weather Concreting. Temperature of concrete placed shall not exceed 90°F.
- I. Provide concrete Delivery Slip prepared at batch plant with each truck load of concrete showing ticket number, date, truck number, mix strength, maximum

stone size, weight of coarse aggregate, weight of fine aggregate, cement weight, volume of concrete, gallons of water added at plant, time water added at plant, quantities of all admixtures used and gallons of water withheld at the plant.

- J. Thoroughly moisten subgrade materials prior to placing slabs on grade.
- K. Horizontal wall construction joints deeper than 8 feet from top of placement, place one inch of sand cement slurry prior to placing concrete.
- L. Thoroughly clean the surface of the concrete at construction and control joints and remove laitance prior to placing adjoining concrete. Do not place concrete against the hardened side of a joint for at least 48 hours.

3.6 TESTING CAST-IN-PLACE CONCRETE

- A. An Independent Testing Laboratory, selected and paid for by the Owner, shall test and sample concrete for strength, slump and air content as follows:
- B. Obtain 5 standard test cylinder samples (6 inches x 12 inches) of each 100 cubic yards or less of each class of concrete placed in any one day.
- C. Test 2 cylinders at 7 days; 2 cylinders at 28 days. Hold one cylinder for later testing.
- D. Perform slump tests and air entrainment tests on each truck and at each sampling. Perform slump and air entrainment tests before addition of High Range Water Reducer and after addition of High Range Water Reducer.
- E. Sample concrete for testing of air and slump at the discharge end of the truck. When concrete is pumped, concrete taken for test cylinders shall be at the discharge end of the pump hose.
- F. Perform strength, slump and air entrainment tests at other times when directed by the Engineer.
- G. Additional testing and sampling required as a result of deficient results or improper curing shall be paid for by Owner. The cost of resampling and retesting will be determined by Engineer, and Owner will invoice Contractor for this cost. If unpaid after 60 days, this invoice amount will be deducted from the Contract Price.
- H. Contractor shall provide and maintain an insulated, heated concrete cylinder curing box, 4-foot square minimum, with a min.-max thermometer and maintain the temperature between 60°F and 80°F. Contractor to coordinate location with Engineer and Independent Testing Laboratory.

3.7 ADDITIONAL CONCRETE TESTS

- A. Independent Testing Laboratory shall provide additional testing of in-place concrete as directed by Engineer due to non-compliance or considered substandard. Additional tests may consist of non-destructive testing, cores drilled from the area in question or load tests. Costs of additional testing will be paid by Owner. The cost of the additional testing will be determined by Engineer and Owner will invoice Contractor for that cost. If unpaid after 60 days, the invoice amount will be deducted from the Contract Price.
- B. When the concrete strength is substandard as defined in Specification 03300 Section 3.15 paragraph A, concrete core specimens shall be obtained and tested from the affected area.
 - 1. 3 cores shall be taken for each sample in which the strength requirements were not met. The drilled cores shall be obtained and tested in conformance with ASTM C 42 "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete."

- C. Field cured cylinders may be cast and tested by the Independent Testing Laboratory at the request of the Contractor. The costs of these tests shall be borne by the Contractor. If the field cured cylinders are cast and tested prior to 28-days to determine the in-place concrete strength in order to facilitate an accelerated schedule for subsequent concrete placements, backfilling or leakage testing, the following criteria must be met:
1. The Contractor shall notify the Engineer and Independent Testing Laboratory 48 hours in advance of the concrete placement. The Engineer will determine at that point if the results of the field cured cylinders may be used to determine the in-place concrete strength. The Contractor shall notify the Engineer as to when the field cured cylinders will be tested and for what purpose.
 2. A minimum of 2 cylinders shall be cast for each separate test the Contractor requests. A test consisting of at least two cylinders will be required to be considered valid.
 3. The field cured cylinders shall be left in the field and located such that they are exposed to the identical environmental conditions as the concrete structure. The cylinders shall remain at this location a minimum of 14 days prior to testing.
 4. The Engineer shall determine if the strengths indicated by the field cured cylinder tests are adequate for their intended purpose.

3.8 FINISHING SLABS AND FLATWORK

- A. Screed to bring concrete surface to proper contour and elevation. D, E, or F below is acceptable.
- B. Highway straightedge, bull float or darby float the concrete surface immediately after screening.
- C. Allow bleed water to evaporate or remove.
- D. (STF) Steel Troweled Finish: Float the surface with magnesium or cast aluminum float or with a power finishing machine. Steel trowel surface immediately after floating to produce smooth surface. Steel trowel again after concrete has hardened enough so that mortar does not adhere to trowel edge. Ringing sound should be apparent when performing second troweling due to tilted, compacting motion.
- E. (WFF) Wood Float Finish: allow concrete to stiffen; float surface twice or more to a uniform sandy texture.
- F. (LBF) Light Broom Finish: wood float finish as in E above; while plastic draw a soft-bristled broom, over the concrete in long even strokes with downward pressure. Broom transverse to traffic or at right angles to the slope of the slab.
- G. Tolerances for trowel finished floors: ACI 302 class BX. 5/16 inch maximum deviation from 10 foot long straightedge placed anywhere on the surface.

3.9 FINISHING VERTICAL SURFACES

- A. (RFF) Rough Form Finish: Repair structural defects only and patch tie holes. Fins exceeding 1/4 inches in height to be removed by grinding and/or rubbing.

3.10 CURING

- A. Curing shall begin immediately following the initial set of concrete or after slab surface finishing has been completed and shall continue after form removal per Section 03300A, 3.1.H. All concrete shall be cured to attain strength and

durability by one of the following methods for a minimum of seven days after placement regardless of the ambient air temperature:

1. Ponding or continuous sprinkling. Intermittent wetting and drying is not an acceptable curing method.
 2. Application of absorptive mats of fabric kept continuously wet.
 3. Application of concrete curing compounds. If applying slab sealing compounds, use dissipating resin curing compound. Allow dissipating resin curing compound to chemically break-down, and remove residuals and other foreign material, prior to applying slab sealing compound.
- B. Moisture loss from surfaces placed against wooden or metal forms exposed to heating by the sun shall be minimized by keeping the forms wet until they can be safely removed. After form removal, the concrete shall be cured by one of the methods described above, for the balance of time remaining as specified above.
- C. Schedule of Finishes and Curing Requirements:

1. Provide finishes on concrete surfaces according to the following schedule:

<u>Location</u>	<u>Finish</u>	<u>Curing Requirements</u>
Exterior Exposed Walls	SFF	Moist cure or apply two to 6"below grade coats dissipating curing compound.
Exterior unexposed walls	RFF	Moist cure or apply two coats curing and sealing compound.
Exterior slabs-on-grade	LBF	Moist cure and apply two coats of slab sealer.
Slabs (not coated)	STF	Apply two coats of curing/hardening compound.
Equipment Pads	WFF	
Stairs, Exterior platforms	LBF	Moist cure and apply to sidewalks and drives two coats of slab sealer.

NOTE:

- a. Coordinate compatibility of curing compounds with damp proofing and waterproofing compounds.
 - b. When 2 coats of materials are required as indicated above, second coat shall be applied perpendicular to the first coat.
- D. Cold Weather:
1. Conform to ACI 306R
 2. Maintain concrete temperature between 50°F and 70°F for a minimum of seven days after placement, enclose and heat, insulate as required.
 3. Reapply curing compounds every two days during heating period.
 4. The maximum allowable temperature drop of the concrete surfaces during the first 24 hours after the end of the curing period shall not exceed 5°F in any 1 hour and shall not exceed a total of a 40°F drop in the first 24 hours.
- E. Hot Weather: Conform to ACI 305R Concrete temperature shall not be greater than 90°F. Protect from loss of slump, flash set, plastic cracking and rapid evaporation of water.

3.11 JOINTS

- A. Saw cut control joints for slabs-on-grade as indicated on the Drawings within 12 hours of placement.

- B. Provide joints only where shown on the drawings or as otherwise approved after written request.

3.12 MODIFICATIONS OR REPAIRS TO EXISTING CONCRETE

- A. Field measurements shall be taken at the required structures to determine the quantity of concrete to be removed and/or repair and the amount of patching to be done.
- B. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, and to prevent damage to the structures or contents by falling or flying debris.
- C. Remove concrete to the depths shown or required. Roughen concrete surfaces by chipping, sandblasting or scarifying.
- D. Surfaces must be clean and sound. Surfaces may be dry, damp, or wet, but free of standing water. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles, and disintegrated materials by mechanical abrasion methods such as sandblasting.
- E. Exposed reinforcement shall be cleaned by wire brushing and where shown the reinforcement shall be cut or bent. Additional reinforcement shall be provided as shown on the Drawings.

3.13 CORING OF HOLES

- A. Core drill holes where shown.
- B. Coring shall be performed with a non-impact rotary tool with diamond core drills, size shall be suitable for pipe conduit, sleeves or mechanical seals to be installed. All equipment shall conform to OSHA standards. Protect all existing equipment, utilities and critical areas against water or other damage caused by the drilling operation.
- C. No structural members shall be cut without any exceptions taken by the Engineer.

3.14 TOLERANCES

- A. Maximum allowable deviations from dimensions, elevations, slopes and position shall conform to ACI 117. Tolerances apply to concrete dimensions only, not to positioning of vertical reinforcing steel, dowels, or embedded items.

