PROJECT MANUAL (OUTLINE SPECIFICATIONS)

CDB #630-128-005
CONSTRUCT MAINTENANCE FACILITY
STEVENSON YARD MAINTENANCE FACILITY
8630 JOLIET ROAD
MCCOOK (COOK COUNTY), ILLINOIS
CDB BUILDING INV. NO. IDOT128-0001, D0139, D0140
CONTRACT: BRIDGING DOCUMENTS

State of Illinois

CAPITAL DEVELOPMENT BOARD

USING AGENCY: ILLINOIS DEPARTMENT OF TRANSPORTATION

BY:

MULLER & MULLER, LTD. - ARCHITECTS
700 N. SANGAMON
CHICAGO, IL. 60642
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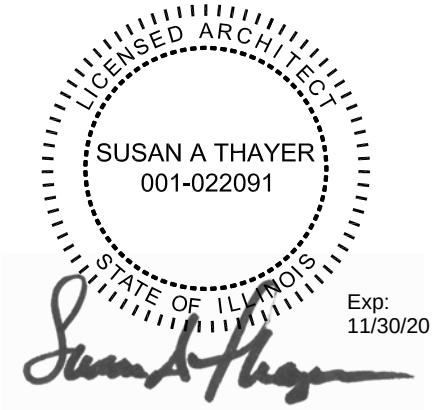
DESIGN FIRM REG # 184-003047



DATE: May 06, 2020

Final Bridging Documents

State of Illinois
CAPITAL DEVELOPMENT BOARD

Muller & Muller Ltd.
700 North Sangamon
Chicago, IL 60622
(312) 432-4180

PROJECT MANUAL FOR

CDB 630-128-005
Construction Maintenance Facility
Stevenson Yard Maintenance Facility
8630 Joliet Road
McCook (Cook County), Illinois

DATE: May 06, 2020

BRIDGING DOCUMENTS

DIVISION 33 – UTLITIES

33 41 00 Storm Utility Drainage Piping

33 71 73 Electrical Utility Services

SPECIFIERS: Bridging Documents – Not for Construction

Architectural	Muller & Muller, Ltd	Susan A. Johnson	630-205-9468
Civil	Graef USA	Peter M. Johnston	773-399-5443
Structural	Graef USA	George J. Podrebarac	312-582-2012
Geotechnical	Intertek-PSI	David. T. Lewandowski	708-236-0720
HVAC	Clark Dietz, Inc.	Nirav T. Patel	312-466-8242
Electrical	Clark Dietz, Inc.	Michael L. Strom	217-373-8986
Communications	Clark Dietz, Inc.	Michael L. Strom	217-373-8986
Plumbing	Clark Dietz, Inc.	Nirav T. Patel	312-466-8242
Fire Protection	Clark Dietz, Inc.	Nirav T. Patel	312-466-8242

END 00 01 10.

All Bridging Document Drawings dated: May 06, 2020

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END 00 01 15.

DOCUMENT 00 31 32 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.

B. A geotechnical investigation report for Project, prepared by Intertek - PSI, dated October 30, 2019, is available for viewing as appended to this Document.

END OF DOCUMENT 00 31 32

GEOTECHNICAL ENGINEERING SERVICES REPORT

For the

Proposed IDOT Maintenance Building
8630 Joliet Road
McCook, Illinois

Prepared for:

Muller & Muller
700 N. Sangamon Street
Chicago, Illinois 60642

Prepared by:

Professional Service Industries, Inc.
4421 Harrison Street
Hillside, IL 60162
Phone (708) 236-0720
Fax (708) 236-0721

PSI Project No. 00473970

October 30, 2019

David T. Lewandowski, P.E.
Project Engineer

Eram Iqbal
Principal Consultant

Information To Build On

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1. PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

The following Table summarizes, in chronological order, the project authorization history for the services performed and represented in this report:

DOCUMENT	DATE	REQUESTED/PROVIDED BY
Email: Request for Proposal	7/06/2018	Mr. Mark M. Stromberg – Muller & Muller
Email: Subconsultant Agreement (Fully Executed)	10/16/2018	Ms. Cynthia B. Muller– Muller & Muller
Email: Authorization to Proceed	9/16/2019	Ms. Susan Thayer – Muller & Muller

1.2 PROJECT DESCRIPTION

The following table lists the materials and information provided in the preparation of this report:

DESCRIPTION OF MATERIAL	PROVIDER/SOURCE	DATE
Email: Scope of Work	Mr. Mark M. Stromberg – Muller & Muller	7/06/2018
Email: Current Plan / Updated Site Plan / Updated Site Plan with Truck Movements	Ms. Susan Thayer – Muller & Muller	7/09/2019
Email: Preliminary Site Investigation Report by Andrews Engineering (Environmental)	Ms. Susan Thayer – Muller & Muller	9/11/2019
Email: Soil Boring Layout Concept Plan	Mr. Peter Johnston - Graef	9/16/2019
Email: Proposed Building Loads / Depth of Stormwater Detention System	Mr. Peter Johnston - Graef	9/16/2019
Email: Traffic Loads	Mr. Peter Johnston - Graef	9/16/2019
Email: Revised Boring Location Plan	Mr. Peter Johnston - Graef	9/18/2019

DESCRIPTION OF MATERIAL	PROVIDER/SOURCE	DATE
Email: Revised Traffic Loads	Ms. Susan Thayer – Muller & Muller	10/07/2019
Email: Draft Architectural, Civil, and Structural Drawings	Ms. Susan Thayer – Muller & Muller	10/18/2019
Email: Revised Traffic Loading / Stormwater Vault Requirements	Mr. Eric Meschewski - Graef	10/28/2019
Phone Conversation: Pavement Section / Stormwater Detention Vault	Mr. Eric Meschewski - Graef	10/30/2019

The proposed building has overall dimensions of 118 feet by 316 feet. The approximate eastern half of the building plan will consist of storage bays and a wash bay for snowplows and salt trucks. The central part of the building plan will include office space, a break room, a mechanical room, a materials lab, and locker rooms. The western part will include maintenance bays, a general shop, a parts / tool room, and tire storage.

The majority of the structure will consist of metal framing supported by columns. The office area will be supported by load bearing concrete masonry unit (CMU) walls. Per the information provided, the maximum wall and column loads of the new building will be 3 kips per lineal feet (klf) and 125 kips, respectively. The loads on the floor slab in pounds per square foot (psf) were not provided; however, wheel loads in excess of 20 kips may be anticipated. A heavy floor slab on the order of 8 inches in thickness is anticipated. The finished floor elevation of the new building will be approximately at EL. 612.00 feet. Fill height up to two (2) feet is anticipated to achieve final grade.

An underground stormwater detention system (e.g. Stormtrap) is planned to be constructed in the proposed parking area northwest of the new building. The bottom depth of the proposed detention structure will be about 5½ feet below final grade (about EL. 606 feet). The vaults are typically constructed on concrete pads with a required soil bearing pressure of 3,000 psf. At the time this report was issued, the final design of the vault was not complete (Phase I).

Based upon the Draft Civil plans, the proposed grades in the proposed pavement areas east of the new building will be in the range of EL. 610 to EL. 611 feet. These elevations appear to be within one foot of existing grades.

For the proposed traffic loads, PSI was provided the following by IDOT and Graef. The Design Service Life will be 50 years.

<u>Snowplows:</u>

- (15-Full Group Storms): 15 vehicles, average 4 trips/day for the 15 full group storms. In addition, 5 trucks from the Hillside facility for 4 trips/day for the 15 full group storms. On 4 occasions, the storms lasted for two days.

- (18 Half Group Storms) 8 vehicles, average 4 trips/day for the 18 half group storms. In addition, 4 trucks from the Hillside facility 4 trips/day for the 18 half group storms.

- (16 Quarter Group Storms) 4 vehicles, average 4 trips/day for the 16 quarter group storms.

- (5 TSP storms) 1 truck 2 trips/day for five TSP storms.

- Winter Traffic Patrol: December 1 through April 1. (One truck per night) 1 trip per night.

  Based on the information above, PSI has estimated the traffic loading as follows:

  (20 vehicles X 19 days X 4 trips/day X 2) +
  (12 vehicles X 18 days X 4 trips/day X 2) +
  (4 vehicles X 16 days X 4 trips/day X 2) +
  (1 vehicle X 5 days X 2 trips/day X 2)
  (1 vehicle X 4 months X 30 days/month X 1 trip/night X 2)

  5,540 vehicles/year

  Note: X 2 = in and out of the maintenance yard

  The snow plows are estimated at 3.62 ESALs/vehicle.
  This value was provided by Graef for snowplows.

  (5,540 vehicles X 3.62 ESALs/vehicle X 50 years) = 1,002,740 ESALs over 50-year design service life

  Note: PSI has based this calculation on the ESALs provided being 18-kip Flexible ESALs.

Outside Vendor Salt Delivery Trucks (WB-65's):

- 161 semi-trucks averaging 23 tons of salt for last year's snow and ice season (Oct. thru April):
- In addition to salt deliveries, the IDOT McCook facility hauled approximately 950 tons of salt between other IDOT facilities (totaling 10-12 tons per truck = 80 trucks).

  Based on the information above, PSI has estimated the traffic loading as follows:

  (161 trucks/year) + (80 trucks/year) = 241 trucks/year X 2 = 482 trucks/year

  Note: X 2 = in and out of the maintenance yard

  The salt delivery trucks are estimated at 3.4 ESALs/truck.
  This value was provided by Graef for salt delivery trucks.
  PSI estimated used this value for delivery and haul vehicles.

(482 trucks/year X 50 years X 3.4 ESALs/truck) = 81,940 ESALs over 50-year design service life

Note: PSI has based this calculation on the ESALs provided being 18-kip Flexible ESALs.

Miscellaneous Truck Traffic:

- IDOT McCook received deliveries on average once a month for attenuators/crash barrels etc. (semi-trucks)
- Quarterly: the facility receives fuel deliveries and waste oil pick up
- Once a month the garbage dumpster is picked up; and
- IDOT dumps large debris daily from roadside clean ups.

Based on the information above, PSI has estimated all the miscellaneous trucks as 5-Axle Tractor-Semitrailer, WB-50 truck, using a single axle loading of 12 kips and two tandem axle loadings of 34 kips each for a total vehicle weight of 80 kips. This loading distribution meets the maximum weights for tandem axles per IDOT: Maximum Legal Dimensions and Weights.

(1 truck/month X 12 months X 2) +
(4 fuel trucks/year X 2) +
(1 refuse truck/month X 12 months X 2) +
(6 debris trucks/day X 365 days/year X 2)

4,435 trucks/year

Note: X 2 = in and out of the maintenance yard

The WB-50 trucks are estimated at 2.34 ESALs/truck.

(4,435 trucks/year X 50 years X 2.34 ESALs/truck) = 518,895 ESALs over 50-year design service life

Note: PSI has based this calculation on 18-kip Flexible ESALs.

Total Truck Traffic:

(Snow plows + Salt Delivery and Haul Trucks + Miscellaneous Truck Traffic) =

(1,002,740 + 81,940 + 518,895) = 1,603,575 18-kip Flexible ESALs over 50 years.

The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If any of the information noted above is incorrect, please inform PSI in writing so that the recommendations presented in this report can be adjusted, if appropriate and if desired by the client. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

1.3 Purpose and Scope of Services

The purpose of this engineering evaluation was to explore the subsurface conditions at the site to prepare recommendations for the foundation system, floor slab, and pavement sections. PSI's contracted scope-of-services included drilling a total of 6 soil test borings, B-1 through B-6, at the site (as illustrated on the Boring Location Map in the Appendix). The boring locations in the figure are as follows:

- One (1) soil test boring, B-1, was drilled within the proposed parking lot / underground stormwater detention area. The planned depth was 15 feet bgs; however, the boring was extended to a depth of about 20 feet bgs. Apparent limestone bedrock was encountered at this depth and precluded deeper drilling.

- Five (5) soil test borings, B-2 through B-6, were drilled within the proposed IDOT maintenance building. These borings were planned to a depth of about 30 feet below the existing ground surface (bgs); however, auger or spoon refusal was encountered prior to reaching plan depth. The borings were terminated prematurely at depths ranging from about 13½ feet to 28½ feet bgs. Apparent limestone bedrock was encountered at these depths

Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client. Except as noted above, the scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater, or air on, below, or around this site.

PSI's scope also did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. The client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The client should also be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or reoccurrence of mold amplification.

2. DRILLING, FIELD AND LAB TESTING PROCEDURES

2.1 Drilling, and Sampling Procedures

A truck-mounted CME 75 drill rig was mobilized to the site for the subsurface exploration. The borings were advanced using 3¼-inch inside diameter hollow-stem augers. Representative samples were obtained employing split-spoon and Shelby tube sampling procedures in general accordance with ASTM procedures.

2.2 Field Tests and Measurements

Penetration Tests and Split-Barrel Sampling of Soils - During the sampling procedure, Standard Penetration Tests (SPT) were performed at regular intervals (2½-feet intervals to 10 feet and 5 feet intervals at greater depths) to obtain the standard penetration value (N) of the soil. The results of the standard penetration test

indicate the relative density and comparative consistency of the soils, and thereby provide a basis for estimating the relative strength and compressibility of the soil profile components. The split-barrel sampler provides a soil sample for identification purposes and for laboratory tests appropriate for soil obtained from a sampler that may produce large shear strain while obtaining the sample.

WATER LEVEL MEASUREMENTS - Water level observations were made during and upon completion of the drilling operations. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table and volumes of water will depend on the permeability of the soils.
BORING LOCATIONS – Graef, the project structural engineer, provided a concept plan with the boring locations. Subsequently, PSI placed the plan and boring locations over an existing aerial image of the site using ESRI's ArcMAP software. The coordinates of the boring locations were obtained using the ArcMAP software. The Illinois State Plane East, NAD 1983, Coordinate System was used for this purpose. These coordinates were loaded into a GPS Trimble instrument. This instrument was used by PSI to mark the borings across the site. The approximate boring locations are shown on the Boring Location Map in the Appendix.

GROUND SURFACE ELEVATIONS – The client provided a grading plan with topography of the subject site. PSI interpolated the elevations of the existing ground surface at the boring locations. The approximate elevations at the boring locations are included on the Boring Logs in the Appendix.

2.3 LABORATORY TESTING PROGRAM

In addition to the field investigation, a supplemental laboratory-testing program was conducted to determine additional engineering characteristics of the subgrade materials necessary in analyzing the behavior of the proposed building and pavement systems. The laboratory testing program is as follows:

LABORATORY DETERMINATION OF WATER (MOISTURE) CONTENT OF SOIL BY MASS - The water content is a significant index property used in establishing a correlation between soil behavior and its index properties. The water content is used in expressing the phase relationship of air, water, and solids in a given volume of material. In fine grained cohesive soils, the behavior of a given soil type often depends on its water content. The water content of a soil along with its liquid and plastic limits as determined by Atterberg Limit testing, is used to express its relative consistency or liquidity index. The moisture contents provided in this report are based on the gravimetric relationship between the soil particles and the moisture in the soil matrix.

UNCONFINED COMPRESSIVE STRENGTH OF COHESIVE SOILS (QU) - The primary purpose of the unconfined compressive strength test is to obtain the compressive strength of soils and rock that possess significant cohesion to permit testing in the unconfined state. Unconfined compressive strength (Qu) is the compressive stress at which an unconfined cylindrical specimen of soil will fail in a simple compression test. In this test method, unconfined compressive strength is taken as the maximum load obtained per unit area or the load per unit area at 15% axial strain, whichever is secured first during a performance of a test. For the unconfined compressive strength test, the shear strength (Su) is calculated to be half of the compressive stress at failure. Because thin-walled tube samples are relatively undisturbed and are larger in size, these samples produce more accurate unconfined compressive strength results. Thin-wall tube samples were used for the analyses herein.

ATTERBERG LIMITS - The Atterberg Limits are defined by the liquid limit (LL) and plastic limit (PL) states of a given soil. These limits are used to determine the moisture content limits where the soil characteristics

changes from behaving more like a fluid at and above the liquid limit to where the soil behaves more like individual soil particles near the plastic limit. The liquid limit is often used to indicate if a soil is a low or high plasticity soil. The plasticity index (PI) is the difference between the liquid limit and the plastic limit. The plasticity index is used in conjunction with the liquid limit to assess if the material will behave like a silt or clay. The material can also be classified as an organic material by comparing the liquid limit of the natural material to the liquid limit of the sample after being oven-dried.

The phases of the laboratory testing program were conducted in general accordance with applicable ASTM specifications. The results of these tests are to be found on the accompanying Boring Logs and Subsurface Profile in the Appendix.

3. SITE AND SUBSURFACE CONDITIONS

3.1 Site Location and Description

The subject site is located about 1,000 feet southwest of the intersection of Joliet Road and State Road 171 in Cook County, Village of McCook, Illinois. Per our site visit, the subject site is an existing IDOT maintenance yard. The site terrain appears to be relatively level across the property. The topographic data indicates elevations ranging from EL. 610 feet to EL. 611 feet. Most of the area is covered by asphalt pavement. The existing calcium chloride tank and salt loading ramp in the central part of the yard will be removed to facilitate the new building. In addition, the existing cold storage building at the southwest part of the site will be removed.

3.2 Subsurface Conditions

The subsurface conditions at the site were explored with a total of 6 soil test borings, B-1 through B-6. The approximate boring depths, terminal elevations, and locations relative to the proposed improvements are provided in the table below.

BORING	APPROXIMATE TERMINAL DEPTH (feet bgs)	APPROXIMATE TERMINAL ELEVATION (feet per MSL)	LOCATION
B-1	13½	598	Proposed Parking Area / Underground Stormwater Detention
B-2	25	586	Northwest Corner of Proposed Building
B-3	13½	597	Northeast Corner of Proposed Building
B-4	28½	581	Central Part of Proposed Building
B-5	27½	584	Southwest Corner of Proposed Building
B-6	20	590	Southeast Corner of Proposed Building

The boring locations are shown on the Boring Location Map in the Appendix. As stated previously, the boring

locations were marked by PSI prior to the drilling exploration.

Representative soil samples were obtained from the soil borings and were returned to PSI's laboratory where they were visually classified using the Unified Soil Classification System (USCS) as a guideline. Further, PSI conducted limited laboratory testing on select soil samples to aid in identifying and describing the physical characteristics of the soils and to aid in defining the site soil stratigraphy. The results of the field exploration and laboratory tests were used in PSI's engineering analysis and in the formulation of engineering recommendations.

3.2.1 Parking Lot / Underground Stormwater Detention (B-1)

The ground surface at the boring location was covered by about 4 inches of asphalt millings underlain by about 4 inches of crushed aggregate base.

The aggregate base was underlain by a layer of black / dark gray lean clay to a depth of about one foot bgs (about EL. 610 feet).

The black / dark gray lean clay was underlain by a stratum of brown lean clay to a depth of about 5½ feet bgs (about EL. 606 feet). The in-situ moisture contents ranged from 10% to 13%. The consistency was medium stiff as indicated by the Standard Penetration Test (SPT) or N-values ranging from 5 to 7 blows per foot (bpf). An Atterberg Limits test was conducted on a sample of the natural brown lean clay. The results are summarized in the Table below:

Sample Location	Sample Depth Interval (feet bgs)	Approximate Sample Elevation (feet per MSL)	Atterberg Limits			USCS Soil Classification	Estimated AASHTO Soil Classification
			LL	PL	PI		
B-1	1 - 2½	609	39	17	22	CL	A-6

The brown lean clay transitions to gray lean clay extending to a depth of about 8 feet bgs (about EL. 603 feet). The in-situ moisture content was 14%. The consistency was very stiff as indicated by the N-value of 19 bpf. An Atterberg Limits test was conducted on a sample of the natural gray lean clay. The results are summarized in the Table below:

Sample Location	Sample Depth Interval (feet bgs)	Approximate Sample Elevation (feet per MSL)	Atterberg Limits			USCS Soil Classification	Estimated AASHTO Soil Classification
			LL	PL	PI		
B-1	6 - 7½	604	25	15	10	CL	A-6

The gray lean clay is underlain by a layer of gray sandy silt to a depth of about 10½ feet bgs (EL. 601 feet). The relative density was medium dense as indicated by the N-value of 22 bpf. The in-situ moisture content was 15%.

The sandy silt was underlain by gray silty clay to a depth of about 13 feet bgs (about EL. 598 feet). The silty clay was very stiff in consistency as indicated by the N-value of 21 bpf and the hand penetrometer (Qp) reading of 4 tons per square foot (tsf). The in-situ moisture content was 11%.
The bottommost formation consisted of weathered limestone, and spoon refusal was encountered at a depth of about 13½ feet (about EL. 597.5 feet).

3.2.2 IDOT Maintenance Building (B-2 through B-6)

The ground surface at the boring locations was covered by asphalt pavement ranging from about 3 to 7 inches in thickness and underlain by about 3 to 8 inches of crushed aggregate base. The exception was B-5 where the base material consisted of asphalt grindings.

In soil borings B-5 and B-6, the aggregate base was underlain a layer of black / dark brown lean clay to depths ranging from about 1½ feet to 3 feet bgs (about EL. 609 feet to EL. 608 feet). The in-situ moisture contents ranged from 17% to 22%. An Atterberg Limits test was conducted on a sample of the black / dark brown lean clay. The results are summarized in the Table below:

Sample Location	Sample Depth Interval (feet bgs)	Approximate Sample Elevation (feet per MSL)	Atterberg Limits			USCS Soil Classification	AASHTO Soil Classification
			LL	PL	PI		
B-5	1 - 2½	609	44	22	22	CL	A-7-6

In soil borings B-2, B-5, and B-6 the aggregate base and black / dark brown lean clay were underlain by medium stiff dark brown, brown, and brown with gray mottle lean clay. The medium stiff lean clay extends to a depth of about 5½ feet bgs (about EL. 606 feet to EL. 605 feet). The in-situ moisture contents ranged from 14% to 22%. The medium stiff consistency was indicated by N-values ranging from 4 bpf to 6 bpf. An Atterberg Limits test was conducted on a sample of the natural brown lean clay. The results are summarized in the Table below:

Sample Location	Sample Depth Interval (feet bgs)	Approximate Sample Elevation (feet per MSL)	Atterberg Limits			USCS Soil Classification	AASHTO Soil Classification
			LL	PL	PI		
B-6	3 - 5	606	23	13	10	CL	A-6

The crushed aggregate base in B-3 and B-4 and the medium stiff lean clay in B-2 and B-5 were underlain by stiff to hard brown and gray lean clay / silty clay / clayey silt to depths ranging from about 8 feet to 22 feet bgs (about EL. 603 feet to EL. 589 feet). The in-situ moisture contents ranged from 9% to 20%. The stiff to hard consistencies were indicated by N-values ranging from 9 bpf to 41 bpf and an unconfined compressive strength (Qu) of 2.8 tsf. An Atterberg Limits test was conducted on a sample of the natural brown with gray mottle lean clay. The results are summarized in the Table below:

Sample Location	Sample Depth Interval (feet bgs)	Approximate Sample Elevation (feet per MSL)	Atterberg Limits			USCS Soil Classification	AASHTO Soil Classification
			LL	PL	PI		
B-4	3 - 5	606	24	15	9	CL	A-6

The stiff to hard brown and gray cohesive strata were underlain primarily by granular strata consisting of silt, sandy silt, silty clayey sand, gravel (B-4), and sand to depths ranging from about 13 feet to the auger refusal depth of about 27½ feet bgs in B-5 (about EL. 597 feet to EL. 584 feet). The relative densities were medium dense to very dense as indicated by N-values ranging from 12 bpf to over 50 bpf. The in-situ moisture contents ranged from 6% to 16%.

The silt (B-2), silty clay (B-3), and sandy silt (B-4) were underlain by weathered limestone extending to depths ranging from about 13½ feet to 28½ feet bgs (about EL. 597 feet to EL. 581 feet). At the refusal depths in soil borings B-2 through B-4, probable intact limestone bedrock was encountered.

The above subsurface descriptions are of a generalized nature to highlight the major subsurface stratification features and material characteristics. The Boring Logs included in the Appendix should be reviewed for specific information at individual boring locations. These records include visual soil descriptions/classifications, stratifications, penetration resistances, and locations of the samples and laboratory test data. The stratifications shown on the Boring Logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual. Water level information obtained during field operations is also shown on these boring logs. The samples that were not altered by laboratory testing will be retained for sixty (60) days from the date of this report and then will be discarded.

3.3 Water Level Measurements

Free groundwater was encountered in each soil boring at depths ranging from about 6 feet to 24 feet bgs (about EL. 604 feet to EL. 587 feet) while drilling and upon completion. The approximate depths and elevations are listed in the table below.

Boring	Approximate Depth / Elevation of Groundwater While Drilling		Approximate Depth / Elevation of Groundwater Upon Completion of Drilling	
	Depth (feet bgs)	Elevation (feet per MSL)	Depth (feet bgs)	Elevation (feet per MSL)
B-1	9.5	602	10	601
B-2	8.5	603	6	605
B-3	11	599	7	603
B-4	6.5	604	10.5	600
B-5	24	587	16	595
B-6	6	604	15	595

The free water appeared to lie within permeable strata (sandy silt or gravel). Water can be present at different levels during other times of the year depending upon climatic and rainfall conditions. Additionally, discontinuous zones of perched water may exist within the soil profile, especially within existing fill soils.

4. GEOTECHNICAL EVALUATION

The following geotechnical related recommendations have been developed on the basis of the subsurface conditions encountered and PSI's understanding of the proposed development. Should changes in the project criteria occur, a review must be made by PSI to determine if modifications to our recommendations will be required.

4.1 GEOTECHNICAL DISCUSSION

There are three (3) primary concerns at this site, which will affect the performance of the foundations, floor slabs, and pavement systems at the subject site. The following summarizes these concerns:

1. The shear strength and compressibility of the soils
2. Proper removal of existing structures followed by proper backfilling and compaction within the excavations created by the demolition activities.
3. Relatively moist and sensitive soils

1. SHEAR STRENGTH AND COMPRESSIBILITY OF SOIL

The primary geotechnical property controlling the bearing capacity and compressibility of the soils bearing the applied loads of the proposed maintenance building is the shear strength of the soil. Based on the finished floor elevation at EL. 612.00 feet, a shallow foundation bearing at a depth of 3½ feet (about EL. 608.5 feet) below exterior or adjacent grades, the applied foundation load on a square spread footing up to 6½ feet wide

will be distributed through a depth range from about 3½ feet to 16½ feet below finished floor elevation (about EL. 608.5 feet to EL. 595.5 feet). PSI believes the shear strength of the natural cohesive soils in this elevation range are between about 500 psf to 5,000 psf based on our exploration and laboratory testing.

The shear strengths are considered "undrained" or a "total stress" parameter and will be used in conjunction with other physical and geometric parameters to calculate an allowable bearing capacity. In addition, the stiff non-organic natural cohesive soils appear to be overconsolidated. Although consolidation testing was beyond the scope of services, an indicator of some degree of overconsolidation is the proximity of the natural moisture content of these soils to the plastic limit.

2. DEMOLITION AND BACKFILLING

Within the plan of the new maintenance building, the proper demolition and removal of the existing structures, associated foundations, and utilities followed by proper backfilling of the excavations is important for the integrity of the new structure. Therefore, PSI recommends that the existing foundations, below grade walls, slabs and loose and/or wet backfill along the outside of the existing below grade walls, be completely removed. Water seepage, if encountered, should be controlled with appropriate dewatering devices. Construction should be completed in dry conditions. It is recommended that any unsuitable or saturated soils at the bottom of the excavations also be removed. The soils at the bottom of the excavations should be observed and verified by a representative of the geotechnical engineer prior to engineered fill placement.

After a stable subgrade at the bottom of the excavations has been achieved, then the excavations can be backfilled with compacted and tested engineered fill. The placement and compaction criteria are described in a subsequent section of this report.

3. EQUIPMENT MOBILITY

The upper fine-grained (sandy lean clay and lean clay) soils can potentially be sensitive to increases in moisture content during construction activities. PSI has been involved with several projects in this region where these otherwise competent soils can undergo a significant loss of stability while construction activities take place during wetter portions of the year. Thus, during wetter portions of the year, there may be an increased difficulty with site grading. Soils that become disturbed would need to be excavated and replaced; however, this remedial excavation may expose progressively wetter soils with depth, thus compounding the problem condition. Thus, a normal approach to subgrade preparation may not be possible.

Depending on weather and soil conditions at the time of construction, methods for accomplishing grading may include the use of wide-track, low-contact-pressure type equipment to perform the recommended site grading. The determination of the proper equipment for use in excavation would be dependent on the condition of the soils at the time of construction and the prevailing weather conditions. Narrow track equipment and rubber-tired vehicles may experience difficulty moving about the site and may deteriorate otherwise suitable soils.

4.2 SITE PREPARATION

Prior to the placement of new fill or preparation of the construction area subgrades, PSI recommends that the existing surficial vegetation, root systems, asphalt pavement, aggregate base, asphalt millings, black lean clay (B-5 and B-6), organic matter, frozen soils, and very moist surficial soils be removed from within and a

minimum of 5 feet beyond the new building and pavement areas. The unsuitable materials should be either wasted or stockpiled for later use in non-load bearing areas.

In addition, PSI recommends that the existing structures (i.e. salt loading ramp, calcium chloride tank, and cold storage building) be removed in their entirety from the new building plan. This removal includes all foundations, below grade walls, slabs, base, and existing utilities from beneath the new building plan and pavement areas. The removal should also extend a minimum 5 feet away from the new building plan. If a successful proof-roll test can be achieved, the excavation of foundations and foundation walls may be limited to 2 feet below final grade in proposed pavement areas provided the Owner is willing to accept the elevated risk. It should however be recognized that remnant foundations left in place may cause obstructions for utility or other excavations that are required as part of the site work. If loose and/or wet backfill is encountered, these unsuitable materials should also be completely removed. In the event of water infiltration, temporary dewatering devices should be utilized to remove free water from the excavations.

The upper lean clay soils are considered highly moisture sensitive and subject to softening. Therefore, equipment and worker traffic must be kept to a minimum on subgrade bearing surfaces, especially during times of precipitation or following spring thaw. In addition, it is likely that stripping and excavating to the proposed subgrade level will require the use of wide-track or other equipment that has a low contact pressure on the subgrade. Otherwise, the soils at the excavation bottom may become disturbed and additional excavation would be recommended.

Following the removal of the unsuitable surficial materials described above, it is recommended that a thorough proof-roll be conducted over the subgrade soil. The proof-roll should be performed with a fully-loaded tandem axle dump truck or rubber-tired vehicle of similar size and weight, typically 9 tons/axle. Materials that are observed to rut or deflect excessively under the moving load (typically greater than about 1 inch) indicate a failed proof-roll. In the event of an unsuccessful proof-roll, an improvement to the subgrade is recommended. It is recommended that the subgrade soil be improved by one of the following methods:

1. Scarification, aeration, and recompaction
2. Undercut and replacement with geotextile fabric or geogrid and properly compacted engineered fill
3. Chemical stabilization

Disking and aeration of the upper soils can be performed to achieve proper compaction of the subgrade; however, this procedure is very dependent upon favorable weather conditions. The second option is to undercut unstable areas about 1 to 2 feet below the final subgrade level followed by replacement with a geotextile fabric or geogrid and dense graded engineered fill (i.e. IDOT CA-6) compacted in place. A third option would be to dry/stabilize unstable subgrade soils using chemical methods such as lime kiln dust or lime. However, this option may not be feasible for this site. **Based on the findings in the borings, subgrade improvements can be anticipated especially in the areas of soil borings B-2 and B-5. Elevated moisture contents were observed in the upper soil profile at these locations.**

After subgrade improvement has been completed, it is recommended that a subsequent proof-roll be performed to verify that a stable subgrade has been achieved. A successful proof-roll is recommended prior to placement of new pavement sections.

The proof-rolling and any recompaction or undercutting activities should be documented by a representative

of a qualified testing firm and should be performed during a period of dry weather. It must be recognized that the upper lean clay soils present on the site are highly moisture and disturbance sensitive and certain areas were observed to be in an elevated moisture condition. Therefore, some difficulty with subgrade preparation can be expected on this site.

Additionally, to lessen the "bath tub" effect, where cohesive soils are exposed, the bottom of over excavations replaced with granular engineered fill should be sloped to drain to a 4-inch drain tile that is in turn sloped to drain (minimum slope of 1 percent) to the nearest catch basin, storm sewer structure, or daylighted to an appropriate area of the site.

4.3 Fill/Backfill Requirements

After subgrade preparation and observation have been completed, placement of new fills needed to backfill undercut excavations or obtain proposed grades may begin. The first layer of fill should be placed in a relatively uniform horizontal lift and be adequately keyed (where needed) into the stripped and scarified subgrade soils. Fill materials should be free of organic or other deleterious materials, have a maximum particle size less than 3 inches, and have a liquid limit less than 45 and plasticity index less than 25. The materials should have a maximum dry unit weight (per ASTM D698) of 100 pcf or greater. Soils classified as CL, ML, CL-ML, SM, SC-SM, SW, and GW will generally be suitable for use as engineered fill. Soils classified as MH, CH, GP and SP could be made suitable for use as engineered fill with caution. The application of these materials should be reviewed by a qualified geotechnical engineer prior to implementation. Soils classified as OL, OH, and PT should be considered unsuitable.

The existing black lean clay should not be reused as engineered fill beneath structural elements. However, non-organic soils, brown/gray lean clay or sandy lean clay, may be considered for reuse. If the engineered fill material is too dry, water should be uniformly applied and thoroughly mixed into the soil by disking or scarifying. Similarly, if the material is too wet, disking and aeration can be used to lower the moisture content. Close moisture content control will be required to achieve the recommended degree of compaction. In utility trenches, shallow foundation excavations, along the sides of the underground detention vault, and other areas where large compaction equipment cannot be used, a dense graded engineered fill (i.e. IDOT CA-6) should also be used as backfill. **It is recommended that this material (IDOT CA-6) be placed as subbase for the new floor slab to increase the subgrade modulus.** Engineered fill should be placed in accordance with the recommendations below.

Engineered fill should be placed in maximum lifts of 8 inches of loose material and should be compacted within the range of 2 percentage points below to 2 percentage points above the optimum moisture content value as determined by the Standard Proctor test (AASHTO T99 – Method C). Each lift of compacted engineered fill should be tested and approved by a representative of qualified testing firm prior to placement of subsequent lifts. The following table summarizes the recommended compactive effort for various types of engineered fills.

FILL/BACKFILL REQUIREMENTS

RECOMMENDED COMPACTIVE EFFORT (FOR VARIOUS TYPES OF STRUCTURAL FILL/BACKFILL)				
MATERIAL TESTED	PROCTOR TYPE	MIN % DRY DENSITY	MOISTURE CONTENT RANGE	RECOMMENDED FREQUENCY OF TESTING *
Engineered Fill – Final Lift (building and pavement areas)	Standard	100%	-2 to +2%	1 per 2,000 sf of fill placed
Engineered Fill (building and pavement areas)	Standard	95%	-2 to +2%	1 per 2,000 sf of fill placed
Base Under Slab	Standard	95%	-2 to +2%	1 per 2,000 sf of fill placed
Landscape Fill (non-load bearing)	Standard	90%	-2 to +2%	1 per 5,000 sf of fill placed
Utility Trench	Standard	95%	-2 to +2%	1 per 100 lf of backfill placed

*Minimum of 3 tests per lift

If the borrow or source of fill material changes, a new reference moisture/density test should be performed. Tested fill materials that do not achieve either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner. A re-test of that area should be performed after the Contractor performs remedial measures and prior to continued fill placement.

4.4 Foundation Recommendations

Based on the finished floor elevations of EL. 612.00 feet for the proposed building, the structure can be supported by conventional continuous wall and spread footings. It is recommended that the footings extend through the lower strength natural soil to reach suitable natural bearing soils (stiff to hard lean clay). Alternatively, the footings can bear directly upon compacted engineered replacement fill over the suitable undisturbed soils. For ease of interpretation, the approximate depths/elevations where suitable natural bearing soils were encountered within the test borings is shown below:

Sample Location	Approximate Depth Below Finished Floor (EL. 612 feet) to Suitable Foundation Bearing Soil (feet)	Approximate Elevation to Suitable Foundation Bearing (feet per MSL)	Bearing Soil Type
B-2	7	605	Stiff Gray Lean Clay
B-3	4	608	Very Stiff Brown with Gray Mottle Lean Clay
B-4	4	608	Very Stiff Brown with Gray Mottle Lean Clay
B-5	7	605	Very Stiff Brown with Gray Mottle Lean Clay

Sample Location	Approximate Depth Below Finished Floor (EL. 612 feet) to Suitable Foundation Bearing Soil (feet)	Approximate Elevation to Suitable Foundation Bearing (feet per MSL)	Bearing Soil Type
B-6	5	607	Very Stiff to Hard Brown Lean Clay

Spread footings for building columns and continuous footings for bearing walls can both be designed for allowable soil bearing pressures of 3,000 psf and 2,500 psf respectively, based on dead load plus design live load. The allowable bearing pressures may be increased by one third (1/3) for short-term loads such as earthquake and wind (transient loading).

We estimate that foundations designed and constructed in accordance with the recommendations herein will experience post-construction total settlement generally less than 1-inch.

4.4.1 Improvement Beneath Footings

The foundations must be supported by suitable bearing natural soils that have been observed, documented, and tested in the field by a representative of a qualified testing firm. Where unsuitable bearing soils such as soft/medium stiff lean clay, organic soils, wet, loose or soft soils are encountered in a footing excavation, the excavation should be deepened to competent bearing soil, and the footing could be lowered or an over-excavation and backfill procedure could be performed. An over-excavation and backfill treatment would require widening the deepened excavation in each direction at least 6 inches beyond the edge of the footing for each 12 inches of over-excavation depth (see Figure 1 on the following page). Over-excavations should be backfilled with a dense graded engineered fill (i.e. IDOT CA-6) placed and compacted as outlined in the Fill/Backfill Requirements section of this report.

Given the subsurface profile at this site, sandy soils may be encountered in the excavations. When the overburden soils have been removed, these soils at the undercut depths may exhibit instability. In addition, these soils may “quicken” and lose stability given the presence of groundwater. If this condition is encountered, it is recommended that a geotextile fabric and a coarse crushed stone working mat be placed. The geotextile should be a 10 ounce per square yard or greater non-woven polypropylene such as Mirafi 1120N or equivalent. The coarse crushed stone material should consist of a coarse aggregate, 2 to 3 inches in maximum size. The crushed stone mat should be placed and compacted for the full width of the excavation. The geotextile fabric should cover the bottom and sides of the excavation to minimize the migration of fine soil particles into the voids in the coarse aggregate. This procedure can make a stable working platform for additional engineered fill placement. The coarse aggregate should be backfilled with a dense graded engineered fill (IDOT CA-6) to the foundation bearing levels. The replacement backfill should be placed and compacted as outlined in the Fill/Backfill Requirements section of this report.

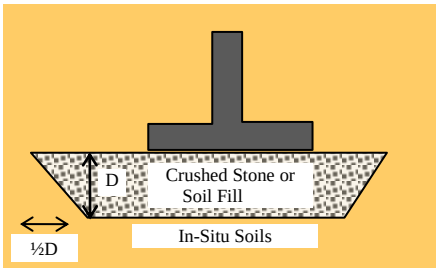
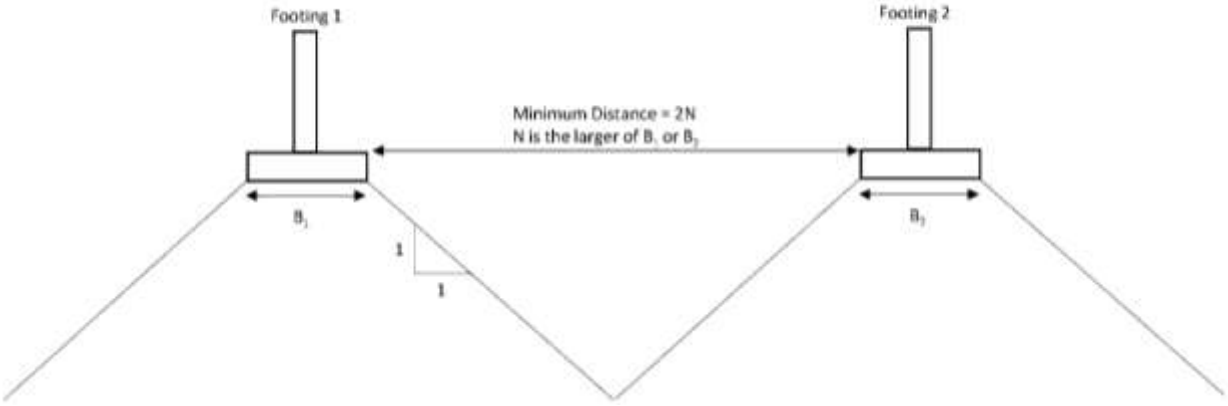


Figure 1

4.4.2 General Recommendations and Parameters

Foundations supporting individual columns should have a minimum dimension of 30 inches, and continuous wall foundations should have a minimum width of 18 inches. Perimeter footings must be placed at a minimum depth of 42 inches below the finished grade in order to protect against frost action. Interior foundations, in the heated areas, may be placed at depth of approximately 12 to 18 inches below the floor slab, provided they will be bearing on acceptable soils.

In the event that the new foundations are to be situated in immediate proximity of any existing functional foundation members, caution must be exercised such that superimposition of foundation stresses will not result in detrimental settlement of either foundation members. In this respect, it is recommended that the new foundations be located, such that no footing is situated within a vertical core extending from the lower contact surface of any existing foundation members, downward and outward at a 45 degree angle (to a depth, approximately equals to twice the width "2B" of footing). However, in the case of new and existing foundations overlapping stress influence zones, PSI should be given an opportunity to evaluate the foundations settlements.



Similarly, if new footings are spaced such that there are overlapping stress influence zones between the new footings, it is recommended that PSI be contacted to calculate the amount of settlement.

Settlement analyses for overlapping stress influence zones or combined foundation systems can be performed as an additional service. Upon request PSI can prepare a change order for these additional services.

4.4.3 Construction Considerations

Footing bearing surfaces evaluations should be performed by a representative of a qualified testing firm. The foundation areas should be critically inspected and tested to verify consistency and compatibility with subsurface exploration data, and to assure that the recommended bearing capacity is being achieved. Any unsuitable, existing undocumented fill, excessively soft/loose or wet soils encountered during foundation excavation and construction should be removed and replaced with compacted engineered fill or the foundations can be extended to bear on the underlying higher strength soils. A representative of a qualified testing firm should be present at the site during foundation excavation and construction in order to determine the extent of remedial measures that may become necessary should unsuitable soils be encountered.

After opening, the bearing surfaces should be evaluated and concrete placed immediately to avoid exposure of the footing bottoms to wetting and drying. If it is required that footing excavations be left open for more than one day, they should be protected to reduce evaporation or entry of soil moisture.

4.5 Floor Slab Recommendations

After the removal of the unsuitable surficial materials followed by a proof-roll, and stabilization where required, **it is recommended that the floor slabs for the new building be supported on a minimum 12 inches of dense graded crushed limestone over the stabilized lean clay subgrade**.

It is recommended that the floor slabs be grade supported on dense graded crushed limestone or sand/gravel mix of IDOT gradation CA-6 (base) or similar. **In addition to the 12 inches of crushed limestone subbase described above, a base thickness of six (6) inches is recommended, but in no case less than four (4) inches.** Where additional drainage capabilities are desired, a more open-graded material may be used. Crushed limestone of IDOT gradation CA-7 would be suitable for this use. If the floor slab is to be supported on IDOT CA-7 crushed limestone or other open-graded material, PSI recommends utilizing a geo-textile fabric between the subgrade soils and this base material to prevent the migration of the subgrade soil into the voids of the open graded “clean” crushed limestone.