3.15 FAILURE TO MEET STRENGTH REQUIREMENTS

- A. The strength of the concrete in place will be considered substandard if any one of the following results occur:
 - 1. The arithmetic average of 28-day cylinder tests for any 3 consecutive test results are less than the specified strength (f'_c).
 - 2. More than 10 percent of the 28-day cylinder tests have strengths less than the specified strength (f'_c).
 - 3. An individual compressive strength test result falls below the specified strength (f'_c) by more than 500 psi.
- B. Concrete which fails to meet the strength requirements as outlined above will be reviewed by the Engineer. The Engineer will determine whether the substandard concrete will be accepted, rejected or additional tests performed.
- C. When Substandard concrete as defined in Parts A.1 and A.2 occurs, the Engineer will require corrective measures to be taken immediately in order to increase the

average of subsequent strength tests. When substandard concrete as defined in part A.3 occurs, non-destructive testing shall be performed on the substandard concrete. The testing shall be performed by an independent firm elected by the Engineer and paid for by the contractor at no additional cost to the Owner.

3.16 DEFECTIVE CONCRETE

- A. Defective concrete is defined as concrete in-place which does not conform to strength, shapes, alignments, appearances and/or elevation as shown on the drawings and/or presents faulty surface areas.
- B. Reinforcing steel size, quantity, strength, position, or arrangement at variance with the Drawings will be considered defective.
- C. Concrete which differs from the required dimensions or locations in such a manner as to reduce the strength will be considered defective.
- D. Concrete surfaces not finished or cured in accordance with this Section shall be classified as defective concrete.
- E. Formed surfaces larger or smaller than dimensional tolerances specified in this Division may be rejected. If the Engineer permits the Contractor to correct the error, such correction shall be as directed and in such a manner as to maintain the strength, function and appearance of the structure.
- F. Concrete members cast in the wrong location may be rejected and shall be removed at no additional cost to the Owner if the strength, appearance or function of the structure is adversely affected.
- G. Inaccurately formed surfaces exposed to view may be rejected and shall be repaired or removed and replaced at no additional cost to the Owner.
- H. Concrete exposed to view with defects which adversely affect the appearance of the specified finish shall be repaired. If, in the opinion of the Engineer, the defects cannot be repaired, the concrete may be accepted or rejected in accordance with the decision of the Engineer.

3.17 PROTECTION

- A. Protect concrete from high and low temperatures for seven days.
- B. Protect against vibration until concrete has attained 33% of its 28-day strength.
- C. Protect against premature loads until the 28-day strength has been attained.
- D. Concrete structures shall be covered, insulated and heated as required to prevent frost penetration beneath the structures until acceptance by the Owner.

3.18 LEAKAGE TESTS

- A. Leakage tests shall be performed after the concrete structure has been in place for a minimum of 28 days and attained design strength for all liquid containing structures to determine integrity, watertightness and appearances of finish concrete surfaces.
- B. Install other equipment, e.g., stop gates, sluice gates, temporary bulkheads, prior to leakage test.
- C. Prior to dampproofing, waterproofing and backfilling, all liquid-containing structures shall be filled with potable water furnished by the Contractor from a municipal water supply or meeting the requirements of ASTM C94.

- D. Fill each tank to the maximum water elevation as indicated on the Process Drawings. Limit the rate of filling to a uniform rate of not greater than 6.5 feet in 24 hours.
- E. Refill the tanks to the maximum water elevation as required to account for absorption after 6 hours.
- F. Close all valves and gates to the structure and measure the change in the water surface elevation for a 72-hour period and record leakage through gates and valves. Determine evaporation by floating an evaporation pan in structure during test period.
- G. During the test period, examine exposed portions of structure for dampness or leaks and record visible leaks or damp spots. Damp areas are defined as areas where moisture can be picked up on a dry hand.
- H. All visible leaks and damp areas shall be repaired and eliminated by a method proposed by the Contractor and reviewed by the Engineer. All repair material in contact with potable water shall be NSF Standard 61 approved.
- I. Subsequent to the repairs and elimination of all visible leaks and damp areas, tanks shall be refilled as previously described.
- J. The water elevation shall remain constant for a total of 72 hours. Should a measurable liquid level drop exist (excluding evaporation and precipitation) at the end of the initial 72 hours period and no leaks are observed, the tank shall be refilled to the maximum water elevation, and the test repeated. If at the end of the second 72-hour test period, a measurable liquid level drop exists, all leaks shall be repaired and eliminated by a method proposed by the Contractor and reviewed by the Engineer.
- K. All liquid containing structures shall be retested subsequent to repairs.
- L. Additional tests and repairs will be performed until such time as the structures can demonstrate compliance with the testing requirements.
- M. Test water shall not be disposed of by discharging onto the ground surface.
- N. Test water shall be disposed of by reintroduction into the plant process at the time, rate of flow, and location as directed by the Engineer.

END OF SECTION

SECTION 03302

FIELD CONCRETE

PART 1 – GENERAL

1.01 WORK INCLUDED:

- A. This Section covers concrete and all related items necessary to place and finish the concrete work.
- B. Concrete thrust, and anchor blocks, to be provided at locations required by the Engineer shall be installed in accordance with the details shown on the drawings and as specified in this section.
- C. Concrete encasement for piping with shallow cover shall be installed in accordance with the details shown on the drawings and as specified in this section.

1.02 RELATED WORK

- A. Section 02300, EARTHWORK
- B. Section 02089, DUCTILE IRON GRAVITY PIPE AND FITTINGS FOR SEWERS

1.03 REFERENCES

- A. The following standards form a part of this specification:

American Concrete Institute (ACI)

- | | |
|-----------|---|
| ACI 304 | Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete. |
| ACI 305 | Recommended Practice for Hot Weather Concreting |
| ACI 306 | Recommended Practice for Cold Weather Concreting |
| ACI SP-66 | Detailing Manual |
| ACI | |
| ACI 318 | Building Code Requirements for Reinforced Concrete |

American Society for Testing and Materials (ASTM)

- | | |
|-----------|---|
| ASTM A615 | Deformed and Plain Billet-Steel Bars for Concrete Reinforcement |
| ASTM C33 | Concrete Aggregates |
| ASTM C94 | Ready-Mixed Concrete |
| ASTM C143 | Test for Slump of Portland Cement Concrete |
| ASTM C150 | Portland Cement |
| ASTM C260 | Air Entraining Admixtures for Concrete |
| ASTM C494 | Chemical Admixtures for Concrete |

1.04 SUBMITTALS

In accordance with requirements of General Specifications, submit the following:

Six (6) copies of the statement of materials constituting the design of mixes for each size aggregate as required by ASTM C94 shall be submitted to the Engineer within one week following award of the Contract.

PART 2 - PRODUCTS

2.01 CONCRETE

- A. All concrete, reinforced or non-reinforced shall have a 28 day compressive strength of 3000 psi unless otherwise noted on the design drawings. A minimum of 5.5 sacks of cement per cubic yard and a maximum water cement ratio of 6.9 gallons per sack shall be used.
- B. Concrete shall conform to ASTM C94. The Contractor shall be responsible for the design of the concrete mixtures. Slump shall be a maximum of 4-inches and a minimum of 2-inches, determined in accordance with ASTM C143.
- C. Admixtures shall be as specified in subsection 2.05. No additional admixtures shall be used unless approved by the Engineer.
- D. No additional water, except for the amount indicated by the design mix shall be added to the concrete without the prior permission of the Engineer.

2.02 CEMENT

The cement shall be an approved brand of American manufactured Portland Cement, Type II conforming to the applicable requirements of ASTM C150.

2.03 AGGREGATES

- A. Except as otherwise noted, aggregate shall conform to the requirements of ASTM C33.
- B. Maximum size aggregate shall be 3/4-inch.

2.04 ADMIXTURES

- A. All concrete (unless otherwise directed) shall contain an air entraining agent. Air entrained concrete shall have air content by volume of 4 to 8 percent for 3/4-inch aggregate.
- B. Air entraining agent shall be in accordance with ASTM C260 and shall be Darex AEA, as manufactured by W.R. Grace & Company; Placewel (air entraining Type), as manufactured by Johns Manville; Sika AER as manufactured by Sika Chemical Company; or an approved equal product.
- C. Water reducing agent shall be WRDA, as manufactured by W.R. Grace & Company; Placewel (non-air entraining Type), as manufactured by Johns Manville; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.
- D. Water reducing agent-retarder shall be "Daratard," as manufactured by W.R. Grace & Company; Sika Plastiment as manufactured by Sika Chemical Company; or an approved equal product.

2.05 WATER

- A. Water for concrete shall be potable, free of deleterious amounts of oil, acid, alkali, organic matter and other deleterious substances.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Before placing concrete, forms and the space to be occupied by the concrete shall be thoroughly cleaned, and reinforcing steel and embedded metal shall be free from dirt, oil, mill scale, loose rust, paint or the material which would tend to reduce the bond.
- B. Earth, concrete, masonry, or other water permeable material against which concrete is to be placed shall be thoroughly saturated with water immediately before concrete is placed.
- C. No concrete shall be placed until the consolidation of the ground and the arrangement and details of forms and reinforcing have been inspected and approved by the Engineer.

3.02 THRUST AND ANCHOR BLOCKS

- A. Minimum bearing areas for thrust blocks and dimensions of anchor blocks shall be as shown on the drawings.
- B. Concrete for thrust and anchor blocks shall be placed against undisturbed earth, and wooden side forms shall be used to provide satisfactory lines and dimensions. Felt roofing paper shall be placed to protect joints. No concrete shall be placed so as to cover joints, bolts or nuts, or to interfere with the removal of the joints.

3.03 FILL CONCRETE

- A. Fill concrete shall be placed in those locations as indicated on the design drawings. Fill concrete shall consist of materials as previously specified, with a minimum 28-day compressive strength of 3000 psi.
- B. Before fill concrete is placed, the following procedures shall be used to prepare surfaces; all dirt, scum and laitance shall be removed by chipping and washing. The clean, roughened base surface shall be saturated with water, but shall have no free water on the surface. A coat of 1:2 cement-sand grout, approximately 1/8-inch thick, shall be well scrubbed into the thoroughly dampened concrete base. The concrete fill shall be placed immediately, before grout has dried or set.
- C. Fill concrete shall be brought to lines and grades as shown on the design drawings.