PSI recommends that the soil surface be graded to drain away from the building without low spots during and after construction, and before the placement of the granular base material. Polyethylene sheeting should be placed to act as a vapor retarder where the floor will be in contact with moisture sensitive equipment or product such as tile, wood, carpet, etc., as directed by the design engineer. The decision to locate the vapor retarder in direct contact with the slab or beneath the layer of granular fill should be made by the design engineer after considering the moisture sensitivity of subsequent floor finishes, anticipated project conditions and the potential effects of slab curling and cracking. The floor slabs should have an adequate number of joints to reduce cracking resulting from differential movement and shrinkage.

For subgrade prepared as recommended and overlain by a minimum 12 inches of properly compacted dense graded engineered fill plus base material, a modulus of subgrade reaction, k value, of 200 pounds per cubic inch (pci) may be used in the grade slab design based on a 1 ft. x 1 ft. plate load test. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction, $k_s = (\frac{k}{B})$ for cohesive soil and

$$k_s = k(\frac{B+1}{2B})^2 \text{ for cohesionless soil}$$

where: k_s= coefficient of vertical subgrade reaction for loaded area (pci)
k = coefficient of vertical subgrade reaction for 1x1 square foot area (pci)
B = width of area loaded (feet)

The precautions listed below should be followed for construction of slab-on-grade pads. These details will not reduce the amount of movement, but are intended to reduce potential damage should some settlement of the supporting subgrade take place. Some increase in moisture content is inevitable as a result of development and associated landscaping. However, extreme moisture content increases can be largely controlled by proper and responsible site drainage, building maintenance and irrigation practices.

- Cracking of slab-on-grade concrete is normal and should be expected. Cracking can occur not only as a result of heaving or compression of the supporting soil and/or bedrock material, but also as a result of concrete curing stresses. The occurrence of concrete shrinkage cracking, and problems associated with concrete curing may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement, finishing, and curing, and by the placement of crack control joints at frequent intervals, particularly where re-entrant slab corners occur. The American Concrete Institute (ACI) recommends a maximum panel size (in feet) equal to approximately three times the thickness of the slab (in inches) in both directions. PSI also recommends that the slab be independent of the foundation walls.
- Areas supporting slabs should be properly moisture conditioned and compacted. Backfill in all interior and exterior water and sewer line trenches should be carefully compacted to reduce the shear stress in the concrete extending over these areas.

Exterior slabs should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

4.6 Exterior/Unheated Area Slabs

Entry slabs, sidewalks, aprons, and other slabs in exterior or unheated areas may bear upon the lean clay or sandy lean clay soils. Such cohesive soils are frost susceptible and poorly drained. Slabs placed directly upon such soils are subject to heaving and subsequent settlement due to freeze/thaw cycles. This can result in cracking, misalignment, and other related effects (especially at joints). It is recommended that the frost susceptible materials be undercut to a depth of 3½ feet (frost depth) or greater below the slabs, and replacement with dense graded, properly placed and compacted granular engineered fill (i.e. IDOT CA-6). A properly designed underdrain system connected to the municipal sewer (if permissible) or directed to on-site storm water management areas should also be incorporated to reduce the potential effects of freeze/thaw cycles.

4.7 Earthquake and Seismic Design Consideration

HAZARD	RELATIVE RISK	COMMENTS
Liquefaction	Low	The overburden soil within the subsurface profile is comprised of relatively stiff cohesive soils and medium dense to very dense granular soils
Slope Stability	Low	The site is relatively flat and does not/will not incorporate significant cut or fill slopes
Surface Rupture	Low	The site is not underlain by a mapped Holocene-aged fault

A more detailed evaluation of these issues can be performed for an additional scope and/or fee.

4.8 Pavement Recommendations

PSI's scope of services did not include extensive sampling and IBR testing of existing subgrade or potential sources of imported fill for the specific purpose of detailed pavement section analysis. Instead, PSI has based this report on estimated pavement-related design parameters that are considered to be typical for the area soil types, including an estimated IBR value of 3. The AASHTO Classification of A-6 for the near surface lean clay soils was confirmed by laboratory testing.

To achieve an IBR value of 3, the upper 12 inches of the subgrade soils are to be compacted to a minimum 95 percent of the maximum dry density per Standard Proctor (AASHTO T99) and successfully pass a proof-roll test. If this compaction density cannot be achieved, the subgrade will require improvement per one of the methods listed in the Site Preparation section.

Per the traffic loading criteria provided by IDOT and Graef and estimates made by PSI, the pavements should be designed for a 50-year design life with Equivalent Flexible 18-kip Single Axle Loadings (ESALs) of 1,603,575.

Pavement sections were evaluated using Pavement Assessment Software (PAS), which is based on the 1993 AASHTO Design equations. The design parameters utilized were as follows:

Design Service Life.....50 years

Reliability.....85%

Overall Deviation, S_o, for Flexible Pavement 0.45

Resilient Modulus, M_r ..... 3,500 psi

Initial Serviceability for Flexible Pavements, P_o 4.2

Terminal Serviceability, P_t 2.0

Drainage Coefficient 1.0

Structural Layer Coefficient, Hot Mix Asphalt Surface Course (see Attachment) 0.40

Structural Layer Coefficient, Hot Mix Asphalt Binder Course (see Attachment).....0.33

Structural Layer Coefficient, Crushed Aggregate Base Course (see Attachment).....0.13

The Attachment includes structural coefficients from the Illinois DOT Bureau of Environment and Design Manual, Chapter 54 Pavement Design, Figure 54.5-O (March 2017).

The analysis resulted in a required Structural Number (SN) of 4.43 for flexible pavement design.

The recommended thicknesses presented in the table below were calculated based upon the anticipated soil conditions and the parameters listed above.

Pavement Material(s)	Design Thickness
Asphalt Surface Course; Section 406 of IDOT Standard Specifications for Road and Bridge Construction	2
Asphalt Leveling Binder; Section 406 of IDOT Standard Specifications for Road and Bridge Construction	4
IDOT CA-6 Aggregate Base Section 1004.1 of IDOT Specifications Handbook	12
Geogrid (Tensar TX160 or equivalent) over Compacted / Stabilized Subgrade	-

Given the Design Service Life of 50 years, a geogrid is recommended between the subgrade and base course since the subgrade soils are moisture sensitive. Turning movements by the trucks will exert significant stresses on the base and subgrade. The geogrid will help distribute these stresses and protect the integrity of the of these materials. In addition, the geogrid reduces the required base thickness about 6 to 7 inches.

Asphalt Pavement Section

PSI recommends that the bituminous concrete mix meet the general guidelines as outlined in IDOT "Standard Specifications for Road and Bridge Construction" Article 406 for the base and surface courses.

Base Rock Section

PSI recommends that an IDOT CA-6 aggregate base rock (IDOT Specifications Handbook, Sec. 1004.1) be used under the asphalt or concrete pavements. The material should be placed and compacted as discussed in the

Fill / Backfill Requirements section of this report. The following recommended gradations are based on the specifications of IDOT for a CA-6 aggregate base rock:

Sieve Size	Percent Passing by Weight (Mass)
1 1/2-inch (37.5 mm)	100
1-inch (25.0 mm)	90-100
1/2-inch (12.5 mm)	60-90
No. 4 (4.75 mm)	30-56
No. 16 (1.18 mm)	10-40
No. 200 (75 µm)	4-12

Pavement Drainage and Maintenance

PSI recommends that pavements be sloped to provide adequate surface drainage. Water allowed to pond on or adjacent to the pavement could saturate the subgrade and cause premature deterioration of pavements, and removal and replacement may be required.

PSI recommends that subsurface drains be installed in low spots in the pavement, undercuts that have been filled with granular engineered fill, and as finger drains. At a minimum, finger drains should consist of installing 3 to 4 drain tiles extending radially outward, 20 feet from each interior catch basin. In addition, drain tiles should extend along curb lines, 20 feet up the slope from curb inlets. The drain tile should be directly connected to the storm sewer manholes or catch basins. The drain tile should consist of 4-inch diameter perforated PVC pipe placed beneath the base layer, extending at least 8 inches into the subgrade. The pipe should be surrounded by clean stone, 1-inch in size, with the pipe and stone being wrapped with a geotextile filter fabric to reduce the potential of soils from migrating into and obstructing the pipe. Additionally, the drain tile should be installed with a positive slope (minimum ½% to 1%) throughout the length of the tile.

Periodic maintenance of the pavement should be anticipated to be necessary. This should include sealing of cracks and joints and by maintaining proper surface drainage to avoid ponding of water on or near the pavement area.

4.9 Utilities Trenching

In the event soft or otherwise unstable soils are observed at the bottom of the utility excavations, it is recommended that they be undercut and replaced with crushed stone or other suitable granular backfill. This procedure is to establish a stable working mat and/or bearing subgrade for proposed utilities. Some difficulty with the stability of utility trenches should be expected due to the presence of existing undocumented fill in the upper profile. If perched groundwater is encountered, the difficulty of trench stability will be increased. If the utility excavations encounter water infiltration, adequate dewatering and bracing of sidewalls will be required.

Excavation for utility trenches shall be performed in accordance with OSHA regulations as stated in 29 CFR

Part 1926. It should be noted that utility trench excavations have the potential to degrade the properties of the adjacent fill materials. Utility trench walls that are allowed to move laterally can lead to reduced bearing capacity and increased settlement of adjacent structural elements and overlying slabs.

Backfill for utility trenches is as important as the original subgrade preparation or engineered fill placed to support either a foundation or slab. Therefore, it is imperative that the backfill for utility trenches be placed to meet the project specifications for the engineered fill of this project. The backfill for the utility trenches should be placed in 4 to 6-inch loose lifts and compacted to a minimum of 95% of the maximum dry density achieved by the Standard Proctor test. Although the final should achieve 100% of the maximum value. The backfill soil should be moisture conditioned to be within 2% of the optimum moisture content as determined by the Standard Proctor test. Up to 4 inches of bedding material placed directly under the pipes or conduits placed in the utility trench can be compacted to the 95% compaction criteria with respect to the Standard Proctor. Compaction testing should be performed for every 100 lineal feet of backfill placed. Backfill of utility trenches should not be performed with water standing in the trench. If granular material is used for the backfill of the utility trench, the granular material should have a gradation that will filter protect the backfill material from the adjacent soils. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the above compaction criteria. Clean granular backfill material should be compacted to achieve a relative density greater than 75% or as specified by the geotechnical engineer for the specific material used. As an alternative, flowable fill or lean mix concrete can be utilized for utility trench backfill.

5. CONSTRUCTION CONSIDERATIONS

It is recommended that a qualified construction testing and inspection firm be retained to provide observation and testing of construction activities and to verify/validate that the field conditions encountered are consistent with those encountered during the subsurface exploration. PSI is not responsible for the recommendations or conclusions made by others in reference to this report or for variations between the borings and the encountered field conditions. PSI does not provide construction materials testing or inspection services in the Greater Chicago Market and therefore any required building pad or foundation installation certification is outside of our scope of services.

5.1 Drainage and Groundwater Concerns

Free water was observed in each soil boring at depths ranging from about 6 feet to 24 feet bgs (about EL. 604 feet to EL. 587 feet) while drilling and just upon completion. PSI recommends that the Contractor determine the actual groundwater levels at the site at the time of the construction activities to assess the impact groundwater may have on construction. Water should not be allowed to collect in the foundation excavations, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building. A typical sump and pump

technique should be sufficient for groundwater control; however, in the event excessive and uncontrolled amounts of seepage occur, the geotechnical engineer should be consulted. It is recommended that construction be completed in dry conditions. PSI recommends that the Contractor determine the actual groundwater levels at the site at the time of the construction activities.

5.2 Underground Detention System

The Client indicated that an underground stormwater detention system (e.g. Stormtrap) will be installed beneath the proposed parking lot in the vicinity of soil boring B-1. The bottom elevation will be about 5½ feet bgs (about EL. 606 feet). Based on the findings in B-1, the structure will bear on the very stiff gray lean clay. Although free groundwater was observed below this level, temporary dewatering (see previous section) should be anticipated as perched water or an elevated groundwater level may be encountered. After the system has been installed, the sides of the excavation should be properly backfilled with a granular engineered fill. The placement and compaction criteria are described in the Fill / Backfill requirements section of this report.

Graef indicated that the stormwater vault is typically supported on a concrete slab with a 3,000 psf bearing capacity requirement. However, even when full of water, stormwater vaults may weigh less than the soil that was displaced during excavation. As a result, buoyancy should be considered in the design. Since the proposed design of the vault is in the initial stages (Phase I), PSI cannot properly evaluate the bearing capacity or estimated settlement at this time. **Once the final dimensions of the proposed concrete slab and the service loads become available, PSI can provide an allowable bearing pressure and settlement estimate upon request.**

5.3 Excavations

In Federal Register, Volume 54, No. 209 (October, 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P." This document was issued to better insure the safety of workers entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or foundation excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced. If they are not followed closely, the Owner and the Contractor could be liable for substantial penalties.

The Contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The Contractor's "responsible person" as defined in "CFR Part 1926," should evaluate the soil exposed in the excavations as part of the Contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

Materials removed from the excavation should not be stockpiled immediately adjacent to the excavations, in as much as this load may cause a sudden collapse of the embankment.

PSI is providing this information solely as a service to our client. PSI is not assuming responsibility for

construction site safety or the Contractor's activities; such responsibility is not being implied and should not be inferred. A trench safety plan was beyond the scope of PSI's services for this project. If the excavations are left open and exposed to the elements for a significant length of time, desiccation of the clays may create minute shrinkage cracks which could allow large pieces of clay to collapse or slide into the excavation.

6. GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding section constitutes PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

7. REPORT LIMITATIONS

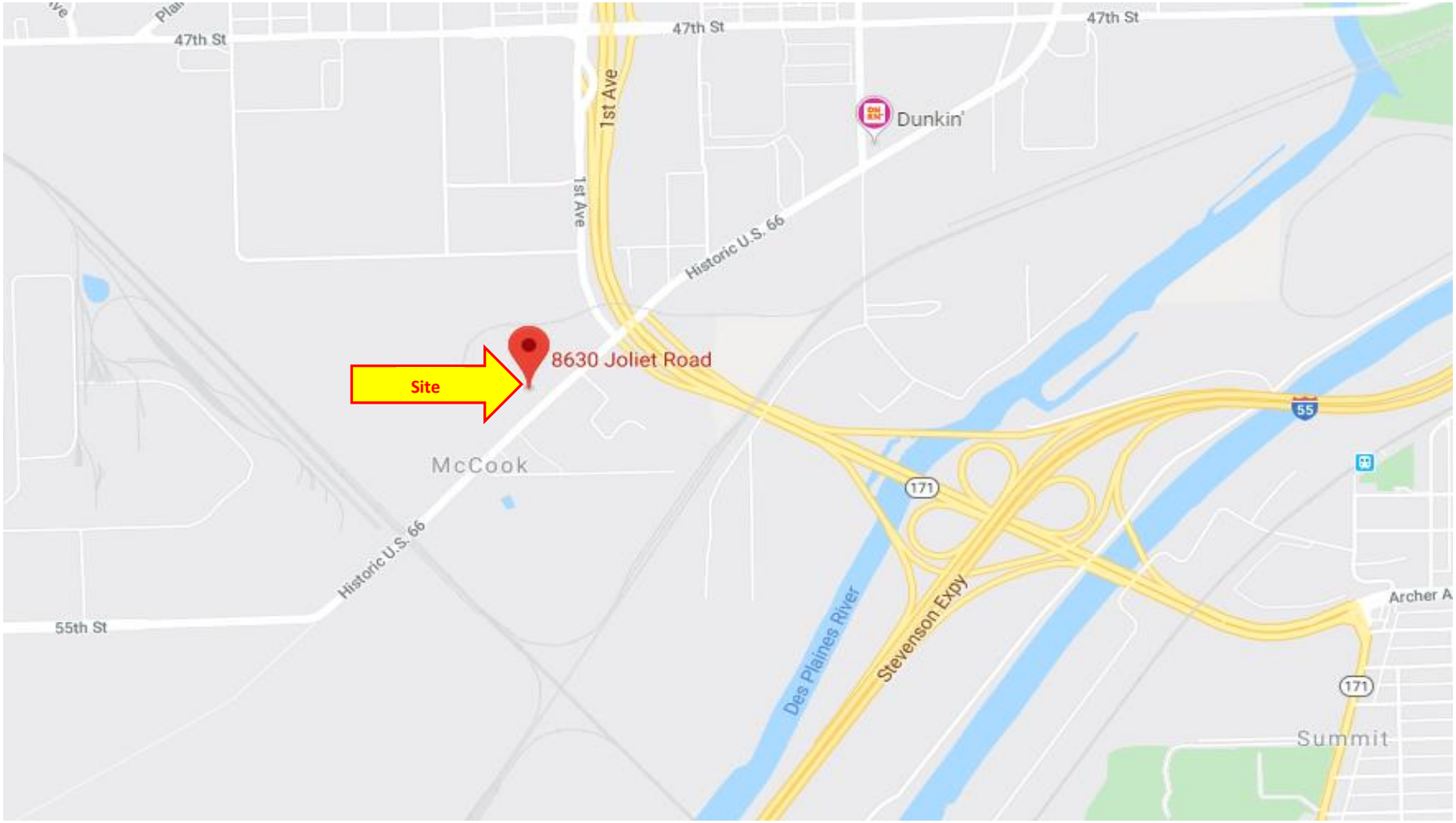
The recommendations submitted are based on the available subsurface information obtained by PSI and design details furnished by Sysco Corporation. If there are revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be notified immediately to determine if changes in the foundation recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the project.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

This report has been prepared for the exclusive use of Muller & Muller for specific application to the proposed IDOT Maintenance Building to be constructed at the existing IDOT facility at 8630 Joliet Road in McCook, Illinois.

Appendix

Site Vicinity Map



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The image above is a copy from Google Maps

intertek psi	**Project Name:**	Proposed IDOT Maintenance Building	**Project No:**	00473970	**Site Vicinity Map**
			Date:	10/30/2019	
	Location:	8630 Joliet Road McCook, Illinois	**Drawn By:**	DTL	
			Scale:	NTS	

Boring Location Map

intertek psi

Legend

Boring

Overlay Image Provided by Client

N
W E
S

0 20 40 80

Feet

1 inch = 80 feet

Figure 2

Boring Location Map
Joliet Road, McCook, IL

Project No.: 00473970

Drawn By: S. Daviou

Date: 9/18/2019

Document Path: P:\046\GIS Data\00473970 - Muller2, McCook, IL\00473970 - Boring Location Map.mxd

Boring Logs

BORING B-1

DATE STARTED:	9/19/19	**DRILL COMPANY:**	Groff Testing Corp.
DATE COMPLETED:	9/19/19	**DRILLER:** TDH	**LOGGED BY:** RG
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	611 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	David T. Lewandowski

Water

While Drilling	9.5 feet
Upon Completion	10 feet
Cave-in	N/A

BORING LOCATION:
See Boring Location Map

REMARKS: USCS Classifications Based on Visual Classification Only

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
610	0			4" (±) Asphalt grindings 4" (±) Crushed aggregate base Black / dark gray lean clay, very moist				
		1	15	Brown lean clay with sand, trace gravel, moist, medium-stiff to stiff	CL	2,3,2 N=5	10	LL = 39 PL = 17
	5	2	18			2,3,4 N=7	13	>>
605		3	18	Gray lean clay with sand seams, trace gravel, moist, very stiff	CL	4,7,12 N=19	14	LL = 25 PL = 15
		4	18	Gray sandy silt trace gravel, wet, medium-dense sand/gravel seam at approx. 9.5 ft.	ML	4,10,12 N=22	15	
600	10	5	18	Gray silty clay with sand, trace gravel, moist, very stiff to hard	CL-ML	7,9,12 N=21	11	
		6	1	Weathered Limestone fragments		50/1	6	>>
	15			End of Boring / Spoon Refusal at 13.5 Feet on Probable Intact Bedrock				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

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PROJECT NO.: 00473970-1
PROJECT: IDOT Maintenance Building
LOCATION: 8630 Joliet Road
McCook, Illinois

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-2

DATE STARTED:	9/19/19	**DRILL COMPANY:**	Groff Testing Corp.
DATE COMPLETED:	9/19/19	**DRILLER:** TDH	**LOGGED BY:** RG
COMPLETION DEPTH	25.0 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	611 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	David T. Lewandowski

Water

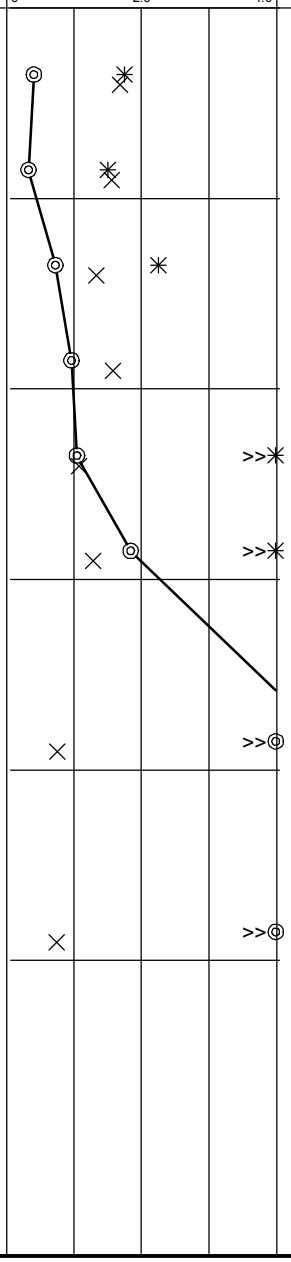
While Drilling	8.5 feet
Upon Completion	6 feet
Cave-in	N/A

BORING LOCATION:
See Boring Location Map

REMARKS: USCS Classifications Based on Visual Classification Only

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
610	0			3 1/2" (±) Asphalt 8" (±) Crushed aggregate base				
		1	18	Dark Brown to brown lean clay with sand, trace gravel, very moist, medium-stiff to stiff	CL	1,1,4 N=5	21	
		2	18	Brown with gray mottle sandy lean clay, trace gravel, moist, medium-stiff	CL	1,1,3 N=4	19	
605	5	3	18	Gray lean clay with sand, moist, stiff	CL	2,4,5 N=9	17	
		4	18	Gray sandy silt, very moist to wet, medium dense Orangish brown poorly graded sand, wet, medium dense	ML SP	3,4,8 N=12	20	
600	10	5	18	Gray silty clay, moist, stiff to hard	CL-ML	4,6,7 N=13	13	
		6	18	Gray silt, very moist, medium dense	ML	5,10,13 N=23	16	
595	15							
		7	12	Gray silt with sand and gravel (weathered limestone), moist, very dense	ML	35,50	9	
590	20							
		8	4	Weathered limestone fragments		100/4	9	
	25			End of Boring / Auger and Spoon Refusal on Probable Intact Bedrock at 25 Feet				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0



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PROJECT NO.: 00473970-1
PROJECT: IDOT Maintenance Building
LOCATION: 8630 Joliet Road
McCook, Illinois

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-3

DATE STARTED:	9/19/19	**DRILL COMPANY:**	Groff Testing Corp.
DATE COMPLETED:	9/19/19	**DRILLER:** TDH	**LOGGED BY:** RG
COMPLETION DEPTH	15.0 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	610 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	David T. Lewandowski

REMARKS: USCS Classifications Based on Visual Classification Only

Water		
	While Drilling	11 feet
	Upon Completion	7 feet
	Cave-in	N/A

BORING LOCATION:
See Boring Location Map

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					7" (±) Asphalt 6" (±) Crushed aggregate base					
				1	18	Brown with gray mottle lean clay with sand, trace gravel, moist, very stiff	CL	4,7,9 N=16	9	× >>✳	
				2	18	Brown silty clay with sand, trace gravel, moist, very stiff	CL-ML	6,8,15 N=23	12	×	
605	5										
				3	18	Gray silty clay with sand, trace gravel, moist, stiff	CL-ML	4,7,12 N=19	13	×	
				4	18	Gray silty, clayey sand with gravel, moist, very hard	SC-SM	7,18,40 N=58	6	× >>◎	
600	10										
				5	13	Gray silty clay with sand, trace gravel, very moist, very dense	CL-ML	19,65,30/1 N=95	10	× >>◎	
						Weathered limestone fragments					
				6	2	End of Boring / Auger and Spoon Refusal at 13.5 Feet on Probable Intact Bedrock		100/1	6	× >>◎	
595	15										

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McCook, Illinois

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-4

DATE STARTED:	9/19/19	**DRILL COMPANY:**	Groff Testing Corp.
DATE COMPLETED:	9/19/19	**DRILLER:** TDH	**LOGGED BY:** RG
COMPLETION DEPTH	30.0 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	610 ft	**SAMPLING METHOD:**	2-in SS/3-in ST
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	David T. Lewandowski

REMARKS: USCS Classifications Based on Visual Classification Only

Water

While Drilling	6.5	feet
Upon Completion	10.5	feet
Cave-in	N/A	

BORING LOCATION:
See Boring Location Map

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS) Push Pressure (ST)	Moisture, %
	0					6" (±) Asphalt 3" (±) Crushed Stone Aggregate Base			
				1	18	Brown with gray mottle lean clay with sand, trace gravel, moist, very stiff		4,5,8 N=14	16
				2	12		CL		14
605	5			3	18			4,11,16 N=27	10
				4	6	Gravel (weathered rock) with gray sandy silt, moist, dense to very dense		11,15,21 N=36	6
600	10			5	12		GP	7,63,30 N=93	7
						Gray silty clay with sand, moist, hard	CL-ML		
				6	18	Gray sandy silt trace gravel, moist, dense to very dense		10,18,45 N=63	16
595	15								
				7	18		ML	9,12,20 N=32	12
590	20								
				8	18			19,57,13 N=70	9
585	25					Weathered limestone fragments, wet			
				9	2			100/2	7
580	30					End of Boring / Spoon Refusal at 28.7 Feet on Probable Intact Bedrock			

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
× Moisture ◪ PL ✚ LL
0 25 50
STRENGTH, tsf
▲ Qu ✳ Qp
0 2.0 4.0

Additional Remarks

DD = 117 pcf
LL = 24
PL = 15
Q_u = 2.8 tsf

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McCook, Illinois

The stratification lines represent approximate boundaries. The transition may be gradual.

BORING B-5

DATE STARTED:	9/19/19	**DRILL COMPANY:**	Groff Testing Corp.
DATE COMPLETED:	9/19/19	**DRILLER:** TDH	**LOGGED BY:** RG
COMPLETION DEPTH	27.5 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	611 ft	**SAMPLING METHOD:**	2-in SS
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	David T. Lewandowski

Water

While Drilling	24 feet
Upon Completion	16 feet
Cave-in	N/A

BORING LOCATION:
See Boring Location Map

REMARKS: USCS Classifications Based on Visual Classification Only

Elevation (feet)	Depth, (feet)	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
610	0			3" (+) Asphalt 7" (±) Asphalt Millings				
		1	18	Black lean clay with sand, very moist, medium-stiff	CL	2,2,3 N=5	22	LL = 44 PL = 22
		2	12	Brown with gray mottle lean clay with sand, trace gravel, very moist, medium-stiff	CL	2,3,3 N=6	22	
605	5	3	18	Brown with gray mottle lean clay with sand, trace gravel, moist, very stiff	CL	8,11,15 N=26	13	>>
		4	18	Gray lean clay with sand, trace gravel, moist, hard	CL	12,15,26 N=41	10	>>
600	10	5	0	No Recovery		18,20,20 N=40		
		6	18	Gray clayey silt, moist, very stiff	ML	7,9,10 N=19	14	>>
595	15							
		7	18	Gray silty clay with sand, very moist, stiff	CL-ML	3,5,7 N=12	20	>>
590	20							
		8	15	Gray sandy silt with gravel (weathered limestone), moist, very dense	ML	23,65,30/3 N=95	9	>>
585	25			End of Boring / Auger and Spoon Refusal at 27.5 Feet on Probable Intact Bedrock				

STANDARD PENETRATION TEST DATA
N in blows/ft ◎
Moisture × PL ◪ LL ✚
0 25 50
STRENGTH, tsf
Qu ▲ Qp ✳
0 2.0 4.0

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BORING B-6

DATE STARTED:	9/19/19	**DRILL COMPANY:**	Groff Testing Corp.
DATE COMPLETED:	9/19/19	**DRILLER:** TDH	**LOGGED BY:** RG
COMPLETION DEPTH	20.0 ft	**DRILL RIG:**	CME-75
BENCHMARK:	N/A	**DRILLING METHOD:**	Hollow Stem Auger
ELEVATION:	610 ft	**SAMPLING METHOD:**	2-in SS/3-in ST
LATITUDE:		**HAMMER TYPE:**	Automatic
LONGITUDE:		**EFFICIENCY**	N/A
STATION: N/A	**OFFSET:** N/A	**REVIEWED BY:**	David T. Lewandowski

REMARKS: USCS Classifications Based on Visual Classification Only

Water

While Drilling	6	feet
Upon Completion	15	feet
Cave-in	N/A	

BORING LOCATION:
See Boring Location Map

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS) Push Pressure (ST)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ × Moisture ◪ PL ✚ LL (0, 25, 50) STRENGTH, tsf ▲ Qu ✳ Qp (0, 2.0, 4.0)	Additional Remarks
	0					5" (±) Asphalt					
						5" (±) Crushed aggregate base					
				1	18	Black to dark brown lean clay with sand, trace gravel, moist, stiff	CL	3,4,7 N=11	17		
						Brown lean clay with sand, trace gravel, moist, hard					
				2	20		CL		10		DD = 131 pcf >>LL = 23 PL = 13
605	5										
						Orange-brown poorly graded sand with silt and gravel, wet, medium dense	SP-SM				
				3	18			15,14,14 N=28	8		
						Brown clayey silt with sand, trace gravel, moist, very stiff	ML				
						Orange-gray to gray sandy silt trace gravel, moist, dense to medium-dense					
				4	18			8,18,19 N=37	11		
600	10						ML				
				5	18			9,9,10 N=19	9		
						Gray sandy silt with limestone, moist, very hard					
				6	18			6,9,45 N=54	12		>>
595	15						ML				
				7	12			23,75	6		>>
590	20					End of Boring / Auger and Spoon Refusal at 20 Feet on Probable Intact Bedrock					

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PROJECT NO.: 00473970-1
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LOCATION: 8630 Joliet Road
McCook, Illinois

The stratification lines represent approximate boundaries. The transition may be gradual.

IDOT Structural Coefficients

STRUCTURAL MATERIALS	MINIMUM STRENGTH REQUIREMENTS			COEFFICIENTS ③		
	MS ①	IBR	CS ②	a_1	a_2	a_3
HMA Surface						
Road Mix (Class B)				0.20		
Plant Mix (Class B)						
Liquid Asphalt				0.22		
Asphalt Binder	900			0.30		
HMA Surface Course (4% voids)				0.40		
Base Course						
Aggregate, Type B						
Uncrushed		50			0.10	
Crushed		80			0.13	
Aggregate, Type A		80			0.13	
Waterbound Macadam		110			0.14	
Bituminous Stabilized Granular Material	300				0.16	
	400				0.18	
	800				0.23	
	1,000				0.25	
	1,200				0.27	
	1,500				0.30	
	1,700				0.33	
HMA Binder Course (4% voids)					0.33	
Pozzolanic, Type A			600		0.28	
Lime Stabilized Soil			150		0.11	
Select Soil Stabilized			300		0.15	
with Cement			500		0.20	
Cement Stabilized Granular Material			650		0.23	
			750		0.25	
			1,000		0.28	
Subbase						
Granular Material, Type B		30				0.11
Granular Material, Type A						
Uncrushed		50				0.12
Crushed		80				0.14
Lime Stabilized Soil			100			0.12

Notes:

① *Marshall Stability (MS) index or equivalent.*

② *Compressive strength (CS) in pounds per square inch (psi). For cement stabilized soils and granular materials, use the 7-day compressive strength that can be reasonably expected under field conditions. For lime stabilized soils, use the accelerated curing compressive strength at 120°F for 48 hours. For Pozzolanic, Type A, use the compressive strength after a 14-day curing period at 72°F.*

③ *For materials with strengths other than those shown, the coefficients may be determined from Figures 54-5.P, 54-5.Q, and 54-5.R. Other approved materials of similar strengths may be substituted for those presented in Figure 54-5.O.*

COEFFICIENTS FOR MATERIALS IN NEW FLEXIBLE PAVEMENT STRUCTURES (Modified AASHTO Design)

Figure 54-5.O

General Notes

GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼ Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.002 mm to 0.075 mm
Clay:	<0.002 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

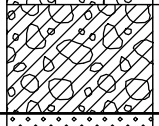
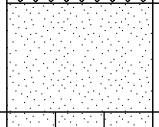
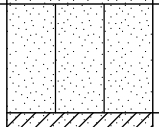
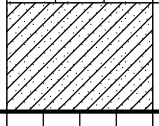
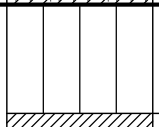
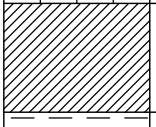
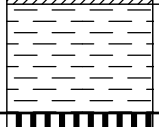
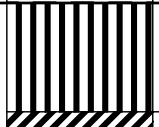
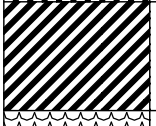
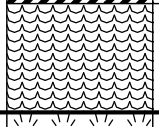
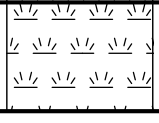
Slightly Weathered: Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.

Weathered: Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.

Highly Weathered: Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

USCS SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

1. **STANDARD DOCUMENTS FOR CONSTRUCTION**: CDB's (2009) edition of the Standard Documents for Construction (SDC) and the Supplement to Standard Documents for Construction (Section 01 11 01) shall apply to this project.

2. **GENERAL PROJECT INFORMATION**:

   A. **DESCRIPTION:** The scope of this project is the final design and construction of a new maintenance facility building (IDOT128-00001) at the IDOT Stevenson Expressway maintenance yard. This facility also includes program spaces for the IDOT Materials Lab, and a portion of the existing building will be retained and modified to function as the cold storage for the facility. The existing facility must remain operational throughout the construction of the new facility.

   B. **EXISTING CONDITIONS:** The existing maintenance facility building (D0139) is approximately 22,160 SF and was built in 1963. The existing materials lab is housed in two temporary trailers on the site that are a minimum of 10 years old. The existing salt dome (D0145) and fuel pump (D0146) are to remain and are not part of this scope of work. The existing cold storage building (D0140), as well as the existing salt ramp will be demolished as part of this scope. A portion of the existing maintenance building will be demolished after the new facility is operational. The existing materials lab trailers will be demolished after the new facility is operational.

   C. **RELATED WORK**

      1. **WORK BY OTHERS:** IDOT will be providing all furniture and equipment, with the exception of the vehicle lifts. IDOT will also be providing all Fire Extinguishers, Room Signage, Lockers and Toilet Accessories as identified in the drawings. IDOT is responsible for relocating the existing chloride tanks, and constructing a new salt ramp.

      2. **FUTURE WORK:** Additional site access to 53rd Street may be explored by IDOT with the adjacent property owner. Betterment G-1 for an access drive directly to Joliet Road may take place in the future, if this project budget cannot accommodate it.

3. **CONTRACT TIME**: Refer to Articles 00 72 10 and 01 32 00 of the Standard Documents for Construction.

   The contractor shall complete all work through Substantial Completion in accord with the contract within 744 consecutive calendar days from the date of the Authorization to Proceed and shall complete all remaining work in accordance with the contract (Final Acceptance) within 60 consecutive calendar days from the date of Substantial Completion.

4. **CONTRACT(S)**. Construct project under single prime contract. All work shown on the bidding documents is the responsibility of the contractor, regardless of the trade or specialty involved.

5. **PRE-BID CONFERENCE**. The pre-bid meeting will be as indicated in 00 11 13. Bidders are strongly urged to attend this meeting. See SDC 00 21 10 and 00 25 00.

6. **CONSTRUCTION ADMINISTRATION FEE**: A construction administration fee (CAF) is applicable to each contract in accordance with Article 00 21 40 of the Standard Documents for Construction:

   The contractor will be assessed three percent (3%) of their awarded contract (base bid plus any awarded alternates). The assessed amount will be included in the Notice of Award Letter. Bidders shall include an allowance for the CAF assessment in their bid.

7. **BID SECURITY**: Bid security must be submitted with each bid equal to 10% of the base bid and must be in the form of a CDB bid bond, certified check, cashier's check or bank draft. Refer to Article 00 43 13 of the Standard Documents for Construction.

8. **BUILDERS RISK INSURANCE, DESIGNATED PURCHASER**. The contractor shall purchase and maintain builder's risk insurance in accord with Article 00 73 19 of the Standard Documents for Construction.

9. **PROCUREMENT OF DOMESTIC PRODUCTS ACT.**
   A. The Procurement of Domestic Products Act, 30 ILCS 517/30, requires each purchasing agency making purchases of procured products to promote the purchase of and give preference to manufactured articles, materials, and supplies that have been manufactured in the United States.

   B. "Manufactured in the United States" means, in the case of assembled articles, materials, or supplies, that design, final assembly, processing, packaging, testing, or other process that adds value, quality, or reliability occurs in the United States.

   As the Bridging Document A/E, our determination is the promotion and preferences required are being applied to this project. Bidders may request preference on document 00 41 00 – Bid Form.

10. ***FIELD OFFICES***:

    A. Coordinating contractor provide and maintain a field office in accordance with Article 01 52 00 of the Standard Documents for Construction.

    B. See Related Requirements:
       1. Section 01 51 50 Use of Existing Facilities
       2. Section 01 51 00 Temporary Utilities

11. **VALUE MANAGEMENT.** The value management program is applicable to this project.

The Standard Documents for Construction and Standard Documents for Construction for Projects with a Construction Manager are hereby changed. The following articles replace those in the 2006 and 2009 editions. All other articles remain applicable.

00 21 05 PREQUALIFICATON

.7 Single Prime Delivery Method Projects. The protected subcontractors, as identified on Document 00 41 00 bid form, shall be prequalified with CDB under the same requirements listed in 00 21 05 .1 -.6 for the bidder.

00 21 50 WORK WITH OWN STAFF

.1 General. For Single Prime Delivery Method Projects: The Prime Bidding Contractor and the designated protected subcontractors shall perform the work at the site employing not less than the following amount of its own forces. For purposes of this Article, the work includes direct labor and supervision, as well as material purchases where the material is installed by the Prime Bidding Contractor/Protected Subcontractors.

A. When General Trade is the Prime Bidding Trade: The General trade shall perform 20% of the following amount: total value of awarded amount less total value of designated protected trade work identified on the bid form, and less the cost of CAF, insurance and bonds.
Each designated protected trade work: 40% of the value of the respective designated protected trade work identified on the bid form.

B. When a trade other than the General is the Prime Bidding Trade: the Prime Bidding Trade shall do 40% of the following amount: total value of awarded amount less total value of designated protected trade work identified on the bid form, and less the cost of CAF, insurance and bonds. Each designated protected trade work: 20% of the value of the General Trade work, and 40% of the value of the remaining respective designated protected trade work identified on the bid form.

.2 Subcontractors and Suppliers

C. Subcontract/Supplier Disclosure. The Contractor shall submit with his/her bid the names and CDB issued identification (ID) numbers (prequalification ID number or registration ID number), if known, of all first tier subcontractors and suppliers with a subcontract value greater than $50,000 to be utilized by the Contractor in the performance of this contract and any lower tier subcontractor/supplier with a subcontract value greater than $50,000 and where the subcontractor/supplier is either named in the specifications or is one over whom the Contractor retains the right to approve and/or make payments for work. The subcontract shall include reference for compliance with Illinois Procurement Code 30 ILCS 500/20-120. Financial and Conflict of Interest disclosures and standard certifications for each subcontractor over $50,000 must be submitted to CDB by the contractor within 20 days of the execution of a contract with CDB or 20 days of the execution of the subcontract, whichever is later. The Contractor shall promptly notify the State in writing of any additional

or substitute subcontractors meeting the above criteria hired during the term of this contract (names, addresses, expected contract amount and CDB ID nos.). Upon request by the CPO, the Contractor shall provide CDB a copy of each subcontractor's subcontract. No work can be performed by these subcontractors until the Certifications and Disclosures have been reviewed and approved by the State Purchasing Officer.

00 21 55 USE OF ILLINOIS LABOR

.1 30 ILCS 570 mandates that during a period of excessive unemployment at least 90% of the total labor hours on State construction projects must be performed by persons who have resided in Illinois for at least thirty (30) days and intend to become or remain Illinois residents. (30 ILCS 570/3). 'A period of excessive unemployment' means any month immediately following 2 consecutive calendar months during which the level of unemployment in the State of Illinois has exceeded 5% as measured by the United States Bureau of Labor Statistics in its monthly publication of employment and unemployment figures. (30 ILCS 570/1).

.2 Contractors are required to incorporate the above provisions into all subcontracts for subcontractors who will have workers at the project site.

.3 To verify that this requirement is being met, contractors must submit Certified Payroll forms for themselves and their subcontractors each month for the duration of the contract/subcontract.

A. The Certified Payroll form(s) must include the name and address of each worker on the project site during the time period covered by the form.
B. For subcontractors, the contractor will include the beginning and ending dates of the subcontract on the Certified Payroll form.
C. If Certified Payroll forms are not submitted timely, payment may be reduced or withheld until Certified Payroll submittals are brought up to date.

00 43 30 BUY ILLINOIS PROGRAM

.1 **General.** The Buy Illinois Program encourages contractors to incorporate products manufactured, fabricated or assembled in the State of Illinois. It is a voluntary program; there is no incentive provision affecting the award of the contract nor is there a required percent of the contract that must be Illinois products.

.2 Illinois products will be indicated in the project manual with (IL) preceding the item in the specification paragraph. Typically, only specifications that are prescriptive, those listing three or more manufacturers, will be in the program. Contractors should consider these products when procuring the materials and equipment for the project. If the contractor is aware of an Illinois product not listed, the contractor is encouraged to advise the A/E prior to bidding or offer a product substitution with the bid. CDB will verify that the product meets the definition of an Illinois product and add it to CDB's Buy Illinois product directory.

.3 Contractors should provide the total value of Illinois products on the Contractor's Schedule of Values (CSV) in the space provided. The individual items included in the total should be identified by putting "IL" in front of their descriptions on the CSV.

.4 Where material is specified by standards and/codes and not by a list of acceptable manufacturers, contractors are still encouraged to purchase Illinois products. However, the contractor should not include these materials in the computation of the total dollars for Illinois products on the CSV.

00 43 39 MINORITY, WOMEN, AND VETERAN BUSINESS ENTERPRISE PARTICIPATION

.1 Certification. CDB will only accept Minority and Women and Veteran Business Enterprise (MBE/WBE/VBE) firms certified by the Illinois Department of Central Management Services (CMS) as a MBE or WBE or VBE. The MBE/WBE/VBE's certification/or recognition with CMS shall be in good standing prior to the bid opening date.

.2 Designated Projects. CDB may designate projects with "MBE/WBE/VBE participation goals." See the bid form, Section 00 41 05 of the project manual, for applicable goals for first and second tier (level) subcontractors and supplier MBE/WBE/VBE participation. For Single Prime Delivery Method Projects: participation of certified MBE/WBE second level subcontractors and suppliers is permissible for meeting applicable goals.

.3 Bid Form. Each bidder shall name, on the bid form provided, the minority, women, and veteran owned businesses it intends to use to meet the specified goals. If the specified goals are not met, within 10 (ten) calendar days of the bid opening the bidder shall: (1) cure the deficiency in the bid by adding participation to meet the goals, or (2) request a waiver of the specified goals including documentation of its good faith efforts to achieve the goals.