3.04 CONCRETE PLACING DURING COLD WEATHER

- A. Concrete shall not be placed on frozen ground, and no frozen material or material containing ice shall be used. Materials for concrete shall be heated when temperature is below 40°F, or is expected to fall to below 40°F, within 72 hours, and the concrete after placing shall be protected by covering, heat, or both.
- B. All details of Contractor's handling and protecting of concrete during freezing weather shall be subject to the approval of the Engineer. All procedures shall be in accordance with provisions of ACI 306.

3.05 CONCRETE PLACING DURING HOT WEATHER

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing, shall be sprinkled with cold water. The Contractor shall make every effort to minimize delays, which will result in excessive mixing of the concrete after arrival on the job.
- B. During periods of excessively hot weather (90°F or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 90°F, when ready for placement, will not be acceptable, and will be rejected.

3.06 FIELD QUALITY CONTROL

- A. Concrete inspection and testing shall be performed by the Engineer or by an inspection laboratory, designated by the Engineer, engaged and paid for by the Owner. Testing equipment shall be supplied by the laboratory, and the preparation of samples and all testing shall be performed by the laboratory personnel. Full assistance and cooperation, concrete for samples, and such auxiliary personnel and equipment as needed shall be provided by the Contractor.
- B. At least 4 standard compression test cylinders shall be made and tested and 1 slump test from each day's placement of concrete. A minimum of four compression test cylinders shall be made and tested for each 100 cubic yards of each type and design strength of concrete placed. One cylinder shall be tested at 7 days, and two at 28 days. The fourth cylinder from each set shall be kept until the 28 day test report on the second and third cylinders in the same set has been received. If the average compressive strength of the two 28 day cylinders do not achieve the required level, the Engineer may elect to test the fourth cylinder immediately or test it after 56 days. If job experience indicates additional cylinder tests or other tests are required for proper control or determination of concrete quality, such tests shall be made.
- C. The Engineer shall have the right to reject concrete represented by low strength tests. Rejected concrete shall be promptly removed and replaced with concrete conforming to the specification. The decision of the Engineer as to whether substandard concrete is to be accepted or rejected shall be final.

END OF SECTION

DIVISION 13

SPECIAL CONSTRUCTION

SECTION 13100

ISOLATION VALVE BUILDING

1.0 SCOPE

- A. The contractor shall furnish and install a 9'-4" x 17'-4" isolation valve building to control the flow of water to the Farnum Hill Water Storage Tank. The isolation valve building will be mounted on a cast-in-place reinforced concrete foundation consisting of frost walls and a slab on grade. Equipment will include a butterfly valve, a flow meter and transmitter, hypochlorite feeding system, chlorine controller, chlorine analyzer, pressure transmitter, telemetry panel, and a power and control panel with a PLC controller. The building will be 2" x 6" wood stud construction, 2" x 8" wood rafters, fiberglass batt insulation, plywood sheathing, red cedar clapboard siding, standing seam metal roof, pine fascia and soffits, and two 36" insulated steel doors with hardware. The isolation valve building will be supplied with two wall mounted heaters, a dehumidifier, ventilation fan and louver, and interior and exterior LED lights.

1.01 SUBMITTALS

- A. Equipment submittals shall be submitted digitally for review and approval.

2.0 EQUIPMENT

2.01 STRUCTURE

- B. Wall framing will be 2"x6" standard studs. The wood roof rafters shall be a minimum of 2" x 8". The size and placement and spacing of studs and joist shall be in accordance with material standards listed below and building design criteria. Metal studs are not considered an equal to the wood studs and rafters.
- C. The exterior wall sheathing will be 5/8" CDX grade plywood. The exterior roof sheathing shall be 3/4" CDX grade plywood. The interior wall and ceiling sheathing will be 5/8" CDX grade plywood. OSB or particle board sheathing is not acceptable. The walls will be insulated with fiberglass batts and continuous insulation to create an R-23.8 insulation value (minimum) and the roof shall be fiberglass batts to create an R-49 insulation value.
- D. The roof shall be gabled with a center ridge line running the long dimension of the building. The gable roof system shall include a 8:12 minimum roof pitch with 12" overhang on all sides. The wood roof system shall include wood rafters placed 16" on center, covered with 3/4" CDX plywood. The plywood shall be covered with ice and water shield and a standing seam metal roof. The standing seam metal roof color shall be selected by the City Engineer. The soffits and fascia shall be constructed with No. 1 pine trim.
- E. The exterior wall covering shall be red cedar clapboard siding. The clapboard shall be fastened to the wall using stainless steel nails. The clapboard shall be stained with 2 coats of Cabot OVT Solid Color Oil Stain. Stain color shall be Bark.
- F. Doors shall be single leaf and sized per the plan sheet. The doors shall be flush design manufactured of 18-gauge, grade III, extra heavy duty steel panels with flush top channel and inverted bottom channel with internal insulation to exceed R-5. The door frame shall be a full CF frame of 14-gauge cold formed steel and securely fastened to the framed opening. Each door shall include three hinges,

one cylindrical lockset, two flush bolts, one closer, one overhead stop, one threshold, two sweeps, one weather strip and one drip. The door frame shall be three sided hollow 16-gauge metal. The doors will be painted by the manufacturer. The color will be chosen by the City Engineer.

2.08 PROGRAMMABLE LOGIC CONTROLLER

- A. The Programmable Logic Controller shall be a MicroLogix 1400 as manufactured by Allen Bradley. I/O shall be supplied to accommodate all control processes in the system while providing for a 10% spare density for future use. The PLC shall be equipped with a digital input card, digital output card, analog input card, analog output card, a Fortinet firewall, and a Comcast connection.

2.09 HYPOCHLORITE FEEDING SYSTEM

- B. The hypochlorite feeding system shall be constructed of high impact HDPE and all wetted areas, internal fittings, and level controls shall be constructed of suitable plastics or other non-metallic materials. The system shall be capable of supplying up to 50 pounds of dry calcium hypochlorite briquettes per day on a sustained basis. The unit shall utilize spray technology and have a mixing mechanism within a solution reservoir. The system shall automatically fill the solution tank. The unit shall be skid mounted with secondary containment and have an area for pump mount. The unit will be SCADA compatible. The hypochlorite feeding system shall be a ConstantChlorplus, MC4-50 Lite or approved equal.
- C. Provide an analog controller with local communication to SCADA and the PLC. Hach SC4500 Analog Controller.
- D. Provide a chlorine analyzer for continuous monitoring of free or total residual chlorine in water. Hach CL17sc Online Chlorine Analyzer.

2.10 WIRING

- A. Power service to the water booster station shall be single phase, 60 hertz, 120/240-volt. Wiring of the station shall be in accordance with the National Electrical Code. All internal wiring shall be installed in conduit.
- B. All wiring in the control panel shall be color-coded. All wiring from the control panel to the junction boxes adjacent to equipment served shall be in conduit. All conduit and wires shall be adequately sized for the maximum anticipated load. All conduits shall be neatly arranged and securely clamped to the structure.

2.11 INTERIOR LIGHTS

- A. The interior lights shall be surface mount fixtures, 4 feet long, curved lens, 2,290 lm, 3,500K, 18W, Keystone Technologies Model KT-MSLED18-4-835-VDIM-P or approved equal.

2.12 EXTERIOR LIGHTING

- A. A LED exterior light shall be a full cutoff wall pack, 30W, 3000K, LEDVANCE Luminaires Model SLMWPKC3a/S030UNHD8SC2/BZP or approved equal.
- B. The light shall be operated by a fixed position photo control. The photo control shall provide dusk-to-dawn lighting control.

2.13 DEHUMIDIFIER

- A. DrizAir 1400 portable dehumidifier, Model No. 127890, or approved equal. Condensate shall be piped to the floor drain, using 1/2" polyethylene tubing.

2.14 HEATER

- A. Two 120V, 1000-watt fan-forced electric wall heaters with a minimum capacity of 1,700 BtuH and a maximum capacity of 3,400 BtuH controlled by an integral thermostat shall be provided to regulate the temperature in each room of the Isolation Valve Building. Dayton Model 2HAC4, or approved equal.

2.15 VENTILATION

- A. Provide a vertical discharge fan mounted in the ceiling of the chlorination room, Broan Model 505, 8" duct with built-in damper or approved equal.
- B. Provide a roof cap to be mounted on the vertical discharge fan 8" duct. 24 GA. CRCQ stell, black powder coat paint finish, built-in back draft damper and bird screen. Broan NuTone, Model 634 or approved equal.
- C. Intake louver shall be flanged, flush mount, 11 1/2" high, 11 1/2" wide, aluminum. Connect to ductwork to attic space. Dayton 805TT8 or approved equal.