.4 MBE/WBE/VBE Bidder. If the bidder is a minority or women or veteran owned business then indicate the work proposed to be done with own forces on the 00 41 05 Form. CDB encourages MBE/WBE/VBE prime bidders to use MBE/WBE/VBE subcontractors/suppliers.

.5 Joint Venture. If the bidder is a joint venture, the MBE/WBE/VBE joint venturer may be used to meet the MBE/WBE/VBE goal for the contract, consistent with the provisions of subsection .11(g).

.6 Subcontracts. Subcontracting of work to a lower tier non-MBE/WBE/VBE firm which would reduce the proceeds received by the subcontracting MBE/WBE/VBE firm below the specified goal is prohibited. CDB may, in such cases, reject the bid or terminate the contract. Refer to Paragraph 00 51 20.2.A).

.7 Request for Assistance. If the bidder needs assistance in locating subcontractors or suppliers to meet the goals, bidder shall contact CDB's Fair Employment Practices Division both prior to the submittal of the bid, and, if applicable, during the 10-day cure period.

.8 Submittal of Good Faith Effort documentation or waiver request. Include with the package:

A. All information indicating why the specified goal cannot be met.

B. A list of all MBE/WBE/VBE firms contacted and the dates they were contacted, including documentation from those firms.

C. Copies of all bid solicitation letters to MBE/WBE/VBE firms. Letters shall contain, at a minimum:

1) project title and location;
2) classification of work items for which quotations are requested;
3) date, time, and place quotations are due; and
4) returnable acknowledgment of the solicitation.

D. Evidence, such as a log of telephone contact including time and date of call, telephone number, and name of the person called; written correspondence; and quotes from solicited firms.

E. All other evidence of good faith efforts made by the bidder to secure eligible

MBE/WBE/VBE firms to meet the specified goal. Evidence may include documentation that states the following:

1) A reasonable number of MBE/WBE/VBE firms were contacted.
2) The work selected by the bidder for allocation to MBE/WBE/VBE firms was selected in order to increase the likelihood of achieving the specified goal.
3) The bidder negotiated, in good faith, with the potential MBE/WBE/VBE firms by not imposing any conditions which are not similarly imposed on all other subcontractors and suppliers, or by denying benefits ordinarily conferred on subcontractors or suppliers for the type of work for which bids were solicited.
4) The services of the referral agencies were used by the bidder in efforts to achieve the specified goal.
5) The bidder attended the CDB pre-bid meeting for the project.

F. Mathematical errors should be addressed by providing a detailed rationale and evidence, such as quotes, notes, and spreadsheets that explains and justifies the mathematical error.

G. All actions taken to solicit MBE/WBE/VBE firms both pre-bid opening date and post-bid opening date.

H. A revised 00 41 05 form, if MBE/WBE/VBE participation increases during the 10 day cure period but goals are not met.

I. Other relevant information in support of the waiver request.

.9 Replacement of MBE/WBE/VBE Subcontractor or Supplier. If it can be demonstrated that the MBE/WBE/VBE subcontractor or supplier cannot perform the work, or if a MBE/WBE/VBE loses its CMS certification or recognition after the bid opening, then the Contractor shall make a good faith effort to replace, in-kind, the MBE/WBE/VBE. The contractor shall identify the replacement MBE/WBE/VBE or provide evidence of good faith effort to find a replacement on the Contractor's letterhead and submit with documented evidence of cause to CDB's Fair Employment Practices Division. CDB will review the submittal and may authorize the replacement or approve the good faith effort.

.10 Calculation of MBE/WBE/VBE Participation as a Material Supplier or Subcontractor

A. MBE/WBE/VBE as a material supplier: A 100 percent goal credit is allowed for the cost of materials or purchases from a MBE/WBE/VBE manufacturer or supplier.

B. MBE/WBE/VBE as a subcontractor: A 100 percent goal credit is allowed for the work of the subcontract performed by the MBE/WBE/VBE's own forces (performing, managing and supervising the work), including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the MBE/WBE/VBE subcontractor from the prime Contractor or its affiliates. Work that a MBE/WBE/VBE subcontractor in turn subcontracts to a non-MBE/WBE/VBE does not count toward the MBE/WBE/VBE goal.

.11 Work to be Completed by Firm Certified with BEC/CMS. To be credited towards goals for Minority Business Enterprise (MBE), Women Business Enterprise (WBE), and Veteran Business Enterprise (VBE) participation, work must be performed by an entity certified by the Business Enterprise Council for Minorities, Women and Persons with Disabilities ("BEC") as administered by the Illinois Department of Central Management Services (CMS) as an MBE, WBE, or VBE firm pursuant to the Business Enterprise for Minorities, Women, and Persons with Disabilities Act (30 ILCS 575/5) and the Illinois Procurement Code (30 ILCS 500/45-57).

a) The entire amount of contractual work performed by a MBE, WBE, or VBE's own forces will be credited towards MBE/WBE/VBE goals, including the cost of supplies, materials, and equipment obtained by the MBE, WBE, or VBE for this work (except supplies and equipment the MBE/WBE/VBE obtains from the prime

contractor or its affiliate).

b) The entire amount of fees or commissions charged by a MBE/WBE/VBE firm for providing a bona fide service, such as professional, technical, consultant, or managerial services will be credited towards MBE/WBE/VBE goals provided such fees are reasonable and not excessive as compared to fees customarily allowed for similar services. Services for materials and supplies are defined in Section 00 43 39.14 and are not considered to be professional, technical, consultant, or managerial services.

c) Work subcontracted by a MBE/WBE/VBE to another firm will not be credited towards goals unless the subcontractor performing the work is also certified by BEC/CMS as a MBE/WBE/VBE. Work that a MBE/WBE/VBE subcontracts to a firm not certified as a MBE/WBE/VBE does not count toward the goal. For example, if a MBE firm has a subcontract to perform $100,000 worth of work and subcontracts $10,000 of that work to a non-MBE firm, only the $90,000 worth of work performed by the MBE firm will be credited toward the goal.

d) If a firm is not currently certified as a MBE/WBE/VBE at the time of the execution of the contract, the firm's participation will not be counted toward any goals.

e) The dollar value of work performed under a contract with a firm after it has ceased to be certified will not be counted toward the overall goal.

f) The participation of a MBE/WBE/VBE subcontractor will not be counted toward a Contractor's final compliance with its MBE/WBE/VBE obligations on a contract until the amount being counted has actually been paid to the MBE/WBE/VBE.

g) When a MBE/WBE/VBE performs as a participant in a joint venture, a portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work of the contract that the MBE/WBE/VBE performs with its own forces may be counted toward MBE/WBE/VBE goals.

.12 Commercially Useful Function. Expenditures to a MBE/WBE/VBE will only be credited towards MBE/WBE/VBE goals if the MBE/WBE/VBE performs a commercially useful function on that contract. A MBE/WBE/VBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. To perform a commercially useful function, the MBE/WBE/VBE must also be responsible, with respect to materials and supplies used on the contract, for negotiating price, determining quality and quantity, ordering material, and installing (where applicable) and paying for the material itself.

a) Factors to be used in determining whether a MBE/WBE/VBE is performing a commercially useful function include, but are not limited to, the amount of the work subcontracted, industry practices, and whether the amount the firm is paid is commensurate with the work it is performing and the MBE/WBE/VBE credit claimed for its performance of the work.

b) A MBE/WBE/VBE does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of MBE/WBE/VBE participation. In determining whether a MBE/WBE/VBE is such an extra participant, similar transactions, particularly those in which MBE/WBE/VBEs do not participate, will be examined.

c) If a MBE/WBE/VBE does not perform at least 30 percent of the total cost of its contract with its own work force, or the MBE/WBE/VBE subcontracts a greater

portion of the work than would be expected on the basis of normal industry practice for the type of work involved, a presumption will arise that the MBE/WBE/VBE is not performing a commercially useful function. A MBE/WBE/VBE firm may present evidence to CDB to rebut this presumption. The MBE/WBE/VBE must provide such evidence to rebut the presumption within 7 business days of being notified that the presumption will be applied.

d) A prime contractor that is a MBE/WBE/VBE will still be required to meet the goals required on the contract. In determining whether the MBE/WBE/VBE prime contractor has met the goal, the work the MBE/WBE/VBE prime contractor actually performs with its own forces will be credited, as well as work performed by MBE/WBE/VBE subcontractors or suppliers, consistent with the terms of Section 00 43 39. The presumption in .12(c) above will not attach if the MBE/WBE/VBE is the prime contractor and satisfies the "Work With Own Staff" requirement in Section 00 21 50.

e) A bidder's efforts to exercise Good Faith Efforts by providing assistance in advance of the bid to a MBE/WBE/VBE firm in making purchases, obtaining bonding, obtaining credit, or providing equipment will not invalidate the commercially useful function of a MBE/WBE/VBE, provided that the MBE/WBE/VBE has otherwise performed a commercially useful function consistent with the terms of Section 00 43 39. Credit will only be given for work performed by, purchases made by, and equipment obtained by the MBE/WBE/VBE, consistent with the terms of Section 00 43 39. A bidder's efforts to assist the MBE/WBE/VBE will not be credited.

.13 Trucking Company. To be credited towards MBE/WBE/VBE goals, a trucking company or major construction equipment rental (MCER) must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting MBE/WBE/VBE goals.

a) The MBE/WBE/VBE must itself own and operate at least one fully licensed, insured, and operational truck or major construction equipment unit (MCEU) used on the contract.

b) The entire value of transportation services a MBE/WBE/VBE provides on the contract using trucks or MCEUs it owns, insures, and operates using drivers it employs will be credited towards MBE/WBE/VBE goals.

c) If a MBE/WBE/VBE leases trucks or MCEUs from another MBE/WBE/VBE, the entire value of the services provided by the lessee will be credited.

d) If a MBE/WBE/VBE leases trucks or MCEUs from a company that is not a MBE/WBE/VBE, the total value of transportation services provided by the lessee is not to exceed the value of transportation services provided by MBE/WBE/VBE owned trucks or MCEUs on the contract.

e) For purposes of this section, a lease must indicate that the MBE/WBE/VBE has exclusive use of and control over the truck(s) or MCEU(s). This does not preclude the leased truck from working for others during the term of the lease with the consent of the MBE/WBE/VBE, so long as the lease gives the MBE/WBE/VBE absolute priority for the leased truck(s) or MCEU(s). Leased trucks and MCEUs must display the name and identification number of the MBE/WBE/VBE.

f) The MBE/WBE/VBE must be responsible for the management and supervision of the entire trucking operation for which it is responsible on a particular contract, and there cannot be a contrived arrangement for the purpose of meeting MBE/WBE/VBE goals.

.14 Materials and Supplies

a) Credit towards goals will be given for materials purchased from a MBE/WBE/VBE supplier or manufacturer that is certified as such with BEC/CMS.

b) For purposes of this section, a manufacturer is a firm that operates and maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the contract and of the general character described in the specifications.

c) For the purposes of this section, a supplier is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which materials, supplies, articles or equipment of the general character described by the specifications and required under the contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business.

1) A supplier must be an established, regular business that engages as its principal business and under its own name, in the purchase and sale or lease of the products in question.

2) A person may be a supplier in such bulk items as steel, cement, gravel, stone, petroleum products, or asphalt without owning, operating, or maintaining a place of business as provided in this paragraph c if the person both owns and operated distribution equipment for the products. Any supplementing of a supplier's own distribution equipment shall be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis.

3) Brokers, packagers, manufacturers' representatives, or other persons who arrange or expedite transactions are not suppliers within the meaning of this section.

00 45 00 CERTIFICATIONS OF COMPLIANCE WITH APPLICABLE LAWS

.14 Recertification. If the contract extends over multiple years, vendor (A/E or Contractor) and its subcontractors will sign and submit to CDB Contracts the required Compliance Form (available in the Reference Library on CDB's website: www.illinois.gov/cdb) by April 1 of each subsequent year after the contract is signed. Failure to do so may result in voiding the contract by operation of law or rendering the contract voidable at the option of the State without additional compensation. Violations of certain provisions may also be deemed a civil or criminal offense.

00 51 20 ACCEPTANCE AND REJECTION OF BIDS

.1 CDB's Rights. When, in its opinion, it is in the best interest of the state, CDB reserves the right to:

A. Accept any bid
B. Reject any or all bids
C. Waive technical deficiencies and irregularities
D. Allow bidder to remedy technical deficiencies or irregularities within a stated time
E. Rescind any notice of award if CDB determines the notice of award was issued in error
F. Rescind any notice of award when it is in the best interest of the state
G. Rebid any contract

.2 Bid Rejection.

A. Bids will be rejected for the following material deficiencies:

1) Failure to be prequalified with CDB no later than the close of business the day before the bid opening (Article 00 21 05) or being determined non-responsible after bid opening.

2) Submission of a bid late (Paragraph 00 51 10.1).

3) Failure to submit bid and/or bid modifications to appropriate bid opening office.

4) Submission of a bid in a manner that reveals the bid price prior to the bid opening (example: by fax). (Paragraph 00 42 10.4).

5) Use of a bid envelope, which is received by CDB unsealed, or marked in a manner that does not reasonably identify the project and/or contract for which it is intended (Paragraph 00 42 10.3).

6) Omission of a base bid price, alternate bid price or unit price (Paragraph 00 42 10.1).

7) Submission of a bid price that cannot be determined.

8) Deletion of original signatures to the extent that an intent to be bound by the bid is not apparent.

9) When CDB does not accept the unit price(s), when those prices are an integral part of the base bid, the bidder shall be rejected.

10) Failure to attend a mandatory pre-bid meeting.

11) Bids not in substantial conformance with the bidding documents and whose non-conformance is determined to be material and unresponsive.

12) Failure to submit Bidder Disclosure(s) form and Certifications with bid, when the bidder is not registered with the Illinois Procurement Gateway (IPG).

13) Failure to be registered with the State Board of Elections, prior to bid opening date, when applicable.

14) Failure to submit Disclosure of Business Operations with Government of Iran form in accord with 30 ILCS 500/50-36.

15) Any other material deficiency specifically identified in the project bid documents.

16) For Single Prime Contract Bids (as defined by 30 ILCS 500/30-30(a)): failure to provide names and bid proposal costs for required protected subcontractor trades or providing more than one protected subcontractor for each trade.

17) For Single Prime Contract Bids: failure of identified protected subcontractor to be properly prequalified with CDB, licensed and certified, at the time of bidding, to perform the identified trade.

B. Failure to remedy the following technical deficiencies with seven (7) calendar days after the bid opening shall result in rejection of the bid. These technical deficiencies are:

1) Failure to use a revised bid form when bid forms have been changed by addenda.

2) Failure to acknowledge an addendum, however adjustment of the bid amount will not be allowed.

3) Failure to provide USDOL Apprenticeship and Training Certification for bidder and all known subcontractors.

4) Failure to submit bidder's Certificate of Registration in an approved apprenticeship and training program.

5) Failure to supply subcontractor and/or supplier names and Taxpayer Identification Numbers as required on Document 00 41 01.

6) Submission of a bid bond not on CDB's form (Paragraphs 00 43 13.1 and 00 43 13.2).

7) Submission of a bid security in a form other than a bid bond, certified check, cashier's check or bank draft (Paragraph 00 43 13.1).

8) Omission of the signature of the officer of the surety or any other required signatures except the signature in Paragraph 00 51 20.2.A.8), submission of those signatures in pencil or submission of a non-original signature.

9) Replacement of a bid security from an unacceptable surety with one from a surety acceptable to CDB (Paragraph 00 43 13.4).

10) Failure to furnish and/or complete the DHR PC-2 form.

11) Failure to submit a signed affidavit stating that the bidder will maintain an Illinois office as the primary place of employment for persons employed in the construction authorized by the contract.

12) Failure to submit Certificate of Registration with State Board of Elections in accord with 30 ILCS 500/20-160.

13) Any other technical deficiency specifically identified in the project bid documents.

C. MBE/WBE/VBE goal compliance deficiencies. Failure to remedy the following deficiencies within ten (10) calendar days after bid opening shall result in rejection of the bid. These deficiencies are:

1) When applicable, failure to submit a revised 00 41 05 form, documenting achievement of goals.

2) When applicable, failure to submit documentation acceptable by CDB of good faith efforts to meet minority/Women/veteran goals.

D. CDB at its sole discretion and without conferring any rights on any bidder may waive bid technical deficiencies or irregularities that are not in conformance with the bidding documents but whose non-conformance is non-material or minor.

E. Submittal of conditions or qualifying statements contrary to CDB's contract terms is not acceptable and, unless rescinded, the bid shall be rejected.

00 51 28 MBE/WBE/VBE BUSINESS CERTIFICATION, POST AWARD REQUIREMENTS

.1 Post-Award submittal. See Article 00 51 40. The contract awardee shall submit CDB's MBE/WBE/VBE Subcontractor Supplier Certification form, Document 00665 (available in the Reference Library on CDB's website), for each of the MBE/WBE/VBE subcontractor(s) and/or supplier(s) being utilized to meet the designated participation goals as specified on the bid form and in Section 01 11 00 of the project manual. The form must be signed by the MBE/WBE/VBE subcontractor or supplier and shall be submitted to CDB's FEP section.

Completion of the 00665 form is not required if the Contractor is an MBE or WBE or VBE firm. MBE/WBE/VBE prime contractors are encouraged to utilize MBE/WBE/VBE subcontractors/suppliers. If goals are split (separate MBE and WBE and VBE goals), then an MBE or WBE or VBE firm must supply 00665 forms for the subcontractor firm(s) utilized to meet the WBE or MBE or VBE goal, respectively.

.2 Listed Firms. The 00665 certification form shall be completed and submitted for each MBE/WBE/VBE firm listed on the 00 41 05 bid form.

.3 Compliance. The MBE/WBE/VBE participation goal dollar value is based upon the total contract sum (including awarded alternates). The participation goal percentage amount(s) shall meet or exceed the goal(s) as specified on the bid form (and in Section 01 11 00 of the project manual), or in an approved change/waiver request (refer to Article 00 43 39 herein).

.4 Voluntary. Contractors are encouraged to utilize MBE/WBE/VBE subcontractors/suppliers for those projects that are not designated for MBE/WBE/VBE participation and complete the 00665 certification form for each MBE/WBE/VBE firm. MBE/WBE/VBE subcontractors/suppliers may be added at any time during the project.

.5 Subcontracts/Supplier agreements. Copies of subcontracts or supplier agreements (to correspond with each 00665 form) are required to be submitted within ten (10) days of the Notice of Award.

00 51 40 POST AWARD REQUIREMENTS

.1 Contractor's Duty to Comply. The Contractor may not proceed with the work until the following post award requirements are met. These requirements are part of the contract and failure to comply with these requirements shall constitute a breach of the contract. CDB shall issue Authorization to Proceed upon successful completion of these post award requirements.

.2 Submittals. Within ten (10) calendar days from the date of the notice of award letter, the Contractor shall furnish, on CDB forms, the following:

A. Contract executed by the Contractor;
B. Performance Bond;
C. Labor and Material Payment Bond;
D. Certificates of Insurance;
E. Builder's Risk Insurance Policy (if applicable);
F. MBE/WBE/VBE Subcontractor Supplier Certifications, Form 00665 and MBE/WBE/VBE Subcontractor/Supplier agreements (if applicable);
G. Completed substance Abuse Prevention Certification form and Contractor's substance abuse plan (if applicable),
H. DHR PC-2 accepted by FEP Technician; and
I. Project Labor Agreement signature sheets for the Contractor and known Subcontractors(if applicable).

.3 Cancellation of Award. All post award requirements are mandatory. Noncompliance shall be cause for CDB to cancel the notice of award and make a claim against the bid security.

.4 Post Award Extensions. CDB may extend the time limitations for good cause. No extension shall operate as a waiver of post award requirements, nor shall it extend the contract completion date.

.5 Delays. Any delays to the commencement of the work due to the Contractor's failure to meet the post award requirements shall be the responsibility of the Contractor and its surety. Contractor and its surety shall be responsible for the costs of any such delays.

00 71 00 DEFINITIONS

.12 Protected Subcontractors. For a Single Prime Delivery Method Project, a subcontractor identified for a protected trade on the 00 41 00 Bid Form. The subcontractor shall be prequalified with CDB, be properly licensed and certified (if applicable), and perform the minimum amount of the identified trade with its own forces by furnishing and installing the work on-site.

.13 Prime Bidding Contractor (Trade): For a Single Prime Delivery Method Project, one of the identified protected trades that submits the bid with the intent of entering into the prime construction contract with CDB as the Contractor.

00 72 10 TIME

.5 Approval Authority. Changes in contract time are subject to approval at or above the CDB Regional Manager level.

00 72 25 CDB - RIGHTS AND RESPONSIBILITIES

.4 Right to Terminate the Contract for Cause.

.6 Availability of Appropriation; Sufficiency of Funds. The contract is contingent upon and subject to the availability of sufficient funds. CDB may terminate or suspend the contract, in whole or in part, without penalty or further payment being required, if (i) sufficient funds for the contract have not been appropriated or otherwise made available to CDB by the State or the Federal funding source, (ii) the Governor or CDB reserves funds, or (iii) the Governor or CDB determines that funds will not or may not be available for payment. CDB shall provide notice, in writing, to the Contractor of any such funding failure and its election to terminate or suspend the contract as soon as practicable. Any suspension or termination pursuant to this Section will be effective upon the date of the written notice, unless otherwise indicated.

.7 **Right to Suspend the Contract Without Cause.** CDB may, without cause, order the Contractor in writing to suspend, delay or interrupt the work in whole or in part for such a period of time as CDB may determine, not to exceed 90 days. At the expiration of 90 days, the contract may continue upon written agreement of the parties or may be terminated in writing by either party. The contract may remain suspended at the expiration of 90 days until the parties either agree in writing to continue the contract or until either party terminates the contract in writing. If the parties enter into a written agreement to continue the contract, the contract may remain suspended after the expiration of 90 days.

A. The contract time will be adjusted for increases in time caused by the suspension, delay or interruption as described in Article 00 72 10.