2.16 BUTTERFLY VALVE

- A. The isolation valve for the Isolation Valve Building shall be a butterfly valve. Valve shall be of the wafer design for installation between ANSI 125/150 flanges. Valve shall be capable of bi-directional, end of line, bubble tight service to rated pressure. Valve rated to full vacuum service. Design Standards: API 608 category A. The valve shall have a pressure rating to 230psi. The valve body shall be a 1-piece ductile iron ASTM A-536 (65-45-12) construction with a laying length conforming to the latest revision of ISO 5752 and a flange connection B16.1/B16.5. The valve disc shall be CF8M stainless steel. Disc shall be designed to accommodate an upper and lower shaft with a thin center profile giving higher Cv values combined with strength. The valve shaft shall be constructed of heat treated 416 stainless steel. Valve shall be designed to accommodate (2) shafts (1 upper and 1 lower). The upper shaft shall have a positive engagement in the disc utilizing an internal square drive and shall be retained by the body top cap and end cap. The valve seat shall be EPDM. Seat design shall consist of 3 tongues (2 located on the side walls and 1 located in the center bore) that engage into 3 grooves in the body. These 3 tongue and groove connection points prevent seat movement in a radial and axial direction. Seats shall be field replaceable. The upper shaft seal shall be self-adjusting V-type and shall be suitable for pressure or vacuum service. Packing shall be located above the bushing and shall create a positive seal against the Top Cap. Bottom end cap contains a captive o-ring creating a positive seal against external leakage. The valve bushings shall consist of (2) full length Nylatron® bushings (upper and lower) offering superior protection against friction, corrosion and impacts. The valve shall be leak tested in the factory at their rated pressure per API 598. The valve shall be manufactured by Henry Pratt Co. Model 2FII.
- B. The butterfly valve shall be equipped with an MDT cylinder actuator with replaceable packing bonnet. The valve shall be capable of being controlled remotely.

2.19 FLOW METER

- A. Electromagnetic flow meter with remote mounted transmitter, Badger Meter ModMAG M2000.

2.20 PRESSURE GUAGE

- A. Gauges will be 4 ½" in diameter per ASME B40.1 and shall be graduated in psi. Rated accuracy will be ± .5% of full scale and the operating temperature shall be -40°F to +150°F. Gauges shall be liquid filled. Additional error when temperature changes from referenced temperature of 60°F ±0.4% for every 18°F rising or falling (percentage of span). Standard features shall include a black fiberglass-reinforced thermoplastic case, black aluminum pointer, white aluminum with black lettering, dampened movement option, stainless steel bourdon tube, copper alloy (0.6 mm) restrictor, copper alloy with ½" NPT lower mount pressure connection with M4 internal tap and be weather resistant (NEMA 3 / IP54).
- B. The ¼" high pressure ball isolation valve standard features shall include a one piece brass body (UNI 5705-65), PTFE self-lubricating seats with flexible-lip design, double seal system to all the valve to be operated in both directions, chrome plated brass ball, blowout-proof brass stem with Viton O-ring, nylon black wedge handle that clearly shows ball position, and NPT taper ANSI B.1.20.1 connections.
- C. Provide a separately mounted pressure transmitter to monitor water system pressure. The pressure transmitter shall sense gauge pressure and transmit a 4-20 mA signal to the programmable logic controller that can send pressure readings to a remote location.

3.0 EXECUTION

3.01 INSTALLATION AND SERVICE INSTRUCTIONS

- A. The Contractor shall furnish three complete and detailed Operating Instructions, Service and Repair Sheets in a bound manual. This manual shall cover the initial start-up, operating procedures, maintenance and servicing procedures on the major component parts provided in the Isolation Valve Building.

3.02 START-UP

- A. It shall be the responsibility of the contractor to inform all parties of this initial start-up, and to insure their attendance. Manufacturer's representatives shall instruct all personnel attending the start-up in the correct and required operation, maintenance and service procedures for the Isolation Valve Building.

3.03 GENERAL

- A. The contractor is hereby notified that responsibility for the complete and satisfactory operation or function of all equipment and material is definitely a part of this contract, regardless of the manufacturer's guarantee on any item furnished. It is the contractor's responsibility to place all equipment in operation, furnish all lubrication, check all fittings for tightness, and see that proper operating and maintenance instructions are prepared and followed.

END OF SECTION

DIVISION 16

ELECTRICAL

SECTION 16010

ELECTRICAL WORK - GENERAL PROVISIONS

1.01 WORK INCLUDED

- A. The work covered by this section of the specifications consists of furnishing all labor, equipment, appliances, materials and incidentals in connection with the installation of the complete electrical systems as herein specified and as shown on the drawings.
- B. It is not the intent that the drawings shall show every junction box, conduit, wire, fitting, device, accessory, etc., but the Contractor shall be required to furnish without additional expense all transportation, labor and materials necessary to complete the electrical systems in accordance with the best practice of the trade.
- C. Unless otherwise specified, materials of the same classifications, used for the same purpose shall be the product of the same manufacturer.
- D. The work shall include furnishing and installing the following items:
 - 1. Underground Secondary Services
 - 2. Grounding System
 - 4. Switchboard additions/modifications
 - 5. Motor wiring and disconnect devices
 - 6. Raceways
 - 7. Feeder and Branch Circuit Conductors
 - 8. Pull and Junction Boxes
 - 9. Hangers and Supports
 - 10. Conduit and wire for equipment and controls furnished under other divisions of the specifications, when shown on the electrical plans.
- E. Electric Service and Metering
 - 1. Electrical service and metering per requirements of Liberty.
- F. All equipment used in areas designated as hazardous shall be designed for Class 1, Division 1, Group D locations. All installation including conduit and wiring shall be in strict accordance with the National Electrical Code Article 500 for Class 1, Division 1, Group D locations.
- G. Interpretation of Drawings
 - 1. The Drawings are diagrammatic only and are not intended to show exact locations of outlets and conduit runs.
 - 2. All three-phase circuits shall be run in separate conduits unless otherwise shown on the Drawings.
 - 3. Any work installed contrary to Contract Documents, or without approval by the Engineer, shall be changed or replaced as required by the Engineer and no extra compensation will be allowed the Contractor for making these changes.
 - 5. The locations of equipment, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. The Contractor shall obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, shall proceed as required by the Engineer and shall furnish all labor and materials necessary to complete the work in an approved manner.
 - 6. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.

7. The number of conductors shown on the Drawings are not necessarily the correct number required. As many conductors as are required in each case shall be installed.
8. The ratings of motors and other electrically operated devices together with the size shown for their branch circuit conductors and conduits are approximate only and are indicative of the probable power requirements insofar as can be determined in advance of the purchase of equipment. The ratings shown for motor branch circuit protective devices are the maximum ratings permitted. Lower ratings may be used where approved as being proper for the dynamic characteristics of the motor and its connected load.
9. Unless otherwise specified, all conduits, wires, and cables and the support systems for the conduits and cables that are required to make the electrical connections to equipment shall be furnished and installed. All connections to equipment shall be made as shown, specified, and required and in accordance with the approved shop and setting drawings.
10. The Contractor shall verify, in the field, all measurements necessary for his work and shall assume responsibility for their accuracy.

1.02 LOCAL CONDITIONS

- A. The Contractor shall provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. The Contractor shall locate all necessary slots for his work and these shall be formed before concrete is poured.
- B. All cutting and patching shall be done in a thoroughly workmanlike manner.
- C. The Contractor shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the manufacturer shall be required to ship his material in sections sized to permit passing through such restricted areas in the building.
- D. Before submitting proposals, the Contractor is expected to inspect the site and survey the conditions to be encountered in the performance of the work. Failure to familiarize himself with the conditions shall not relieve the Contractor's responsibility for full completion of the work in accordance with the provisions of the Contract.

1.03 PERMITS AND INSPECTION

- A. Permits, fees and notices shall be in accordance with the General Conditions.
- B. All work shall meet or exceed the latest requirements of all national, state, county, municipal and other authorities exercising jurisdiction over electrical construction at this project.
- C. All required permit and inspection certificates shall be obtained, paid for, and given to the Owner at the completion of the work.

1.04 CODES AND STANDARDS

- A. Unless indicated or specified otherwise, materials and workmanship shall conform with the latest editions of the following codes, standards and specifications.
 1. National Electrical Code (NEC)
 2. National Bureau of Standards Handbook H-30 National Electrical Safety Code
 3. State and Local Codes, and all other authorities having jurisdiction

4. Underwriter's Laboratories, Inc. (UL)
5. American National Standards Institute, Inc.
6. Institute of Electrical and Electronic Engineers (IEEE)
7. National Electrical Manufacturers Association (NEMA)
8. National Board of Fire Underwriters
9. International Municipal Signal Association (IMSA)
10. Insulated Power Cable Engineers Associated Specifications
11. American Society for Testing Materials Specifications

1.05 REVIEW OF MATERIALS

- A. Material and Equipment Schedules. As soon as practicable and within thirty days after the date of notice to proceed and before commencement of installation of any materials or equipment, the Contractor shall submit to the Engineer digital submittals for approval of materials, fixtures, and equipment to be incorporated in the work. The list shall include manufacturer's name, catalog numbers, cuts, diagrams, drawings, and such other descriptive data as may be required. No consideration will be given to a partial submittal from time to time. Approval of materials will be based on manufacturer's published ratings. Any materials, fixtures and equipment listed that are not in accordance with the specification requirements will be rejected.
- B. Substitutions: Substitution of material or equipment shall be in accordance with the General Conditions.
- C. Shop Drawings. Shop drawings shall be submitted to the Engineer for review in accordance with the Division 1. Shop drawings shall be submitted for, but not limited to the following:
 1. Switchboards additions
 2. Wire and Cable, Wiring Devices, and Finish Plates
 3. Hangers and Supports
 4. Disconnect Switches
 5. Fuses
 6. Circuit Breakers
 7. Raceways
- D. Submit the following information with all equipment shop drawings.
 1. Manufacturer's certified scale drawings, cuts, or catalogs, including installation details and manufacturer's name.
 2. Manufacturer's specifications, including certified performance characteristics and capacity ratings.
 3. Electrical wiring diagrams and controls, where applicable.
 4. Certificate of compliance with Code, where applicable.
- E. Equipment shop drawings and wiring diagrams must be prepared specifically for this installation. Standard factory wiring diagrams with a revision marked in ink for this installation will be accepted.
- F. All control and wiring diagrams shall be complete with the following description:
 1. Sequence of operation
 2. Sequence of interlocking
 3. Operation of alarms
 4. Legend
 5. Wiring Numbers

- G. All equipment shop drawings shall be properly identified and indicate the Article number of the specifications or the Drawing number which applies to the submitted item.
- H. Shop drawings for the items listed above shall be submitted for approval in accordance with the preceding paragraphs. The Engineer, however, reserves the right to require submittal of shop drawings on any other material or equipment to be installed under this Section not specifically listed above.

1.06 MINOR DEVIATIONS

- A. The work as shown on the drawings is diagrammatic and is intended to show the work included and the arrangement of the various systems.
- B. It is not intended that the accompanying plans and specifications cover every detail of the required installation. Furnish and install equipment, materials and labor as shown or specified, as are usually furnished, or as are needed to make a complete and satisfactory operating installation, whether mentioned or not, omitting only those items which are specifically excluded.
- C. Locations and mounting heights of equipment and/or devices as shown are approximately correct. The Engineer reserves the right to relocate any equipment or device prior to actual installation at no extra cost to the Owner.
- D. No deviation from layout shall be made without written approval from the Engineer.

1.07 TEMPORARY LIGHT AND POWER

- A. The Contractor shall provide temporary light and power and pay all energy charges as described in Division 1.

1.08 ELECTRICAL REFERENCE SYMBOLS

- A. Symbols shown on the drawings shall approximate location of outlet boxes, and conduit runs, and other equipment, unless otherwise detailed. The exact location shall be governed by structural conditions and obstructions. This is not to be construed to permit redesigning systems. All outlets shall be interconnected as shown on the drawings. Locate and install all boxes and equipment where they will be readily accessible.

1.09 PHASE IDENTIFICATION

- A. The entire system of wiring shall be phased by color code as follows:
 - 1. Wires No. 6 AWG and smaller shall have a continuous colored outer covering.
 - 2. Wires larger than No. 6 AWG shall be identified at all points of termination by gummed tape, plastic tape, etc., applied to the wire.
 - 3. Code colors for 277/480 volt systems shall be:
 - a. Phase A - Brown
 - b. Phase B - Orange
 - c. Phase C - Yellow
 - 4. Neutral wires shall be white or grey.
 - 5. Equipment ground wires shall be green.
 - 6. The same colors shall be used for the same phases throughout the entire project.

1.10 PROTECTION AND CLEANING OF EQUIPMENT

- A. All electrical equipment, upon receipt, shall be adequately stored and protected from damage.
- B. After installation, all electrical equipment shall be protected to prevent damage during the construction period. Openings in conduits and boxes shall be closed to prevent entrance of foreign materials.
- C. The interior of boxes and cabinets shall be left clean. Exposed surfaces shall be cleaned and plate surfaces polished.

1.11 OPERATION AND MAINTENANCE MANUALS

- A. The Contractor shall furnish the Owner with three (3) copies of complete operating and maintenance manuals. Manuals shall include all equipment, maintenance instruction, parts list, warranties, schematic diagrams of control systems, and lubrication charts.
- B. Manuals shall contain only that information which specifically applies to this project, and all unrelated material shall be deleted. During the instruction period, herein specified, this manual shall be used and explained. Each copy of manual shall be clearly indexed and include a directory of all subcontractors and maintenance contractors, indicate the area of their responsibility, and list the name and telephone numbers of the responsible member of each organization. This material shall have a clear plastic protective shield over each sheet of data.
- C. Each manual shall be bound in an expandable plastic covered hard bound binder. Binders shall be three (3) straight post type. Ring type binders will not be acceptable. The manual's front cover and side cover shall be "Operation and Maintenance Manual -- Electrical Systems" along with the project title.

1.12 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. A competent Engineer shall be provided by the Contractor to instruct operating personnel in the operation and maintenance of equipment and systems.

1.13 SPARE PARTS DATA

- A. The Contractor shall furnish a complete list of recommended spare parts and supplies for the equipment furnished with current unit prices and source of supply.

1.14 TESTS

- A. The Electrical Subcontractor shall perform all tests at the completion of the work and the results furnished to the Owner and Engineer in writing. Tests shall include, but not be limited to: all systems test free of shorts or grounds, proper neutral connections, ground system resistance, secondary voltages at main distribution panel, power panels and lighting panels, all lighting fixtures with lamps in place for 10 hours.
- B. Upon completion of all work, the Electrical Subcontractor shall furnish, in duplicate, certificates of inspections from all inspectors and authorities having jurisdiction, notarized letters from the manufacturers stating that authorized Factory Engineers or agents have inspected and tested the installation of their respective systems and found same to be in satisfactory operating condition.
- C. Furnish all labor, material, instruments, supplies and services and bear all costs for the accomplishment of the tests.

1.15 GUARANTEE

- A. The Contractor shall guarantee equipment and performance of the installation and equipment in accordance with the GENERAL CONDITIONS.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or manufacturer's specification shall be submitted for approval as required by the Engineer. Materials and equipment used shall be U.L. listed wherever such approved materials and equipment is available.
- B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. If any apparatus has been damaged, such damage shall be repaired by the Contractor at his cost and expense. If any apparatus has been subject to possible damage by water, it shall be thoroughly dried out and put through such special tests as required by the Engineer, at the cost and expense of the Contractor, or shall be replaced by the Contractor at his own expense.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. All work shall be executed in full accordance with the National Electrical Code and local rulings. Should any work be performed contrary to said rulings, ordinances and regulations, this Contractor shall bear full responsibility for such violations and assume all costs arising therefrom.
- B. Load Balance. Check the load balance on the phases of the various systems and reconnect where necessary as approved by the Engineer to provide equal division of the loads between the phases of the various systems.
- C. Before starting the work, confer with all other trades relative to the location of pipes, ducts, and apparatus or fixtures to be installed by them and select locations for the work which will avoid possible conflicts with the work of other trades involved. All differences or conflicting conditions concerning the work shall be called to the attention of the Engineer for adjustment before starting work. For such work performed or materials installed in violation of the above clause the work shall be readjusted to the complete satisfaction of the Engineer at the sole expense of the Electrical Subcontractor.
- D. Cleanup
1. This Contractor shall cooperate with other workmen and with the General Contractor in the daily removal of debris from the work site.
 2. This Contractor shall leave "broom clean" all areas where he has interrupted or completed his work.
 3. He shall cooperate with the General Contractor in good housekeeping procedures.

4. At the completion of his work, prior to the final inspection, this Contractor shall clean all devices, plates, fixtures, glassware, switches, cabinets, exposed conduits, fittings, etc. and shall have the premises in a thoroughly clean condition.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.

1.03 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

- A. Product Data: For electric equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electric equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.05 QUALITY ASSURANCE

- A. Comply with NFPA 70.

1.06 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work.
- C. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- D. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

PART 2 - PRODUCTS

2.01 RACEWAYS

- A. FMC: Zinc-coated steel.
- B. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.
- C. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
- D. RNC: NEMA TC 2, Schedule 40 PVC, with NEMA TC3 fittings.
- E. Raceway Fittings: Specifically designed for the raceway type with which used.

2.02 CONDUCTORS

- A. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
- B. Conductors, Larger Than No. 10 AWG: Stranded copper.
- C. Insulation: Thermoplastic, rated at 75 deg C minimum.
- D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

2.03 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring- steel clamps or click-type hangers.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Powder-Driven Threaded Studs: Heat-treated steel.

2.04 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
 - 1. Type: Pre-tensioned, wraparound plastic sleeves. Flexible, preprinted, color- coded, acrylic band sized to suit the diameter of the item it identifies.
 - 2. Color: Black letters on orange background.
 - 3. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
 - 1. Not less than 6 inches wide by 4 mils thick.
 - 2. Compounded for permanent direct-burial service.

- 3. Embedded continuous metallic strip or core.
- 4. Printed legend that indicates type of underground line.
- E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- G. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.05 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.01 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.02 RACEWAY APPLICATION

- A. Use the following raceways for outdoor installations:
 - 1. Exposed: RSC.
 - 2. Concealed: RSC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment: LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
- B. Use the following raceways for indoor installations:
 - 1. Exposed: RSC.
 - 2. Concealed: RSC.
 - 3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
 - 4. Damp or Wet Locations: RSC.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

3.03 RACEWAY AND CABLE INSTALLATION

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- C. Use temporary raceway caps to prevent foreign matter from entering.

- D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- F. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.
- G. Install signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.

3.04 WIRING METHODS FOR POWER AND CONTROL CIRCUITS

- A. Feeders: Type THHN/THWN insulated conductors in raceway.
- B. Underground Feeders and Branch Circuits: Type THWN or single-wire, Type UF insulated conductors in raceway.
- C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.
- D. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

3.05 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.
- B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
- C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque- tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

3.06 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.07 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers

- or clamps.
- F. Install 1/4-inch diameter or larger threaded steel hanger rods, unless otherwise indicated.
 - G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
 - H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
 - I. Simultaneously install vertical conductor supports with conductors.
 - J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
 - K. Install metal channel racks for mounting cabinets, control enclosures, pull and junction boxes and other devices unless components are mounted directly to structural elements of adequate strength.
 - L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
 - M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
 - 1. Wood: Fasten with wood screws or screw-type nails.
 - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 - 3. New Concrete: Concrete inserts with machine screws and bolts.
 - 4. Existing Concrete: Expansion bolts.
 - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 - 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 - 8. Light Steel: Sheet-metal screws.
 - 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.08 IDENTIFICATION MATERIALS AND DEVICES

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding

may be used for voltage and phase identification.

- E. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- F. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
 - 1. Phase A: Brown.
 - 2. Phase B: Orange.
 - 3. Phase C: Yellow.

3.09 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

3.10 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.
- C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.
- D. Remove demolished material from Project site.
- E. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

3.11 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.12 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 - 1. Raceways.
 - 2. Building wire and connectors.
 - 3. Supporting devices for electrical components.
 - 4. Electrical identification.
 - 5. Electrical demolition.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.