B. CDB may decide to terminate the contract under Article 00 72 25 at any time during the period of suspension, delay or interruption.

00 73 17 BONDS, GENERAL

.1 Requirements. The Contractor shall furnish a performance bond and a labor and material payment bond covering the faithful performance of the contract and the payment of all obligations arising thereunder, in accordance with the Public Construction Bond Act (30 ILCS 550). Each bond shall be in the full amount of the contract on forms provided by CDB and executed by a surety acceptable to CDB.

.3 Acceptability. Bonds that meet the requirements of Paragraph 00 73 17.1 shall be acceptable to CDB when issued by a surety that meets all of the following standards:

A. Has a current financial strength of at least "A-" as rated by A.M. Best Company, Inc., Moody's Investor Service, Standard & Poor's Corporation, or similar rating agency (30 ILCS 550/1); and a current Best's financial class of at least "V".

B. Is duly licensed in the state of Illinois by the Department of Insurance (30 ILCS 550/1) and does not have an unacceptable record of improper conduct or financial problems with the Illinois Department of Insurance.

00 73 40 LICENSING

.1 For Single Prime Delivery Method Projects: When licensure and/or certification is required for an identified trade, the identified protected subcontractors or the Prime Bidder, if self-performing the work, shall be properly licensed and certified at the time of bid to perform the work for the identified trade.

01 29 73.1 SCHEDULE OF VALUES

F. Provide CDB prequalification/registration ID numbers on the CSV form for subcontractors/suppliers described in 00 21 50.2C.

G. Identify work performed by MBE/WBE/VBE subcontractors and suppliers on the CSV form.

H. Revise and resubmit CSV for approval if any substitution or replacement of subcontractors or suppliers occurs.

I. Revise and resubmit CSV for approval if any change in the contract amount of subcontractors or suppliers other than a change resulting from a change order occurs.

01 29 76 PROGRESS PAYMENT PROCEDURES

.5 Payments to Subcontractors and Suppliers.

D. Subcontractors (as described in 00 21 50.2C.) who have not obtained a CDB ID number and/or have not submitted the required Disclosures and Certifications may have their payment amounts withheld by CDB in addition to any other remedy provided by this contract or by law. No work can be performed by these subcontractors until the

Certifications and Disclosure documents have been reviewed and approved by the State Purchasing Officer.

1. GENERAL

1.1 REQUIREMENTS INCLUDE:

A. Designated Contractor(s): Provide Betterment Bid prices in Bid Form for specified betterment work.

B. Each Contractor coordinate all related and required work necessary to perform work specified in betterment bids, when accepted and awarded.

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Standard Documents for Construction, Article 00 43 23
B. Bid Forms Document, 00 41 00

2. DESCRIPTION OF ALTERNATE BIDS

2.1 Contract

A. Betterment Bid No. G-1: Access driveway directly from Joliet Road, to include pavement, fencing and gate scope similar to the other property access drives that are included in the base scope.

END 01 23 00

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. Contractor comply with all laws, rules and regulations governing the work.

1. When Contractor observes that contract documents are at variance with specified codes, notify Architect/Engineer in writing immediately. Architect/Engineer will process changes in accord with General Conditions.
2. When Contractor performs any work knowing or having reason to know that the work is contrary to such laws, rules and regulations and fails to so notify the Architect/Engineer, Contractor shall pay all costs arising therefrom. However, it will not be the Contractor's primary responsibility to make certain that the contract documents are in accord with such laws, rules and regulations.

1.2 DEFINITIONS & ABBREVIATIONS

A. Definitions:

1. Dates: Reference Codes, Regulations and Standards are the issue current at date of bidding documents unless otherwise specified.
2. Codes: Codes are rules, regulations or statutory requirements of government agencies.
3. Standards: Standards are requirements set by authorities, custom or general consent and established as accepted criteria.

B. Abbreviations:

1. ACA American Correctional Association.
2. ADA Americans with Disabilities Act.
3. AGCI Associated General Contractors in Illinois.
4. ANSI American National Standards Institute.
5. ASHRAE American Society of Heating, Refrigeration and Air-Conditioning Engineers.
6. ASTM American Society for Testing and Materials.
7. AWWA American Waterworks Association.
8. BOCA Building Officials & Code Administrators
9. CDB Capital Development Board.
10. CPSC Consumer Product Safety Commission (Federal).
11. CSA Canadian Standards Association.
12. DCFS Department of Children & Family Services (Illinois).
13. DHEW Department of Health, Education & Welfare (Federal).
14. FED Federal Agencies.
15. FM Factory Mutual Engineering Corp.
16. IAGO Illinois Attorney General's Office
17. IBOG Illinois Board of Governors
18. IBHE Illinois Board of Higher Education.
19. ICBO Int’l Conference of Building Officials

20. ICCB	Illinois Community College Board.
21. IDHS	Illinois Department of Human Services.
22. IDOC	Illinois Department of Corrections.
23. IDOL	Illinois Department of Labor.
24. IDOT	Illinois Department of Transportation.
25. IDPH	Illinois Department of Public Health.
26. IEPA	Illinois Environmental Protection Agency.
27. IDPR	Illinois Department of Professional Regulation.
28. ISBE	Illinois State Board of Education.
29. ISPE	Illinois Society of Professional Engineers.
30. NFPA	National Fire Protection Association.
31. OSFM	Office of State Fire Marshal.
32. SOS	Secretary of State.
33. UBC	Uniform Building Code
34. UI	University of Illinois.
35. UL	Underwriters Laboratories, Inc.

1.3 QUALITY ASSURANCE

A. Architect/Engineer has designed the project with full knowledge of code requirements and has copies of all specified codes available for Contractor's inspection.

B. Contractor:

1. Ensure that copies of specified codes and standards are readily available to Contractor's personnel. Copies are available at Contractor's expense from source or publisher.
2. Ensure that Contractor's personnel are familiar with workmanship and installation requirements of specified codes and standards.

1.4 REGULATORY REQUIREMENTS

A. Source and requirements: (*NOTE: Include only those appropriate to project. Include date of issuance for each item. Date should be most current at time of bid, unless local governing authority or Using Agency requires otherwise.)

1. ACA:

a. Standards for Adult Correctional Institutions.
b. Standards for Adult Community Residential Services.
c. Standards for Juvenile Training Schools.
d. Standards for Adult Local Detention Facilities (Jails).
e. Standards for Juvenile Detention Facilities.

2. CDB:

a. Illinois Accessibility Code
b. Illinois Energy Conservation Code

3. DCFS:

a. Standards for Licensed Child Caring Institutions and Maternity Centers. Reg. 5.11.
b. Standards for Licensed Day Care Centers and Nighttime Centers.

4. FED:

   a. CPSC: Architectural Glazing Materials, as amended 1981. (Partially pre-empts Illinois Safety Materials Glazing Act.)

   b. DHEW:

      1.) Title V: Handicapped Accessibility.
      2.) Title IX: Regulations Prohibiting Sex Discrimination in Education.

   c. ADA 1990

5. State of Illinois:

   a. Illinois Steel Products Procurement Act, as amended (30 ILCS 565/1 et seq.).
   b. Illinois Procurement Code, as amended (30 ILCS 500/1 et. seq.)
   c. Illinois Domestic Products Act, as amended (30 ILCS 517 et seq).

6. IDOC: Illinois Department of Corrections Construction Standards

7. IDOL: Safety Glazing Materials Act, as amended, with interpretive statement (430 ILCS 60/1 et seq.).

8. IDOT:

   a. Bridge Manual, including all supplements, current at date of bidding documents, unless otherwise specified.
   b. Design and Environment Manual, including all supplements, current at date of bidding documents, unless otherwise specified.
   c. Road and Bridge Laws, including all supplements.
   d. Standard Specifications for Road and Bridge Construction, including all supplements, Jan 1, 2012, except where otherwise specified.
      1.) Change all references to "Engineer" to "Architect/Engineer".
      2.) References to "Method of Measurement" and "Basis of Payment" do not apply.
   e. National Manual on Uniform Traffic Control Devices, including the Illinois supplement.
   f. Policy for Permits for Access Driveways to State Highways.

9. IDPH:

   a. Illinois State Plumbing Code.
   a. Illinois Asbestos Abatement Act (105 ILCS 105/1 et. seq.).
   b. Rules and Regulations for the Asbestos Abatement Act - Title 77, ch. I, subch. p. Part 855.

10. IDPR: Illinois Roofing Industry Licensing Act, as amended (225 ILCS 335/1 et. seq.).

11. IEPA (Current editions at date of bidding documents.)

    a. Air Pollution Standards.
    b. Noise Pollution Standards.
    c. Water Pollution Standards.
    d. Public Water Supplies.
    e. Solid Waste Standards.
    f. Illinois Recommended Standards for Sewage Work.
    g. Hazardous Waste Crane and Hoisting Equipment Operators Licensing Act, 225 ILCS 220/1 et. seq.
    h. Hazardous Waste Laborers Licensing Act, 225 ILCS 221/1 et. seq. Toxic Substance Control Act.

12. OSFM:

    a. Liquefied Petroleum Gas Regulating Act (430 ILCS, refer to NFPA 58-2001)
    b. Liquefied Petroleum Gas Container Act (430 ILCS, refer to NFPA 58-2001)
    c. Boiler and Pressure Vessel Safety Act (430 ILCS 75/1 et seq.)
    d. Tactile identification on Certain Elevators (410 ILCS 30/1 et seq.)
    e. Installation of Elevators (430 ILCS 80/1 et seq.)
    f. Illinois Rules and Regulations for Fire Prevention and Safety, NFPA 101-2000 (new construction), NFPA 101-2000 (existing construction) Except Illinois State Board of Education.

13. SOS:

    a. Ramp on All New or Reconstructed Curbs for Persons Using Wheelchairs, (65 ILCS 5/11-80-11)
    b. Lead Poisoning Prevention Act, as amended (410 ILCS 45/1et seq.).

14. STANDARDS:

    a. AGCI/ISPE: Standard Specifications for Water and Sewer Main Construction in Illinois, Revised.
    b. ANSI No. A.17.1, American Standard Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks.
    c. ANSI No. C-2, National Electrical Safety Code,
    d. ASHRAE No. 62, Standard for Natural and Mechanical Ventilation (*Except IDMH and ISBE.).
    e. ASHRAE No. 90.1-2001, Energy Standard for Buildings Except Low-Rise Residential Buildings.
    f. ASHRAE No. 15, Safety Code for Mechanical Refrigeration.
    g. AWWA: Water and Sewer Main Construction.

15. NFPA: National Fire Codes (Most Current Edition)

    a. 70, National Electrical Code
    b. 72, National Fire Alarm Code
    c. 101, Life Safety Code

16. ISBE:

    a. 2012 International Building Code (IBC)

B. The Architect/Engineer or CDB may reference other codes or standards throughout the Project Manual when deemed appropriate for proper compliance with regulatory requirements.

END 01 41 00.

1. GENERAL

1.1 REQUIREMENTS INCLUDE

A. Architect/Engineer will employ and pay for an independent testing laboratory to perform specified services.

1.1 RELATED REQUIREMENTS

A. See specifications for testing required.

1.1 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", latest edition, published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction".

1.2 LABORATORY DUTIES - LIMITS OF AUTHORITY

A. Cooperate with Architect/Engineer and Contractor; provide qualified personnel promptly on notice.

B. Acquaint Architect/Engineer's personnel with testing procedures and with all special conditions encountered at the site.

C. Perform specified inspections, sampling and testing of materials and construction methods:

1. Comply with specified standards, ASTM, other recognized authorities.
2. Ascertain compliance with contract requirements.
3. Obtain written acknowledgement of each inspection, sampling and test made from contractor whose work is being tested or from his superintendent.

D. Promptly notify Architect/Engineer and contractor, of irregularities or deficiencies of work which are observed during performance of services.

E. Promptly submit 3 copies of reports of inspections and tests to Architect/Engineer including:

1. Date issued.
2. Project title and number.
3. Testing laboratory name and address.
4. Name and signature of inspector.
5. Date of inspection and sampling.

6. Record of temperature and weather.
7. Date of test.
8. Identification of product and specification section.
9. Location of project.
10. Type of inspection or test.
11. Observations regarding compliance with contract documents.

F. Perform additional services ordered by Architect/Engineer.

G. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on, contract requirements.
2. Approve or accept any portion of work.
3. Perform any duties of the Contractor.

END 01 45 29.

1. GENERAL

1.1. WORK INCLUDES

A. Base Bid:

1. General Contractor Provide:

a. Handling, temporary storage, hauling, and legal disposal of regulated soils or other wastes found within the project limits. This includes regulated soil, sediments, or water generated during the excavation process in support of construction activities.

b. Comply with all Federal, State, and Local law or ordinances regarding the handling and proper disposal of regulated soils.

c. Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the lawful completion of the work.

d. Provide an environmental firm for producing required environmental plans and reports, and monitoring and testing all excavation work. Submit plans, reports, and testing as specified using IDOT BDE forms 2730, 2730A, 2732, and 2733 (Available on the IDOT Resources/Forms Design & Environment website).

e. A qualified inspector, in accordance to paragraph 3.1, must be on site at all times during the initial digging of soil designated in paragraphs 3.4.

f. Field sampling and testing results for the purpose of landfill characterization and disposal in accordance to the requirements in Paragraph 3.12 of this specification.

B. Alternate Bid:

(NOT USED)

C. Unit Prices apply to this section: See Sections 00 41 00

1. Method of Measurement:

a. Handling, hauling, legal disposal and temporary storage, of regulated soils or other wastes will be measured for payment in their original positions (i.e. in situ), and the volume(s) in cubic yards; as computed by the method of average end areas. Unit price will apply for only regulated soils being

removed from the site and disposed of legally in the appropriate landfill. (Refer to paragraphs in 3.4(A)(12)

Material moved more than once at either stage construction measured for payment only once.

2. Basis of Payment

a. The transportation and disposal of regulated soil, sediment and other materials from an excavation will be paid for as part of the Unit Prices per cubic yard for NON-SPECIAL WASTE DISPOSAL, SPECIAL WASTE DISPOSAL, or HAZARDOUS WASTE DISPOSAL.

b. The transportation, management, and disposal of uncontaminated soils that is deemed as CCDD/USFO DISPOSAL will be disposed of as a lump sum item by contractor with construction debris.

1.3. RELATED WORK

A. Specified Elsewhere

1. 00 31 32 - Soil Boring Report
2. 01 11 00 - Project Summary
3. 01 11 01 - Supplement to SD-DB
4. 01 23 00 - Betterments
5. 01 41 00 - Regulatory Requirements
6. 01 45 29 - Testing Laboratory Services
7. 31 20 00 - Earth Moving

1.4. REFERENCES

A. Andrews Engineering, Inc., PSI Report dated April 26, 2019 by. (available upon request).

B. IDOT Standard Specifications for Road and Bridge Construction [SSRBC], including all current edition of Supplemental Specifications, and Recurring Special Provisions (Available for purchase through IDOT).

C. American Petroleum Institute (API) Recommended Practice 1604 (Available for purchase through API).

D. Project Storm Water Pollution Prevention (SWPPP), as applicable (available upon request).

E. Illinois Environmental Protection Agency (IEPA) Forms LPC-663 (available upon request).

F. IDOT Resources/Forms Design & Environment website: http://www.idot.illinois.gov/home/resources/Forms-Folder/d

G. Link to BDE Pre-qual environmental firms and Environmental CDB.

http://www.idot.illinois.gov/doing-business/procurements/engineering-architectural-professional-services/index

1.5. QUALITY ASSURANCE

A. Regulatory Requirements.

1. Shall, at all times, observe and comply with all Federal and State laws, local laws, ordinances, and regulations which in any manner affect the conduct of the work and all such orders or enactments as exist at the present and which may be enacted later, of legislative bodies or tribunals having legal jurisdiction or which may have affect over the work, and no plea or misunderstanding or ignorance thereof will be considered.

2. Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

B. Contractor Qualifications per IDOT BDE form 2730:

1. Environmental firm personnel with one (1) year experience in regulated substances.

2. Shall be an environmental firm having completed at least five (5) documented leaking underground storage tank (LUST); and/or five (5) Site Remediation Program (SRP) cleanups following 35 Ill. Admin. Code 734, 740, or 742 within the last ten (10) years; a prequalified firm in “Hazardous Waste – Simple” or “Hazardous Waste – Advanced” by IDOT or “Environmental” by CDB; or in specific cases, with written BDE approval, applicable project experiences outside of the firm may be allowed for key personnel.

3. Documentation includes, but is not limited to; verifying remediation and special waste operations for sites regulated with gasoline, diesel, or waste oil in accordance with all Federal, State, or local regulatory requirements, and shall be provided to the A/E and the Using Agency for review and approvals.

4. The contractor shall not be a former or current consultant or have any ties with any of the properties contained within and/or adjacent to this construction project.

5. UST only; the contractor shall be licensed and certified with the Illinois Office of the State Fair Marshall (OSFM) and shall possess all required permits to perform the work as indicated prior to bidding.

1.6. ABBREVIATIONS/DEFINITIONS

A. A/E – Architect/Engineer

B. API – American Petroleum Institute

C. CFR – Code of Federal Regulations

D. CCDD/USFO – Clean Construction and Demolition Debris / Uncontaminated Soil Fill Operation; as defined in 35 Illinois Administrative Code (Ill. Admin. Code), Subtitle J, Chapter I, Section 1100.

E. CDB PM – Capital Development Board Project Manager

F. COCs – Contaminants of Concern

G. Disturbing Soil – Excavation, hauling away from site, transfer of soil from original location to stock-piled location

H. Excavation – the digging or grading of any soil or fill material, including underground utility works such as installation of fiber optic cabling, water service, and sanitary sewer services for the purposes of installing foundations or structures with the exception of aggregate fills which are not considered a soil or fill material of concern. The following types of maintenance projects are not considered excavation when the excavated material is left on, or incorporated within, the IDOT project area for that project:

- bridge maintenance
- ditch cleaning
- working within the subbase or pavement
- removal and replacement of shoulders, curb and gutter, or sidewalk ramps

I. Hazardous waste – as defined by 40 CFR, Part 261; and 35 Ill. Admin. Code, Sections 722, 723, 726, 728, and 729

J. IEMA – Illinois Emergency Management Agency

K. IEPA – Illinois Environmental Protection Agency

L. IDOT - Illinois Department of Transportation

M. IDOT BDE – IDOT Bureau of Design and Environment

N. LUST – Leaking underground storage tank

O. MAC – Maximum Allowable Concentrations for chemical constituents in uncontaminated soil; as defined in 35 Ill. Admin. Code, Section 1100.605.

P. MSA – Metropolitan Statistical Area county; as defined in 35 Ill. Admin. Code, Section 742.200

Q. NPDES – National Pollutant Discharge Elimination System

R. OSHA – Occupational Safety and Health Administration

S. OSFM – Office of the Illinois State Fire Marshall

T. Special Provisions – Additions and/or revisions to standard and supplemental guide specifications covering conditions peculiar to an individual contract.

U. Special waste – As defined in 35 Ill. Admin. Code, Sections 808 and 809

V. UST – Underground Storage Tank

W. Work Zones – As described in IDOT BDE Form 2730 (IDOT BDE form 2730 (Figures 1-6, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730.pdf)

1.7. SUBMITTALS

A. **Upon receiving Authorization-To-Proceed (ATP) from CDB, the Contractor must submit 21 calendar days PRIOR to beginning work or working in areas identified herewith**, a Regulated Substance Pre-Construction Plan (RSPCP), IDOT BDE form 2730 (Figures 1-6, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730.pdf), submit form and all supporting documents to the **Using Agency** for review and approval. The form shall be signed by an Illinois licensed Professional Engineer or Professional Geologist.

As part of the RSPCP, the Contractor(s) or firm(s) performing the work shall meet the following qualifications.

1. Regulated Substances Monitoring. Qualification for environmental observation and field screening of regulated substances work and environmental observation of UST removal shall require either pre-qualification in Hazardous Waste by the Department or demonstration of acceptable project experience in remediation and operations for regulated sites in accordance with applicable Federal, State, or local regulatory requirements using BDE 2730.

   Qualification for each individual performing regulated substances monitoring shall require a minimum of one-year of experience in similar activities as those required for the project.

2. UST Removal. Qualification for UST removal work shall require licensing and certification with the OSFM and possession of all permits required to perform the work. A copy of the permit shall be provided to the Using Agency prior to tank removal.

The qualified Contractor(s) or firm(s) shall also document it does not have any current or former ties with any of the properties contained within, adjoining, or potentially affecting the work.

The Using Agency will require up to 21 calendar days for review of the RSPCP. The review may involve rejection or revision and resubmittal; in which case, an additional 21 days will be required for each subsequent

review. Work shall not commence until the RSPCP has been approved by the Using Agency. After approval, the RSPCP shall be revised as necessary to reflect changed conditions in the field and documented using BDE 2730A "Regulated Substances Pre-Construction Plan (RSPCP) Addendum" and submitted to the Using Agency for approval.

B. The Contractor shall document, **daily**, all field activities relating to monitoring/digging/hauling/excavation of regulated materials using the IDOT BDE form 2732 (Figures 7-8, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202732.pdf) submit form and all supporting documents to CDB PM, A/E, and Using Agency.

C. The Contractor shall submit a Regulated Substances Final Construction Report using the IDOT BDE Form 2733 (Figures 9-10, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202733.pdf) submit form and supporting documents (i.e. manifests, IEPA forms, etc.) to the **Using Agency** at Substantial Completion for review and approval with copies sent to CDB PM and A/E.

D. Provide a State certified manifest to the A/E and Using Agency for the transport and disposal of all non-hazardous special waste (hereafter referred to as special waste) or hazardous waste, as well as any removed USTs.

2. PRODUCTS

2.1 MATERIALS

A. Personal Protective Equipment: Ensure each worker has the proper personal protective equipment (PPE) for the zone and location in which he/she is to perform construction or materials management activities. Also, is responsible for providing all PPE required, and defining the provisions for PPE in the Site Health and Safety Plan.