3.13 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
 - 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 - 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 - 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.14 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 16123

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.
- B. Related Sections include the following:
 - 1. Division 16 Section "Basic Electric materials and methods".

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field Quality-Control Test Reports: From Contractor.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.02 CONDUCTORS AND CABLES

- A. Available Manufacturers:
 - 1. Alcan Aluminum Corporation; Alcan Cable Div.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- D. Conductor Insulation Types: Type THHN-THWN complying with NEMA WC.

2.03 CONNECTORS AND SPLICES

- A. Available Manufacturers:
 - 1. AFC Cable Systems, Inc.
 - 2. AMP Incorporated/Tyco International.
 - 3. Hubbell/Anderson.
 - 4. O-Z/Gedney; EGS Electrical Group LLC.
 - 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.01 CONDUCTOR AND INSULATION APPLICATIONS

- A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- C. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- E. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- F. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- G. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.02 INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors where possible.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements.
- G. Identify and color-code conductors and cables according to Division 16 Section "Basic Electrical Materials and Methods."

3.03 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for existing aluminum conductors.

3.04 FIELD QUALITY CONTROL

- A. Testing: Perform the following field quality-control testing:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
- B. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

END OF SECTION

SECTION 16130

RACEWAYS AND BOXES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 2 Section "Underground Ducts and Utility Structures" for exterior duct banks, manholes, and underground utility construction.
 - 2. Division 16 Section "Basic Electrical Materials and Methods" for supports, anchors, and identification products.

1.03 DEFINITIONS

- A. ENT: Electrical nonmetallic tubing.
- B. FMC: Flexible metal conduit.
- C. LFMC: Liquid tight flexible metal conduit.
- D. LFNC: Liquid tight flexible nonmetallic conduit.
- E. RNC: Rigid nonmetallic conduit.

1.04 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.

1.05 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.06 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

2.02 METAL CONDUIT AND TUBING

- A. Available Manufacturers:
 1. AFC Cable Systems, Inc.
 2. Grinnell Co./Tyco International; Allied Tube and Conduit Div.
 3. LTV Steel Tubular Products Company.
 4. Manhattan/CDT/Cole-Flex.
 5. O-Z Gedney; Unit of General Signal.
 6. Wheatland Tube Co.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- E. Plastic-Coated IMC and Fittings: NEMA RN 1.
- F. LFMC: Flexible steel conduit with PVC jacket.
- G. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

2.03 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers:
 1. American International.
 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arnco Corp.
 4. Electri-Flex Co.
 5. Lamson & Sessions; Carlon Electrical Products.
 6. Manhattan/CDT/Cole-Flex.
 7. RACO; Division of Hubbell, Inc.
 8. Spiraldirect, Inc./AFC Cable Systems, Inc.
 9. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Schedule 40 and Schedule 80 PVC.
- D. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- E. LFNC: UL 1660.

2.04 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers:
 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. Emerson/General Signal; Appleton Electric Company.
 3. Erickson Electrical Equipment Co.
 4. Hoffman.
 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
 6. O-Z/Gedney; Unit of General Signal.
 7. RACO; Division of Hubbell, Inc.
 8. Thomas & Betts Corporation.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.

- F. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- G. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

2.05 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard paint applied to factory-assembled surface raceways, enclosures, and cabinets before shipping.

PART 3 - EXECUTION

3.01 RACEWAY APPLICATION

- A. Outdoors:
 - 1. Exposed: Rigid steel.
 - 2. Concealed: Rigid steel.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment: LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 3R.
- B. Indoors:
 - 1. Exposed: Rigid Steel or IMC.
 - 2. Concealed: Rigid Steel or IMC
 - 3. Damp or Wet Locations: Rigid steel conduit.
 - 4. Boxes and Enclosures: NEMA 250, Type 3R, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduits.

3.02 INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

- G. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- H. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- I. Tighten set screws of threadless fittings with suitable tools.
- J. Terminations:
 - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Signal System Raceways, 2-Inch Trade Size and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
- N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- O. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

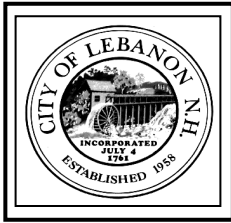
3.03 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.04 CLEANING

- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION



CITY OF LEBANON ~ PLANNING AND DEVELOPMENT

MEMORANDUM

TO: Planning Board

FROM: Planning and Development Department Staff

RE: Proposed Electric Vehicle (EV) Site Plan Amendments by LEAC

DATE: June 16, 2026

The Lebanon Energy Advisory Committee (LEAC) has requested an opportunity to present draft amendments to the Site Plan Review Regulations for the Planning Board's consideration. The proposed amendments – set forth below – establish design criteria for electric vehicle (EV) parking and are intended to complement the EV requirements set forth in Section 607.8 of the Zoning Ordinance. Section 607.8 is also included below for reference. Should the Planning Board choose to move forward with LEAC's proposal, a public hearing will need to be scheduled and held prior to adoption of the amendments.

Proposed Amendments to Site Plan Review Regulations by LEAC

1. *Add under Section 5.1, Drawings and Other Submittals, subsection 4.e (Table Form Information) after existing subsection (5) concerning parking, and renumber remaining subsections, or after the last sub-subsection (13):*

"(X) Number of any off-street parking spaces initially to be EVSE-Installed, EVSE-Ready, EVSE-Capable, and EVSE-Planned, as described in the City's Zoning Ordinance, respectively."

2. *Also under Section 5.1, as part of or following subsection 21 (concerning construction details including parking):*

"XX. 1) A plan showing which spaces are designated as EVSE-Installed, if any, EVSE-Ready, EVSE-Capable, and EVSE-Planned, as described in the City's Zoning Ordinance. 2) The plan shall indicate where electrical circuit breaker panels will be provided initially, and in the future for EVSE-Planned spaces, whether generally within buildings or outdoors as shown on a site plan. 3) The plan shall also indicate where conduit to serve such panels and spaces will initially be provided and where conduit capacity (such as shared with site lighting) and sleeves will initially be provided for EVSE-Planned spaces to avoid the future need to cut through solid walls and floor slabs or excavate under hard surfaces such as pavement, concrete, sidewalks, and curbs for eventual conversion of EVSE-Planned spaces to EVSE-Capable or EVSE-Ready spaces as future demand may require. 4) The plan shall also include a description of planned triggers for such future upgrades and may include annual reporting to the Planning Department of the number of dwelling units, tenants, or residents using EV charging on site and the number of EVSE-Ready or EVSE-Installed spaces provided."

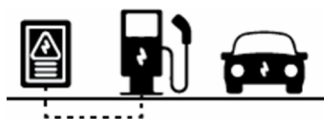
Current EV Zoning Ordinance Requirements

607.8 Electric Vehicles.

- A. Purpose. The purpose of this section is to facilitate the transition to **electric vehicle** use and to expedite the establishment of convenient, cost-effective **electric vehicle infrastructure** that such a transition necessitates.
- B. Applicability. **EV charging stations** are allowed as an **accessory use** in all zoning districts. When the retail charging of **electric vehicles** is proposed to be the principal use of a **lot**, then the proposed **EV charging station** shall be considered a **service station** for zoning purposes.
- C. EV Infrastructure Requirements / Off-Street EV Parking Requirements. **EVSE-installed spaces, EV-ready spaces, and EV-capable spaces** shall be provided as follows:
1. One- and Two-Family Dwellings: All new **one-** and **two-family dwellings** shall provide at least one (1) **EVSE-ready** Low-power level 2 charging space per **dwelling unit**.
 2. All new dwellings with up to three units, included ADUs, shall provide at least one (1) EVSE-Low Power Level 2 charging space per new dwelling unit.
 3. Multi-Family Dwellings: (4 or more units; adding units to existing multi-family housing triggers the requirements for the new units only). Parking for new **multi-family dwellings** shall provide:
 - a. For each residential unit with parking, at least one EVSE-Ready Low-Power Level 2 charging space per unit for 5% (five percent) of total units with parking.
 - b. EVSE-Capable Low-Power Level 2 spaces for a minimum of 10% (ten percent) of residential units with parking. When 80% (eighty percent) of the EVSE-Ready spaces describe in 3.a. are in use, the property owner shall convert half or more of the EVSE-Capable spaces to EVSE-Ready; after that, when 80% (eighty percent) of total EVSE-Ready spaces are in use, additional EVSE-Capable or EVSE-Planned spaces shall be upgraded to EVSE-Ready or EVSE-Capable pursuant to an approved site plan.
 - c. For the remaining number of dwelling units not provided with EVSE-Ready or EVSE-Capable spaces, plus for at least one additional off-street parking space beyond one per dwelling unit, EVSE-Planned spaces shall be designated in a site plan approved by the Planning Board for incremental development as EVSE-Capable and EVSE-Ready spaces as demand for such spaces requires.
 4. Non-Residential Uses. Parking for uses requiring the provision of 10 or more new or additional off-street parking spaces shall include:
 - a. **EVSE-installed** Level 2 spaces for a minimum of 2% of new or additional off-street parking spaces with a minimum of 2 EVSE-Installed spaces.
 - b. For parking spaces dedicated to employee use, the requirement of 4.a. may be replaced by Low-Power Level 2 EVSE-Ready charging spaces at a minimum of 5% of new or additional spaces.