B. Warning Devices and Barricades: Adequately identify and guard all hazardous areas and conditions by visual warning devices and, where necessary, physical barriers. As required, excavations from which the public is excluded shall be marked or guarded in a manner appropriate to the hazard.

C. Equipment [SSRBC 669.02]:

1. The Contractor shall notify CDB PM, A/E, and Using Agency of all excavation, storage, and transportation equipment to a work area location. The equipment shall comply with OSHA and API guidelines and shall be furnished in a clean condition. Clean condition means the equipment does not contain any residual material classified as a non-special waste, non-hazardous special

waste, or hazardous waste. Residual materials include, but are not limited to, petroleum products, chemical products, sludges, or any other material present in or on equipment.

2. Before beginning any associated soils or groundwater management activity, notify CDB PM, A/E, and Using Agency with the opportunity to visually inspect and approve the equipment. If the equipment contains any regulated residual material, decontamination shall be performed on the equipment as appropriate to the regulated substance and degree of contamination present according to OSHA and API guidelines. All cleaning fluids used shall be treated as the contaminant unless laboratory testing proves otherwise.

3. EXECUTION

3.1 PERSONNEL ACTION:

A. The Site Health and Safety Plan, attached to IDOT BDE form 2730 (Figures 1-6, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730.pdf), shall pertain to any visitors or State employees at the site.

B. Health and Safety Training. The Contractor shall indicate the designated environmental professional and project safety officer responsible for monitoring activities within designated exclusion or decontamination zones has successfully completed the initial 40-hour Health and Safety Training Course and are current with refresher training pursuant to applicable Federal, State and/or Local standards, including OSHA requirements under 29 CFR 1910.120 (HAZWOPER). The personnel required to have training in accordance with 29 CFR 1910.120 shall have certifications of completion for the Annual 8-Hour HAZWOPER Refresher with them on the jobsite while working in areas regulated under the special provision(s). The designated environmental professional responsible for monitoring activities shall also have successfully completed an additional 8-Hour Supervisor Training Course pursuant to applicable federal, State and/or local standards, including OSHA requirements under 29 CFR 1910.120. The Contractor is responsible for ensuring that other contractor and subcontractor personnel required to be trained under 29 CFR 1920.120 have received required training and updates [IDOT BDE form 2730, pages 3 (paragraph C.) & 6 (paragraph C.)] (Figures 1-6, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730.pdf).

C. Medical Exams: The Contractor shall indicate all personnel in his/her work force who are required to have the training described in Section 4C of the IDOT BDE form 2730, page 6 (paragraph D) have received and passed a current medical examination as required under applicable Federal, State

and/or Local standards. The Contractor is responsible for ensuring that other contractor and subcontractor personnel subject to medical monitoring under 29 CFR 1910.120 have received and passed a current medical examination under applicable Federal, State, and/or Local standards. (Figures 1-6, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730.pdf).

3.2 WORK ZONES: Three distinct zones (exclusion, decontamination, and support) shall divide the affected portions of the project. [IDOT BDE form 2730] (Figures 1-6, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730.pdf).

3.3 DECONTAMINATION: Document in IDOT BDE form 2730, pages 5-6. (Figures 1-6, fillable form is available on IDOT resources/forms site http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730.pdf)

3.4 REGULATED SUBSTANCES MANAGEMENT AND DISPOSAL:

A. Perform excavation activities in a manner that will limit spills and the potential for regulated soil to be mixed with uncontaminated soil. Direct load regulated soil into roll-off containers or trucks for transportation and disposal, as required. The Contractor shall be responsible for obtaining all approvals for final disposal of regulated and uncontaminated soil.

Management and disposal of regulated soil shall be according to the following: [SSRBC 669.05]

Soil Analytical Results Exceed Most Stringent MAC. When the soil analytical results indicate detected levels exceed the most stringent MAC for chemical constituents in soil established pursuant to Subpart F of 35 Ill. Adm. Code 1100.605, the soil shall be managed as follows:

1. When analytical results indicate inorganic chemical constituents exceed the most stringent MAC but they are still considered within area background levels by the Using Agency, the excavated soil can be utilized within the project area as fill, when suitable. Such soil excavated for storm sewers can be placed back into the excavated trench as backfill, when suitable, unless trench backfill is specified. If the soils cannot be utilized within the project area, they shall be managed and disposed of off-site as NON-SPECIAL WASTE DISPOSAL. [SSRBC 669.09(a)(1)]. **This material can be used on site; otherwise, if there is remaining material it must be disposed at a licensed landfill.**

    a. The conditions described above are met and the Contractor shall manage any excavated soils and sediment in accordance with these criteria within the following areas.

- **Station 6+85 to Station 7+85 (Yard Centerline), 0 to 40 feet LT, and 0 to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameters: Chloride and Manganese.**
- **Station 4+85 to Station 5+85 (Yard Centerline), 0 to 40 feet LT, and 0 to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameter: Manganese.**
- **Station 5+40 to Station 6+00 (Yard Centerline), 40 to 90 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(1). Contaminants of concern sampling parameter: Manganese.**

2. When analytical results indicate chemical constituents exceed the most stringent MAC but do not exceed the MAC for a MSA County, the excavated soil can be utilized within the project area as fill, when suitable, or managed and disposed of off-site at a CCDD facility or an USFO within an MSA County provided the pH of the soil is within the range of 6.25 - 9.0, inclusive. Certification. [SSRBC 669.05(a)(2)]. **This material can be used on site; otherwise, if there is remaining material it must be disposed at a CCDD or USFO.**
   a. The conditions described above are met and the Contractor shall manage any excavated soils and sediment in accordance with these criteria within the following areas:

   - **Station 8+15 to Station 10+40 (Yard Centerline), 60 to 165 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameter: Manganese.**
   - **Station 5+85 to Station 6+85 (Yard Centerline), 60 to 165 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameter: Manganese.**
   - **Station 5+85 to Station 6+85 (Yard Centerline), 0 to 40 feet LT, and 0 to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameter: Manganese.**
   - **Station 9+85 to Station 10+85 (Yard Centerline), 40 to 210 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article**

669.05(a)(2). Contaminants of concern sampling parameter: Manganese.

- **Station 6+00 to Station 8+85 (Yard Centerline), 40 to 210 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameter: Manganese.**
- **Station 4+85 to Station 5+40 (Yard Centerline), 40 to 210 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(2). Contaminants of concern sampling parameters: Manganese.**

3. When analytical results indicate chemical constituents exceed the most stringent MAC but do not exceed the MAC for an MSA County excluding Chicago, or the MAC within the Chicago corporate limits, the excavated soil can be utilized within the project area as fill, when suitable, or managed and disposed of off-site at a CCDD facility or an USFO within an MSA County excluding Chicago or within the Chicago corporate limits provided the pH of the soil is within the range of 6.25 - 9.0, inclusive. [SSRBC 669.05(a)(3)].**This material can be used on site; otherwise, if there is remaining material it must be disposed at a CCDD or USFO.**

4. When analytical results indicate chemical constituents exceed the most stringent MAC but do not exceed the MAC for an MSA County excluding Chicago, the excavated soil can be utilized within the project area as fill, when suitable, or managed and disposed of off-site at a CCDD facility or an USFO within an MSA County excluding Chicago provided the pH of the soil is within the range of 6.25 - 9.0, inclusive. [SSRBC 669.05(a)(4)]. **This material can be used on site; otherwise, if there is remaining material it must be disposed at a CCDD or USFO.**

5. When the Using Agency determines soil cannot be managed according to paragraphs 3.4(A)(1) through 3.4(A)(4) above and the materials do not contain special waste or hazardous waste, as determined by the Using Agency, the soil shall be managed and disposed of at a landfill as NON-SPECIAL WASTE DISPOSAL. [SSRBC 669.05(a)(5)]. **This material must be disposed at a licensed landfill.**

   a. The conditions described above are met and the Contractor shall manage any excavated soils and sediment in accordance with these criteria within the following areas:

   - **Station 10+40 to Station 11+40 (Yard Centerline), 60 to 165 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene,**

Carbazole, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Antimony, Arsenic, Iron, Lead, Manganese and PCBs.

- **Station 6+85 to Station 8+15 (Yard Centerline), 60 to 165 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.**
- **Station 3+85 to Station 5+85 (Yard Centerline), 60 to 165 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.**
- **Station 9+85 to Station 10+85 (Yard Centerline), 0 to 40 feet LT, and 0 to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Dibenzo(a,h)anthracene, Indeno(1,2,3-cd)pyrene and Arsenic.**
- **Station 7+85 to Station 8+85 (Yard Centerline), 0 to 40 feet LT, and 0 to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.**
- **Station 8+85 to Station 9+85 (Yard Centerline), 40 to 210 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic, Lead, Manganese and Nickel.**
- **Station 5+40 to Station 6+00 (Yard Centerline), 90 to 210 feet LT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.**
- **Station 3+85 to Station 4+85 (Yard Centerline), 0 to 40 feet LT, and 0 to 60 feet RT. The Engineer has determined this material meets the criteria of and shall be managed in accordance with Article 669.05(a)(5). Contaminants of concern sampling parameters: Arsenic and Manganese.**

6. When analytical results indicate soil is hazardous by characteristic or listing pursuant to 35 Ill. Admin. Code 721, contains radiological constituents, or the Using Agency otherwise determines the soil cannot be managed according to paragraphs 3.4(A)(1) through 3.4(A)(5) above, the soil shall be managed and disposed of off-site as SPECIAL WASTE DISPOSAL or HAZARDOUS WASTE DISPOSAL, as applicable. [SSRBC 669.05(a)(6)]. **This material must be disposed at a permitted facility.**

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7. Soil Analytical Results Do Not Exceed Most Stringent MAC. When the soil analytical results indicate that detected levels do not exceed the most stringent MAC, the excavated soil can be utilized within the project area as fill, when suitable, or managed and disposed of off-site according to Article 202.03 of the SSRBC. However, the excavated soil cannot be taken to a CCDD facility or an USFO for any of the following reasons. **This material can be used on site, taken to another IDOT, CDB project, or disposed of legally such as in a farmer's field as uncontaminated fill.**
   a. The conditions described above are met and the Contractor shall manage any excavated soils and sediment in accordance with these criteria within the following areas:

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      1. The pH of the soil is less than 6.25 or greater than 9.0. [SSRBC 669.05(b)(1)]
      2. The soil exhibited elevated photoionization detector (PID) utilizing a lamp of 10.6eV or greater or a flame ionization

8. Soil Analytical Results Exceed Most Stringent MAC but Do Not Exceed Tiered Approach to Corrective Action Objectives (TACO) Residential. When the soil analytical results indicate that detected levels exceed the most stringent MAC but do not exceed TACO Tier 1 Soil Remediation Objectives for Residential Properties pursuant to 35 Ill. Admin. Code 742 Appendix B Table A, the excavated soil can be utilized within the project area as fill, when suitable, or managed and disposed of off-site according to Article 202.03 of the SSRBC. However, the excavated soil cannot be taken to a CCDD facility or an USFO. [SSRBC 669.05(c)]. **This material can be used on site, taken to another IDOT, CDB project, or disposed of legally such as in a farmer's field as uncontaminated fill.**

9. Work Zones

   Three (3) distinct OSHA HAZWOPER work zones (exclusion, decontamination, and support) shall apply to projects adjacent to or within sites with documented leaking underground storage tank (LUST) incidents, or sites under management in accordance with the requirements of the Site Remediation Program (SRP), Resource Conservation and Recovery Act (RCRA), or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or as deemed necessary. For this project, the work zones apply for the following ISGS PESA Sites:

   NONE

Additional information on the above sites collected during the Phase I Engineering process is available through the Using Agency.

10. Aside from the materials listed above in Regulated Soils, Most Stringent MAC and Do Not Exceed Most Stringent MAC, all other construction and demolition debris or waste shall be disposed of in a licensed landfill, recycled, reused, or otherwise disposed of as allowed by State or Federal laws and regulations. When the Contractor chooses to dispose of uncontaminated soil at a clean construction and demolition debris (CCDD) facility or at an uncontaminated soil fill operation, it shall be the Contractor's responsibility to have the pH of the material tested to ensure the value is between 6.25 and 9.0, inclusive. A copy of the pH test results shall be provided to the A/E and the Using Agency.

11. Suitable excavated materials naturally occurring within the project area shall not be wasted without permission of the Using Agency. The Contractor shall dispose of all surplus, unstable, unsuitable, and organic materials in such a manner that public or private property will not be damaged or endangered.

12. The estimated volumes of "Special Waste", "Non-Special Waste", "Hazardous Waste", or of "Unregulated Soil" are in situ soils to be removed and disposed. These are the A/E's best estimate of in situ or in place quantities. These differ from haul quantities and the Contractor shall use in situ quantities as reference only.

    a. ***The volume of soil to be managed as non-special waste to a licensed landfill facility is estimated at 9,170 cubic yards (CY) in situ. [Paragraph 3.4(A)(1); 3.4(A)(5)]***

    b. ***The volume of soil to be managed as special waste or hazardous waste to a permitted disposal facility is estimated at ZERO cubic yards (CY) in situ. [Paragraph 3.4(A)(6)]***

    c. ***The volume of soil to be managed as uncontaminated soils to a CCDD/USFO facility is estimated at 7,705 CY in situ. [Paragraphs 3.4(A)(2), 3.4(A)(3), 3.4(A)(4)]***

    d. ***The volume of soil to be managed as uncontaminated soil but not eligible to be disposed at a CCDD/USFO facility due to the iron/manganese result is estimated at ZERO CY in situ. (This pay item is for excavation only, which is included in the base bid.) [Paragraph 3.4(8)]***

3.5 GROUNDWATER:

A. When groundwater analytical results indicate the detected levels are above Appendix B, Table E of 35 Ill. Admin. Code 742, the most stringent Tier 1 Groundwater Remediation Objectives for Groundwater Component of the Groundwater Ingestion Route for Class 1 groundwater, the groundwater shall be managed off-site as a special waste or hazardous waste as applicable. Special waste groundwater shall be containerized and trucked to an off-site treatment facility, or may be discharged to a sanitary sewer or combined sewer when permitted by the local sewer authority. Groundwater discharged to a sanitary sewer or combined sewer shall be pre-treated to remove particulates and measured with a calibrated flow meter to comply with applicable discharge limits. A copy of the permit shall be provided to the Using Agency prior to discharging groundwater to the sanitary sewer or combined sewer.

1. Groundwater encountered within trenches may be managed within the trench and allowed to infiltrate back into the ground. If the groundwater cannot be managed within the trench, it may be discharged to a sanitary sewer or combined sewer when permitted by the local sewer authority, or it shall be containerized and trucked to an off-site treatment facility as a special waste or hazardous waste. The Contractor is prohibited from discharging groundwater within the trench through a storm sewer. The Contractor shall install backfill plugs within the area of groundwater contamination.

2. One backfill plug shall be placed down gradient to the area of groundwater contamination. Backfill plugs shall be installed at intervals not to exceed 50 ft (15 m). Backfill plugs are to be 4 ft (1.2 m) long, measured parallel to the trench, full trench width and depth. Backfill plugs shall not have any fine aggregate bedding or backfill, but shall be entirely cohesive soil or any class of concrete. The Contractor shall provide test data that the material has a permeability of less than 10^{-7} cm/sec according to ASTM D 5084, Method A or per another test method approved by the Using Agency.

3.6 WASTE MINIMIZATION

A. The CONTRACTOR shall minimize the generation of regulated substances to the extent practicable. Take all necessary precautions to avoid mixing regulated substances of differing characteristics.

3.7 TRANSPORTATION OF REGULATED MATERIALS

A. Arrange for all transportation needs of regulated soils or groundwater management and disposal. Ensure the transporters are licensed special/hazardous waste haulers in the State of Illinois.

B. Provide complete manifests necessary and required for transportation and disposal of all regulated waste materials and have them in hand while transporting wastes.

C. Ensure all required placarding and labeling complies with all applicable Federal, State, or local regulations and requirements.

D. Remove all soils, dust, rocks, etc., from the exterior of trucks, trailers, or any other heavy equipment involved with regulated soil excavation, loading, or transportation before they leave the project site.

3.8 TEMPORARY STAGING

A. Soil classified according to paragraphs 3.4(A)(2), 3.4(A)(7)(a), or 3.4(A)(9) may be temporarily staged at the Contractor's option. Soil classified according to paragraphs 3.4(A)(1), 3.4(A)(3), through 3.4(A)(6), or 3.4(A)(7) shall be managed and disposed of without temporary staging to the greatest extent practicable. If circumstances beyond the Contractor's control require temporary staging of these latter materials, the Contractor shall request approval from the Using Agency in writing using BDE 2730. [SSRBC 669.05(a)(2), 669.05(b)(1), 669.05(c); 669.05(a)(1), 669.05(a)(3) through 669.05(a)(6), or 669.05(b)2)]

B. Temporary staging shall be accomplished within the project area and the Contractor's means and methods shall be described in the approved or amended RSPCP. Staging areas shall not be located within 200 feet (61 m) of a public or private water supply well; nor within 100 feet (30 m) of sensitive environmental receptor areas, including wetlands, rivers, streams, lakes, or designated habitat zones.

C. The method of staging shall consist of containerization or stockpiling as applicable for the type, classification, and physical state (i.e., liquid, solid, semisolid) of the material. Materials of different classifications shall be staged separately with no mixing or co-mingling.

D. When containers are used, the containers and their contents shall remain intact and inaccessible to unauthorized persons until the manner of disposal is determined. The Contractor shall be responsible for all activities associated with the storage containers including, but not limited to, the procurement, transport, and labeling of the containers. The Contractor shall not use a storage container if visual inspection of the container reveals the presence of free liquids or other substances that could cause the waste to be reclassified as a hazardous or special waste.

E. When stockpiles are used, they shall be covered with a minimum 20-mil plastic sheeting or tarps secured using weights or tie-downs. Perimeter berms or diversionary trenches shall be provided to contain and collect for disposal any water that drains from the soil. Stockpiles shall be managed to prevent or reduce potential dust generation.

F. When staging non-special waste, special waste, or hazardous waste, the following additional requirements shall apply:

1. Non-Special Waste. When stockpiling soil classified according to paragraph 3.4(A)(1) or 3.4(A)(5), an impermeable surface barrier between the materials and the ground surface shall be installed. The impermeable barrier shall consist of a minimum 20-mil plastic liner material and the surface of the stockpile area shall be clean and free of debris prior to placement of the liner. Measures shall also be taken to limit or discourage access to the staging area. [669.05(a)(1) or 669.05(a)(5) SSRBC]

2. Special Waste and Hazardous Waste. Soil classified according to paragraph 3.4(A)(6) shall not be stockpiled but shall be containerized immediately upon generation in containers, tanks or containment buildings as defined by RCRA, Toxic Substances Control Act (TSCA), and other applicable State or local regulations and requirements, including 35 Ill. Admin. Code Part 722, Standards Applicable to Generators of Hazardous Waste. [669.05(a)(6) SSRBC]

   The staging area(s) shall be enclosed (by a fence or other structure) to restrict direct access to the area, and all required regulatory identification signs applicable to a staging area containing special waste or hazardous waste shall be deployed.

   Storage containers shall be placed on an all-weather gravel-packed, asphalt, or concrete surface. Containers shall be in good condition and free of leaks, large dents, or severe rusting, which may compromise containment integrity. Containers must be constructed of, or lined with, materials that will not react or be otherwise incompatible with the hazardous or special waste contents. Containers used to store liquids shall not be filled more than 80 percent of the rated capacity. Incompatible wastes shall not be placed in the same container or comingled.

   All containers shall be legibly labeled and marked using pre-printed labels and permanent marker in accordance with applicable regulations, clearly showing the date of waste generation, location and/or area of waste generation, and type of waste. The Contractor shall place these identifying markings on an exterior side surface of the container.

   Storage containers shall be kept closed, and storage pads covered, except when access is needed by authorized personnel.

   Special waste and hazardous waste shall be transported and disposed within 90 days from the date of generation

3.9 UNDERGROUND STORAGE TANKS: [SSRBC 669.08]

A. Prior to removing an UST, IDOT D&E will determine whether the Department is considered an "owner" or "operator" of the UST as defined by the UST regulations (41 Ill. Adm. Code Part 176). Ownership of the UST refers to the Department's owning title to the UST during storage, use or dispensing of regulated substances. The Department may be considered an "operator" of the UST if it has control of, or has responsibility for, the daily operation of the UST. The Department may however voluntarily undertake actions to remove an UST from the ground without being deemed an "operator" of the UST.

B. In the event the Department is deemed not to be the "owner" or "operator" of the UST, the OSFM removal permit shall reflect who was the past "owner" or "operator" of the UST. If the "owner" or "operator" cannot be determined from past UST registration documents from OSFM, then the OSFM removal permit will state the "owner" or "operator" of the UST is the Department. The Department's Office of Chief Counsel (OCC) will review all UST removal permits prior to submitting any removal permit to the OSFM. If the Department is not the "owner" or "operator" of the UST then it will not register the UST or pay any registration fee.

C. The Contractor shall be responsible for obtaining all permits required for removing the UST, notification to the OSFM, using an OSFM certified tank contractor, removal and disposal of the UST and its contents, and preparation and submittal of the OSFM Site Assessment Report in accordance with 41 Ill. Adm. Code Part 176.330.

D. The Contractor shall contact IDOT (DOT.CI@illinois.gov) and the OSFM's office at least 72 hours prior to removal to confirm the OSFM inspector's presence during the UST removal. Removal, transport, and disposal of the UST shall be according to the applicable portions of the latest revision of the " API Recommended Practice 1604".

E. The Contractor shall collect and analyze tank content (sludge) for disposal purposes. The Contractor shall remove as much of the regulated substance from the UST system as necessary to prevent further release into the environment. All contents within the tank shall be removed, transported and disposed of, or recycled. The tank shall be removed and rendered empty according to IEPA definition.

F. The Contractor shall collect soil samples from the bottom and sidewalls of the excavated area in accordance with 35 Ill. Adm. Code Part 734.210(h) after the required backfill has been removed during the initial response action, to determine the level of contamination remaining in the ground, regardless if a release is confirmed or not by the OSFM on-site inspector.