- c. For 20% of the remaining number of new or additional parking spaces not provided with EVSE-Installed or EVSE Ready spaces, EVSE-Planned spaces shall be designated in a site plan approved by the Planning Board for incremental development as demand for such spaces required.
 - d. For existing (not greenfield) non-residential developments, these requirements for EV charging may be replaced by a contribution to a common fund managed by the City of Lebanon for installing public EV charging stations at a separate site, with the contribution amount to be determined by the City.
5. Where the calculations above result in a fractional parking space, it shall round up to the next whole number.
 6. Where the number of **EVSE-installed spaces** provided exceeds the minimum required, the excess spaces shall be deducted from the total number of required **EV-ready spaces** of a similar level (Low-Power Level 2 or Level 2).
 7. Where the number of **EV-ready spaces** provided exceeds the minimum required, the excess **EV-ready spaces** shall be deducted from the total number of required **EV-capable spaces** of a similar level (Low-Power Level 2 or Level 2).
 8. Up to ten (10) **Level 2 EV-installed spaces** may be substituted with one (1) **Level 3 EV-installed space** (minimum 50kW).
 9. **EVSE-installed spaces, EV-ready spaces, and EV-capable spaces** are to be included in the calculation for both the number of minimum required and maximum permitted off-street parking spaces.
 - a. Every two (2) **EVSE-installed spaces** provided in addition to the required minimum may be counted as four (4) **off-street parking spaces** as relates to Section 607.1 (Minimum Off-Street Parking Requirements), for reduction of total required parking not greater than 10 percent of the total amount of required parking.
 10. In each instance where EVSE-Capable is required, EVSE-Ready or EVSE-Installed may substitute. In each instance where EVSE-Ready is required, EVSE-Installed may substitute.
 11. Devices such as intelligent load management systems and circuit splitters are permitted that may temporarily reduce EVSE electrical capacity for charging below the designated minimum power level.

APPENDIX A DEFINITIONS



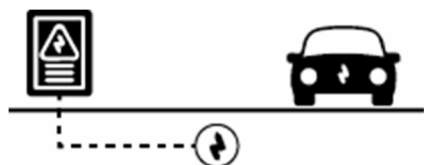
ELECTRIC VEHICLE SUPPLY EQUIPMENT (EVSE) / EV charging station (EVCE): The apparatus installed specifically for the purpose of transferring energy between the site or building

wiring and the Electric Vehicle. EVSE does not include any equipment affixed to the electric vehicle.

ELECTRIC VEHICLE INFRASTRUCTURE: Structures, machinery, and equipment necessary and integral to support an *electric vehicle*, including ***EV charging stations*** and electrical outlets.

ELECTRIC VEHICLE (EV): An automotive-type vehicle for on-road use primarily powered by an electric motor, including any battery electric vehicle, or plug-in hybrid electric vehicle, that draws current from an onboard battery charged through a building or site electrical service, ***EVSE***, or other source of electric current.

EVSE-CAPABLE SPACE: An ***off-street parking space*** with electrical panel capacity and space for a branch circuit dedicated to the parking space that is not less than 20-ampere and 110/120-volt panel capacity for Level 1 charging, or 20 ampere and 208/240-volt for Low-Power Level 2 charging, or 40-ampere and 208/240-volt for Level 2 charging, and is equipped with raceways on conduit, both underground and surface mounted, to enable the future installation of ***EVSE***. For two adjacent EV-capable spaces, a single branch circuit is permitted.



EVSE-READY SPACE: An off-street parking space provided with a full dedicated branch circuit that includes not less than 20-ampere and 110/120-volt panel capacity for Level 1 charging, or 20 ampere and 208/240-volt for Low-Power Level 2 charging, or 40-ampere and 208/240-volt panel capacity for Level 2 charging plus conduit, wiring, receptacle, and overprotection devices terminating in an outlet or receptacle that will support an installed EVSE or support attachment of a charge cord for the vehicle and which is located in close proximity to the location of the parking space. For two adjacent EV-ready spaces, a single branch circuit is permitted. These spaces are “ready to go” as outlets for users who bring their own charging cords or with the addition of an EV charging station (EVSE).



EVSE-INSTALLED SPACE: An ***off-street parking space*** with a dedicated branch circuit and ***EVSE*** for ***Level 2 EV charging stations***.

EVSE IN USE: For the purpose of determining when to trigger conversion of EVSE-Capable spaces to EVSE-Ready, charging spaces shall be considered “in use” based on the number of units with one or more residents at a multi-family housing development that have informed the owner or management they either are charging or would like to charge an EV at their residence parking.

EVSE PLANNED SPACE: An off street parking space that is included in a plan reviewed and approved by the Planning Board for eventual build-out as an EVSE-Ready space pursuant to Site Plan Review Regulations.

DRAFT

**LEBANON PLANNING BOARD
MEETING ROOM 1, CITY HALL OR
REMOTE VIA MICROSOFT TEAMS
LEBANONNH.GOV/LIVE
TUESDAY, MAY 26, 2026 6:30PM**

MEMBERS PRESENT: Karen Zook (Chair), Andrew Faunce (City Council Rep), Max Terzano, Don Collins, Kathie Romano (alt)

MEMBERS ABSENT: Wes Achord (Vice Chair), Patrick Kennelly, Kellen Appleton (City Council Rep alt)

STAFF PRESENT: Tim Corwin (Deputy Planning Director)

1. CALL TO ORDER

Chair Zook called the meeting to order at 6:30pm. Chair Zook included Ms. Romano in voting for this meeting.

2. NOTICE OF REGIONAL IMPACT

Mr. Corwin reviewed the Notice of Regional Impact for Planning Board case PB2026-27-MIN, for 300 Meriden Road, a request for a two (2)-lot Minor Subdivision.

Mr. Corwin reviewed the Notice of Regional Impact for Planning Board case PB2026-28-SPA for 63 Evans Drive, pursuant to Section 9.1 of the Site Plan Review Regulations, the applicant requests a modification to the previously approved Site Plan PB2000-42 to install 11 new parking spaces together with related site improvements.

Mr. Corwin reviewed the Notice of Regional Impact for Planning Board case PB2026-29-SPR for 97 N Main St. and 99 N Main St., request for Site Plan Review per Section 3.1.D of the Site Plan Review Regulations to demolish the existing structures on the subject properties and construct a +/- 4,500 s.f. retail/convenience store and a vehicular refueling station with four (4) fuel dispenser islands with an overhead canopy, together with associated site improvements.

Mr. Corwin reviewed the Notice of Regional Impact for Planning Board case PB2026-30-LLA for 1 Foundry Street, request for approval of a Lot Line Adjustment.

Mr. Corwin stated that staff recommends that none of these applications have the potential for Regional Impact.

A MOTION was made by Kathie Romano that these applications do not have the potential for Regional Impact. The MOTION was seconded by Andrew Faunce.

**The MOTION was approved (5-0).*

3. STUDY ITEMS

A. Review of Proposed Projects for Inclusion in the 2027-2032 Capital Improvement Plan (CIP)

Mr. Corwin explained that the intention is to bring a list of preliminary CIP projects to the Planning Board for comments and questions. Items to be considered for projects are given a closer look by the City Manager's Office and the Planning Department. This is to prepare the Planning Board prior to the final proposed CIP being presented in August. Staff is working to obtain tax impact information for each of the projects to be presented in August.

Andrew Faunce asked about item #14, Route 120-Etna-Old Etna Road Pedestrian Improvements. He asked about relating some of the costs for pedestrian improvements along this stretch to incoming projects, as these costs were likely not considered as part of the impact fees. Mr. Corwin noted that impact fees were contributed toward construction of the sidewalk.

Don Collins stated that for #15, there is currently a one lane bridge along this road, and he would hate to see it turned into a two lane bridge.

The Board discussed items that it would like specific presentations on, including the Greenway extension and the Greenway to Mascoma Street path.

4. COMMITTEE REPORTS

A. City Council Subcommittees:

- Class VI Roads Advisory Committee – No update at this time.
- Lebanon Energy Advisory Committee – No update at this time.

B. Other Subcommittees:

- City Council Representative
- Heritage Commission
- Pedestrian & Bicyclist Advisory Committee
- Upper Valley Lake Sunapee Regional Planning Commission
- UV Subcommittee of the Connecticut River Joint Commissions
- Upper Valley Transportation Management Association
- Mascoma River Local Advisory Committee
- West Lebanon Revitalization Advisory Committee
- Planning & Development Department – Task Status

No updates at this time.

C. Planning Board Subcommittees:

- Planning Board Capital Improvement Program
- Planning Board Development Regulations Update

No updates at this time.

D. Planning Board Development Regulations Subcommittee – No update at this time

E. Minor Site Plan Committee – No update at this time

F. Housing Task Force – No update at this time

1
2 **5. OTHER BUSINESS**

3 A. Appointment of Planning Board Representatives to Other Boards and Committees
4

5 The Board discussed its representative vacancies on other Boards and Committees.
6

7 **6. APPROVAL OF MINUTES**

8 A. April 13, 2026
9

10 *A MOTION was made by Don Collins to approve the April 13, 2026, as presented. The*
11 *MOTION was seconded by Andrew Faunce.*
12

13 **The MOTION was approved (5-0).*
14

15 B. April 27, 2026 – Site Walk
16

17 *A MOTION was made by Don Collins to approve the April 27, 2026 – Site Walk meeting*
18 *minutes, as presented. The MOTION was seconded by Andrew Faunce.*
19

20 **The MOTION was approved (5-0).*
21

22 C. April 27, 2026
23

24 This item was tabled to a future meeting.
25

26 **7. ADJOURNMENT**
27

28 *A MOTION was made by Kathie Romano to adjourn the meeting at 8:00pm. The MOTION was*
29 *seconded by Wes Achord.*
30

31 **The MOTION was approved (5-0).*
32
33

34 Respectfully submitted,
35 Kristan Patenaude
36 Recording Secretary

DRAFT

**LEBANON PLANNING BOARD
COUNCIL CHAMBERS, CITY HALL OR
REMOTE VIA MICROSOFT TEAMS
LEBANONNH.GOV/LIVE
MONDAY, JUNE 8, 2026 6:30PM**

MEMBERS PRESENT: Karen Zook (Chair), Wes Achord (Vice Chair), Patrick Kennelly, Andrew Faunce (City Council Rep), Max Terzano, Don Collins, Kathie Romano (alt)

MEMBERS ABSENT: Kellen Appleton (City Council Rep alt)

STAFF PRESENT: Tim Corwin (Deputy Planning Director)

1. CALL TO ORDER

Chair Zook called the meeting to order at 6:30pm.

Kathie Romano sat as a voting member.

2. NOTICE OF REGIONAL IMPACT

- A. Mason Storage, LLC, 38 Spencer Street (Tax Map 78, Lot 39), zoned LD:**
Request for an Amendment to a previously approve Site Plan PB2021-13-SPR to install four (4) mechanical pads at the rear of the building, PB2026-33-SPA.

Mr. Corwin stated that staff recommends this amendment application does not have the potential for regional impact.

A MOTION was made by Patrick Kennelly that this applications does not have the potential for Regional Impact. The MOTION was seconded by Wes Achord.

**The MOTION was approved (7-0).*

3. PUBLIC HEARING ITEMS

- A. Russell E. and Christine A. Lary, 300 Meriden Road (Tax Map 138, Lot 1), zoned RL-1 an RL-2:** Request for a two (2)-lot Minor Subdivision. PB2026-27-MIN - To be postponed to July 13, 2026

A MOTION was made by Wes Achord to postpone the applications for agenda items 3A and 3C to July 13, 2026. The MOTION was seconded by Patrick Kennelly.

**The MOTION was approved (7-0).*

- B. Evans Drive, SPE, LLC, 63 Evans Drive (Tax Map 78, Lot 40-100), zoned RO-1:** Pursuant to Section 9.1 of the Site Plan Review Regulations, applicant requests a

modification to the previously approved site plan (PB2000-42) to install 11 new parking spaces together with related site improvements. **PB2026-28-SPA - APPLICATION WITHDRAWN**

Chair Zook noted that this application has been withdrawn.

- C. Stewart's Shops Corp (applicant and property owner) and EB II Realty, LLC (property owner), 97 N Main Street (Tax Map 72, Lot 30) and 99 N Main Street (Tax Map 72, Lot 31), zoned CB:** Request for Site Plan Review per Section 3.1.D of the Site Plan Review Regulations to demolish the existing structures on the subject properties and construct a +/-4,500 sq. ft. retail/convenience store and a vehicular refueling station with four (4) fuel dispenser islands with an overhead canopy, together with associated site improvements. **PB2026-29-SPR - To be postponed to July 13, 2026**

This item was previously postponed.

- D. LWM Residential, LLC, 1 Foundry Street (Tax Map 91, Lot 263) and 43 Mechanic Street (Tax Map 106, Lot 34), zoned LD:** Request for approval of a Lot Line Adjustment. **PB2026-30-LLA**

Mr. Corwin stated that staff would recommend that this application is complete enough for the Board to accept jurisdiction and commence review.

A MOTION was made by Don Collins that the application for LWM Residential, LLC, 1 Foundry Street is complete and ready for review. The MOTION was seconded by Patrick Kennelly.

****The MOTION was approved (7-0).***

John Livadas, representing the applicant, explained that this application is directly related to the broader site plan. In the original site plan, 43 Mechanic Street was included as part of the overall development. This was removed in the last approved site plan. Previously, a drain was shown to be located on the 43 Mechanic Street site along with a retaining wall. This adjustment to the 1 Foundry Street lot line allows for all of the development work to occur on 1 Foundry Street. Thus, no easements are needed.

Ms. Romano asked if this would lead to a change in the height of the retaining wall. Mr. Livadas stated that nothing that was previously reviewed and approved will be changed. This proposal only moves the lot line.

Mr. Achord asked for an update on the project. Mr. Livadas stated that the project is still working on fundraising and obtaining capital in order to start in September/October.

Chair Zook asked for public comment. There was none at this time.

Mr. Corwin explained that the staff memo, which was included with the agenda packet, contained several conditions of approval which are relatively standard. The conditions contained within the draft motion before the Board are the same as they appeared in the staff memo.

A MOTION was made by Wes Achord that the Lebanon Planning Board APPROVE the application of LWM Residential, LLC, for a proposed Lot Line Adjustment between 1 Foundry Street (Tax Map 91, Lot 263) and 43 Mechanic Street (Tax Map 106, Lot 34), zoned LD, PB2026-30-LLA, as shown on a plat titled "Lot Line Adjustment Plan prepared for LWM Residential LLC," prepared by Vive Libre Geomatics dated 4/16/26, revised 5/28/26, Drawing: 26001-bo, including any and all supplemental submissions and testimony provided during the public hearing.

In support of its decision, the Board finds that the applicant has submitted plans, testimony, and technical data prepared by a licensed land surveyor that together satisfactorily demonstrates compliance with the applicable requirements of the Subdivision Regulations except as may reasonably be addressed through the imposition of certain conditions of approval, set forth below.

This approval is subject to the following conditions:

A. General Conditions

- 1. This approval shall be considered void unless, within two (2) years from the date of this Notice of Action, a) all conditions precedent have been met and b) the plat and this Notice of Action have been recorded in the Grafton County Registry of Deeds. (Sections 7.11 and 7.12.B) The plat and Notice of Action shall be recorded by the Planning and Development Department in accordance with Planning and Development Department recording procedures.***
- 2. This approval shall automatically expire and be considered void upon failure to meet any of the conditions of approval set forth herein within the timeframes specified.***

B. Conditions to be Satisfied Prior to the Signing and Recording of the Plat

- 1. The applicant shall provide a revised plat depicting the following changes to the satisfaction of the Planning and Development Department:***
 - a. The statement from Section 7.11 of the Subdivision Regulations shall be added.***
 - b. Provide the date and description of the plat revisions. (8.2.A.1)***
- 2. The applicant shall provide a digital record drawing of the revised plat (Cad .dwg format using NH State Plane Coordinate system or an alternative approved by the City's GIS Coordinator) to the Planning and Development Department.***
- 3. The applicant shall submit two (2) mylars of the approved plat and applicable recording fees to the Planning and Development Department in accordance with Planning and Development Department recording procedures. (8.1.D and 7.11).***

The MOTION was seconded by Don Collins.

****The MOTION was approved (7-0).***

A MOTION was made by Wes Achord that the Lebanon Planning Board authorizes the Chair to sign the plat of LWM Residential, LLC, PB2026-30-LLA, titled "Lot Line Adjustment Plan

1 *prepared for LWM Residential LLC,” prepared by Vive Libre Geomatics dated 4/16/26, revised*
2 *5/28/26, Drawing: 26001-bo, as revised per the Planning Board’s conditions of approval. The*
3 *MOTION was seconded by Don Collins.*

4
5 **The MOTION was approved (7-0).*

6 7 **4. OTHER BUSINESS**

8
9 Chair Zook noted that the Board had previously discussed whether to have public hearings and
10 receive presentations regarding governmental use projects, as it does not have jurisdiction over
11 them. There are currently two projects for the Board to consider.

12
13 Mr. Corwin explained that RSA 674:54 regulates governmental uses, which is a defined term in
14 the statute. Generally speaking, it includes any construction project or development that is by or
15 for a government, local government, school district, county, or State. The statute essentially
16 provides that such governmental uses are exempt from local land use regulation, except that for
17 each such governmental use, the government agency that is undertaking the project must give
18 notice to either the local governing body or the local planning board.

19
20 Mr. Corwin stated that the two proposed governmental use projects are both by and for the City of
21 Lebanon. One is for an isolation valve building on Poverty Lane. This is a relatively small project
22 but would ordinarily require site plan review from the Planning Board. However, as it is a
23 governmental use, it is not subject to site plan review, but it is subject to the 674:54 process.
24 Under the statute, the Planning Board is can choose whether or not to hold a public hearing on it.
25 The other governmental use project is a proposed awning and stage at the Kilton Library in
26 Downtown West Lebanon. This project would either require a minor site plan review or a full
27 Planning Board review if it were anything other than a governmental use.

28
29 The Board discussed the first project for the valve building. Chair Zook stated that she does not
30 believe a public hearing is needed, as this deals with the functioning of the water system. Also, the
31 City usually aesthetically tries to blend these buildings into the surroundings. Ms. Romano asked if
32 the abutters to the project will be notified. Mr. Corwin stated that he believes this would only occur
33 as part of a public hearing process. Mr. Faunce stated that the lack of notification to abutters could
34 be justification enough to have a public hearing. Ms. Romano stated that it would be courteous to
35 the public to have a public hearing to alert them of this project.

36
37 There was consensus to hold a public hearing for this project during the Board’s July 13th work
38 session.

39
40 The Board discussed the second project for the Kilton Library. Ms. Romano stated that she
41 believes the public may want to know about the project and so she would be in favor of a public
42 hearing on it. There was discussion that the Library generally does a very good job at advertising
43 its projects and that this is a very minor project.

44
45 There was consensus to not hold a public hearing for this project.

46 47 **5. APPROVAL OF MINUTES**

48 A. April 27, 2026
49

1 *A MOTION was made by Don Collins to approve the April 27, 2026, as presented. The*
2 *MOTION was seconded by Andrew Faunce.*

3
4 **The MOTION was approved (5-0-2 with K. Romano and M. Terzano abstaining).*

5
6 **6. ADJOURNMENT**

7
8 *A MOTION was made by Max Terzano to adjourn the meeting at 7:11pm. The MOTION was*
9 *seconded by Wes Achord.*

10
11 **The MOTION was approved (7-0).*

12
13
14 Respectfully submitted,
15 Kristan Patenaude
16 Recording Secretary