G. In the event the UST is designated a leaking underground storage tank (LUST) by the OSFM's inspector, or confirmation by analytical results, the

Contractor shall notify the CDB PM, A/E, IDOT (DOT.CI@illinois.gov). Upon confirmation of a release of contaminants from the UST and notifications to the Using Agency, the Contractor shall report the release to the Illinois Emergency Management Agency (IEMA) (e.g., by telephone or electronic mail) and provide them with whatever information is available ("owner" or "operator" shall be stated as the past registered "owner" or "operator", or the IDOT District in which the UST is located. Contact the Using Agency for the specific personnel to list);

H. The Contractor shall perform the following initial response actions if a release is indicated by the OSFM inspector:

1. Take immediate action to prevent any further release of the regulated substance to the environment, which may include removing, and disposing of up to 4 ft (1.2 m) of the regulated material, as measured from the outside dimension of the tank

2. Identify and mitigate fire, explosion and vapor hazards;

3. Visually inspect any above ground releases or exposed below ground releases and prevent further migration of the released substance into surrounding soils and groundwater; and

4. Continue to monitor and mitigate any additional fire and safety hazards posed by vapors and free product that have migrated from the UST excavation zone and entered into subsurface structures (such as sewers or basements).

I. The UST excavation shall be backfilled according to applicable portions of SSRBC Sections 205, 208, and 550 with a material that will compact and develop stability. The material shall be approved prior to placement. All uncontaminated concrete and soil removed during tank extraction may be used to backfill the excavation, at the discretion of the Using Agency.

J. After backfilling the excavation, the site shall be graded and cleaned.

3.10 ENGINEERED BARRIER

A. The Contractor shall provide engineered barriers, when required, and shall include materials sufficient to completely line excavation surfaces, including sloped surfaces, bottoms, and sidewall faces, within the areas designated for protection

3.11 SEALING ABANDONED WELLS

A. The work shall consist of sealing abandoned water wells and monitoring wells.

B. Work shall be performed according to the "Illinois Water Well Construction Code" (77 Ill. Admin. Code 920) and shall be performed by a licensed water well driller. A list of licensed water well drillers is available from the Illinois Department of Public Health offices in Springfield.

Any available information , such as well type, diameter, depth and geological data will be shown on the plans. Unless otherwise noted, monitoring wells are assumed to be 2 in. (50 mm) in diameter and a maximum of 25 ft (7.6m) deep.

Basis of Payment. This work will be paid for at the contract unit price per each for sealing abandoned water wells or sealing abandoned Monitoring Wells.

- ***Based on information provided to IDOT, this work will require abandonment of one (1) monitoring well. Additional information pertaining to the monitoring well and/or analytical results is available in the "Final Preliminary Site Investigation (PSI) Report" referenced above in Section 1.4 (References).***

3.12 DISPOSAL FACILITY ACCEPTANCE SAMPLING AND ANALYSIS

A. When the waste material for disposal requires sampling for landfill acceptance, the samples shall be analyzed for TCLP VOCs, TCLP SVOCs, TCLP RCRA metals, TCLP pesticides, TCLP herbicides, PCBs, pH, flash point, paint filter, reactive cyanide, and reactive sulfide. Note that the list of analytes is considered comprehensive; however, testing requirements for individual disposal facilities may vary. The Contractor shall be responsible for determining the specific disposal facilities to be utilized; and collect and analyze any samples required for disposal facility acceptance using a NELAP certified analytical laboratory registered with the State of Illinois.

1. Three landfill disposal acceptance samples are to be collected for this project. Analytical data collected to date is available in the "Final Preliminary Site Investigation (PSI) Report" referenced above in Section 1.4 (References).

3.13 NON-SPECIAL WASTE CERTIFICATION [SSRBC 669.06]:

A. An authorized representative of the Using Agency shall sign and date all non-special waste certifications. These certifications may include but not limited to *Republic Services Special Waste Profile, Generator Non-Special Waste Certification, and Third Party Signature Authorization*. The Contractor shall be responsible for providing the Using Agency with the required information and/or report that will allow the Using Agency to certify the waste is not a special waste.

1. Definition. A waste is considered a non-special waste as long as it is not:

   a. A potentially infectious medical waste.

   b. A hazardous waste as defined in 35 Ill. Admin. Code 721.

c. An industrial process waste or pollution control waste that contains liquids, as determined using the paint filter test set forth in subdivision (3)(A) of subsection (m) of 35 Ill. Admin. Code 811.107.

d. A regulated asbestos-containing waste material, as defined under the National Emission Standards for Hazardous Air Pollutants in 40 CFR 61.141.

e. A material containing polychlorinated biphenyls (PCB's) regulated pursuant to 40 CFR Part 761.

f. A material subject to the waste analysis and record keeping requirements of 35 Ill. Admin. Code 728.07 under land disposal restrictions of 35 Ill. Admin. Code 728.

g. A waste material generated by processing recyclable metals by shredding and required to be managed as special waste under Section 22.29 of the Environmental Protection Act.

h. An empty portable device or container, in which a special or hazardous waste has been stored, transported, treated, disposed of, or otherwise handled.

2. Certification information. All information used to determine the waste is not a special waste shall be attached to the certification. The information shall include but not be limited to:

a. The means by which the generator has determined the waste is not a hazardous waste;

b. The means by which the generator has determined the waste is not a liquid;

c. If the waste undergoes testing, the analytic results obtained from testing, signed and dated by the person responsible for completing the analysis;

d. If the waste does not undergo testing, an explanation as to why no testing is needed;

e. A description of the process generating the waste; and

f. Relevant material safety data sheets.

3.14 SPECIAL ENVIRONMENTAL CONDITIONS:

A. (NOT USED)

3.15 REGULATED SUBSTANCES FINAL CONSTRUCTION REPORT [IDOT BDE Form 2733]:

A. At substantial completion, the Contractor shall submit a hard copy and electronic files of the Regulated Substances Final Construction Report [IDOT BDE Form 2733] on the activities conducted during the life of the

project. The form shall be signed by an Illinois licensed Professional Engineer or Professional Geologist and distributed as follows:

1. One (1) electronic copy (pdf.) shall be submitted to the CDB Project Manager.
2. One (1) hardcopy and electronic copy (pdf.) shall be submitted to the A/E.
3. One (1) electronic (pdf.) shall be emailed to the Using Agency (DOT.CI@illinois.gov).

3.16 UNEXPECTED SUBSTANCES:

A. If abnormal conditions are exposed during the construction which may indicate the presence of a regulated substance, work in this area shall be immediately discontinued. Notify the A/E and Using Agency immediately. A regulated substance is a hazardous substance, special waste or petroleum or any fraction thereof, as those terms are defined in the Illinois Compiled Statutes. The Contractor shall also complete a BDE 2730A and provide to the Using Agency. Work shall not continue in this area until the BDE 2730A is accepted by the Using Agency. http://www.idot.illinois.gov/Assets/uploads/files/IDOT-Forms/BDE/BDE%202730A.pdf

B. Abnormal conditions include but are not limited to the following: Presence of underground storage tanks (UST's), drums, barrels, discolored earth, metal, wood, etc. Visible fumes, obnoxious or unusual odors, excessively hot earth, smoke, or any other condition which appears abnormal and be a possible indicator of the presence of regulated substances. The conditions shall be treated with extraordinary caution. Appropriate action shall be taken to ensure public and employee safety.

C. Operations shall not resume until directed by the A/E or the Using Agency. The Using Agency may contact the Illinois Emergency Management Agency (IEMA) and/or the Illinois Environmental Protection Agency (IEPA). Further removal and disposal operations shall be in accord to the project specifications and the CDB SDC.

D. Disposition of regulated substances shall be made according to the requirements of the IEMA. Any waste generated as a special waste or hazardous waste shall be manifested off-site using the IDOT facility generator number. The A/E will sign all manifests for the disposal of the regulated material and confirm the Contractor transported volume.

E. Any waste generated as a non-special waste may be disposed of off-site at a facility permitted by the IEPA without a manifest, a special waste transporter, and a generator number.

Figure 1: BDE Form 2730 - Regulated Substances Pre-Construction Plan (RSPCP), page 1

Illinois Department of Transportation

Regulated Substances Pre-Construction Plan (RSPCP)

The Contractor shall submit this Regulated Substances Pre-Construction Plan (RSPCP), describing the methods and manners in which regulated substances will be managed during construction activities. The RSPCP is applicable for all personnel working in areas regulated under the special provision(s). The Site Contamination Health and Safety Plan (SCHASP), an attachment to the RSPCP, shall pertain to the Contractor, state employees, and any visitors at the site. After approval, the RSPCP shall be revised, as necessary, to reflect changed conditions in the field.

Section 1.

A. Project Information

District | Route | Marked Route | Section

Job Number | County | Municipality(ies)

Contract Number | PESA Site Number(s) | PESA Date(s)

Bureau of Design and Environment (BDE) Use Only

BDE Sequence Number

B. Endorsement

This plan must be approved by an Illinois licensed Professional Engineer (PE) or Professional Geologist (PG) to comply with the plans, specifications and special provisions for management of regulated substances encountered during construction activities.

Print Name | Title | Company/Firm

☐ By checking this box and typing my name below, I certify this plan has been approved by an Illinois licensed Professional Engineer (PE) or Professional Geologist (PG).

Signature | Date

IL PE/PG Registration Number | IL PE/PG License Expiration Date

Section 2. Experience and Qualifications

A. Experience

The Contractor, or firm, herein referred to collectively as Contractor, performing the on-site monitoring of regulated substance work and/or on-site monitoring of UST removal shall be pre-qualified in Hazardous Waste by the Department, or demonstration of acceptable project experience. Acceptable project experience includes, but is not limited to, having completed at least five (5) documented Leaking Underground Storage Tank (LUST); and/or five (5) Site Remediation Program (SRP) cleanups following 35 Ill. Admin. Code 734, 740 or 742 within the last ten (10) years. Acceptable qualifications shall also be demonstrated with project experience in remediation and regulated substances operations for contaminated sites in accordance with applicable federal, State, or local regulatory requirements. Documentation of qualifications shall be provided to the Engineer for evaluation and acceptance. Acceptable project documentation shall include, at a minimum, the regulatory identification numbers, project completion dates, and description of the Contractor's role in the projects.

The qualified on-site monitoring personnel performing work shall have a minimum of one year experience in similar activities as those required for the project and shall meet Section 669 of the Standard Specifications for Road and Bridge Construction requirements.

Is contractor or firm pre-qualified in Hazardous Waste by IDOT? ☐ Yes ☐ No

☐ Hazardous Waste - Simple ☐ Hazardous Waste - Advanced

SEFC ID Number | Date Approved (Not Submitted)

If not pre-qualified, complete Section 2.B.

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Figure 2: BDE Form 2730 - Regulated Substances Pre-Construction Plan (RSPCP), page 2

B. Contractors and Subcontractors Completing Regulated Substance Work

Provide a list of proposed subcontractors, related project experience, and the work that each will perform related to environmental or regulated substances services.

Company/Firm's Name | Company/Firm's Address

Contact Name | Contact Title

Phone Number | Email Address

Work To Be Performed

Site Monitoring and other Personnel* | Duties

*Site monitoring and other personnel includes those physically conducting on-site monitoring, observing and documenting UST removals, soil disposal and other regulated substances field activities, the person preparing the SCHASP and related duties.

Years Related Experience | 40-Hour HAZWOPER ☐ Yes ☐ No | Annual 8-Hour HAZWOPER Refresher Date | 8-Hour Supervisor Training Course ☐ Yes ☐ No

Add Personnel | Remove Personnel

Project Experience (5 project minimum)

Project # 1 Name | IEPA LPC Number

IEMA Incident Number | Applicable Regulation(s)

Period Firm Worked on Project

From Date | To Date

Company/Firm's Responsibilities

Project Status (Include NFR or 4Y Date, if applicable)

Project # 2 Name | IEPA LPC Number

IEMA Incident Number | Applicable Regulation(s)

Period Firm Worked on Project

From Date | To Date

Company/Firm's Responsibilities

Project Status (Include NFR or 4Y Date, if applicable)

Project # 3 Name | IEPA LPC Number

IEMA Incident Number | Applicable Regulation(s)

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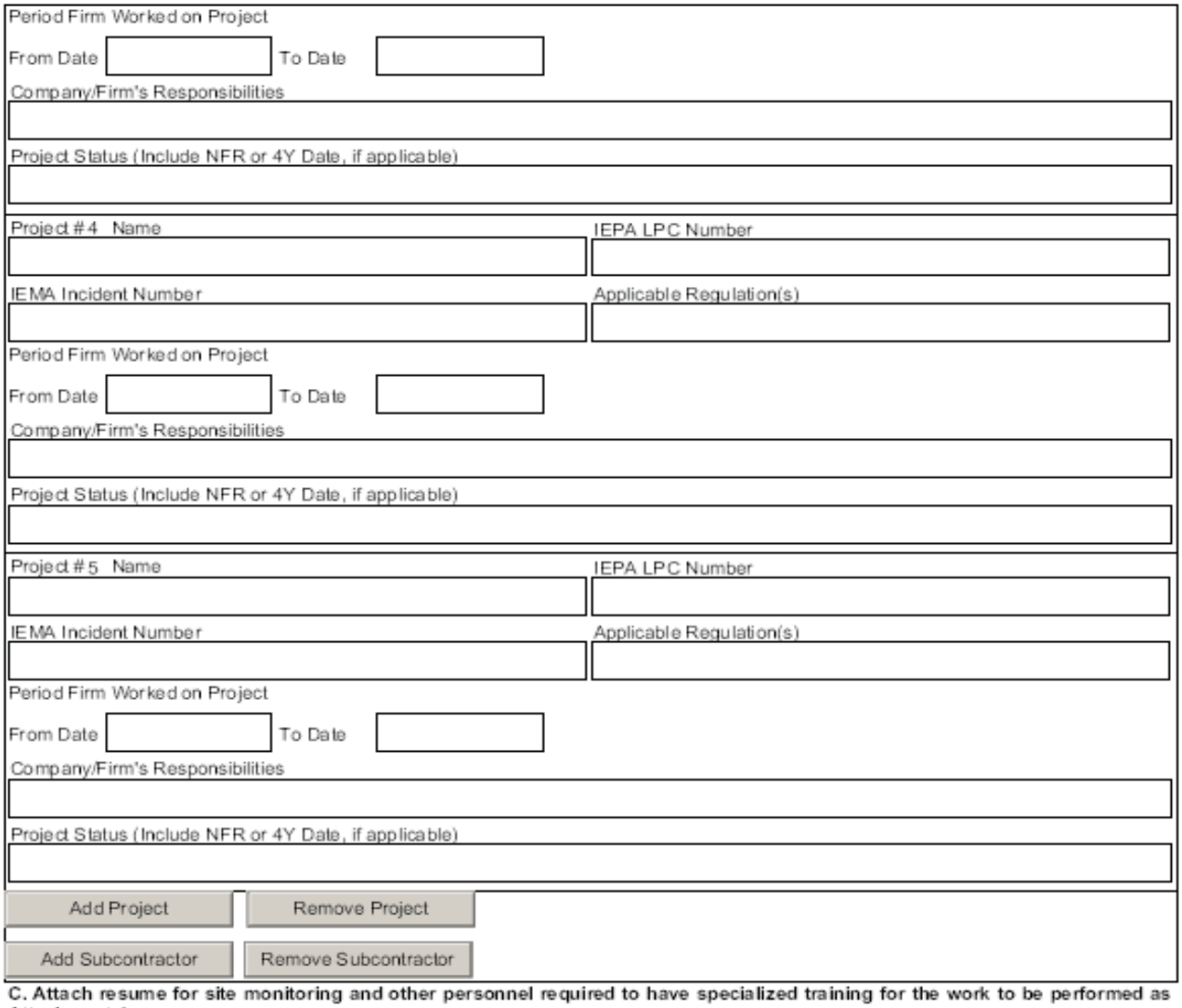
Figure 3: BDE Form 2730 - Regulated Substances Pre-Construction Plan (RSPCP), page 3



Period Firm Worked on Project

From Date | To Date

Company/Firm's Responsibilities

Project Status (Include NFR or 4Y Date, if applicable)

Project #4 Name | IEPA LPC Number

IEMA Incident Number | Applicable Regulation(s)

Period Firm Worked on Project

From Date | To Date

Company/Firm's Responsibilities

Project Status (Include NFR or 4Y Date, if applicable)

Project #5 Name | IEPA LPC Number

IEMA Incident Number | Applicable Regulation(s)

Period Firm Worked on Project

From Date | To Date

Company/Firm's Responsibilities

Project Status (Include NFR or 4Y Date, if applicable)

Add Project | Remove Project

Add Subcontractor | Remove Subcontractor

C. Attach resume for site monitoring and other personnel required to have specialized training for the work to be performed as Attachment 1.

D. Contractor must attach a copy of the current certification of completion of the Annual 8-Hour HAZWOPER Refresher for each person assigned site monitoring duties as Attachment 2. (Include personnel preparing the SCHASP)

Does the Contractor or subcontractor have any current or former ties within, adjoining or potentially affecting this construction project?

☐ Yes ☐ No

If yes, please describe

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Figure 4: BDE Form 2730 - Regulated Substances Pre-Construction Plan (RSPCP), page 4

Section 3. Site Contamination Operation Plan (SCOP)

A. Mark all Regulated Substances Management concerns that apply.

- ☐ Soil Management
- ☐ UST Removal
- ☐ Engineered Barriers
- ☐ Monitoring Well Abandonment
- ☐ Railroad Ties
- ☐ Landfill Waste Disposal Characterization Sample(s)
- ☐ Other, describe below
- ☐ Groundwater Management
- ☐ Backfill Plugs
- ☐ Radiation Monitoring
- ____ Number of samples to be collected for landfill waste disposal characterization

B. Outline the procedures to mobilize all required subcontractors materials and equipment in a timely fashion and provisions to continue work in the potentially contaminated areas identified in the special provision.

C. Describe the methods that will be used to manage soil and/or groundwater for each regulated area. Include a description of disposal methods, if applicable, or if the material will remain on-site.
(Best Management Practice - copy and paste regulated substances special provision and discuss each area)

D. Provide as Attachment 3: site maps illustrating location(s) of soil and/or ground waste management areas, identified USTs to be removed, engineered barriers, backfilled plugs, landfill waste disposal characterization sample locations, site PESA numbers and other pertinent information.

Section 4. Site Contamination Health and Safety Plan (SCHASP)

The contractor shall develop a project specific SCHASP and submit the plan as Attachment 4.

The SCHASP shall specify procedures and equipment to protect site workers and observers from hazards encountered during activities in locations containing contaminated material. **A qualified Industrial Hygienist or Health and Safety Specialist shall prepare the Site Contamination Health and Safety Plan. The Contractor's Corporate Officer responsible for worker health and safety shall approve and sign the plan before submittal to the Department.**

A qualified Industrial Hygienist is defined as having a minimum of five years of experience in the industrial hygiene field, an academic degree in a related science field, and successful completion of two days of testing presented by the American Board of Industrial Hygiene. A Certified Industrial Hygienist (CIH) meets the above definition.

A qualified Health and Safety Specialist is defined as having a minimum of three years experience in hazardous waste operations, familiar with applicable health and safety procedures and protocols, and holds current training status according to 29 CFR 1910.120. This person may be a Certified Safety Professional (CSP) or an Illinois Registered Professional Engineer. A CSP has a minimum of four years of professional safety experience, has a baccalaureate degree in safety, and has successfully completed the safety fundamentals examination and subsequent specialty examination presented by the Board of Certified Safety Professionals.

The Contractor's corporate officer responsible for the Contractor's health and safety program and approval of the SCHASP shall be able to identify hazards; assess employee exposure and risk; have knowledge of Occupational Safety and Health Administration (OSHA) standards, hazards correction techniques and practices, work place safety, and health program requirements. This person shall also be able to effectively communicate this knowledge both orally and in writing or contract for these abilities with a qualified Industrial Hygienist or Health and Safety Specialist.

The responsibility for the implementation and enforcement of all health and safety requirements lies solely with the Contractor. The Contractor shall take all necessary precautions for the safety of, and provide the necessary protection to prevent damage, injury or loss to construction personnel performing work within the exclusion and decontamination zones. The Contractor shall ensure all workers involved in any activities within the contaminated locations or associated with the contaminated materials are conversant with all the requirements of SCHASP and have signed off and dated personal acknowledgment of the plan. The Contractor shall post copies of SCHASP at various locations throughout the work area to facilitate spontaneous review.

A. Zones. Three distinct zones (exclusion, decontamination, and support) shall apply to projects adjacent to or within documented leaking underground storage tank (LUST) incidents, or under management in accordance with the requirements of the Site Remediation Program (SRP) Resource Conservation and Recovery Act (RCRA) or Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), or as deemed necessary in the special provision(s).

Figure 5: BDE Form 2730 - Regulated Substances Pre-Construction Plan (RSPCP), page 5

1. Exclusion Zones are the areas where contamination does or could occur. These zones have the highest inhalation exposure potential and/or a high probability of skin contact with potential contaminants/contaminated material. The exclusion zone designation shall remain until the entire excavated area has been completely backfilled. The Contractor shall ensure that neither their employees nor subcontractors execute maintenance nor repair operations on equipment located in the exclusion zone.

2. Decontamination Zones are areas established to prevent the transfer of contaminants outside the exclusion zones. This zone eliminates the possibility of the physical transfer of contaminating substances on people, equipment, or in the air to unregulated areas. A combination of decontamination, distance from active work areas, zone restrictions, and work function shall eliminate the possibility of physical transfer of contamination. This zone has the next highest inhalation hazard, but does not pose a high probability of skin contact. This zone shall contain the equipment decontamination facility, areas designated for personnel decontamination, and emergency equipment.

3. Support zones shall include the remaining areas of the job site. This zone shall contain the change and shower rooms, lunch and break areas, operation direction, and support facilities (including supplies, equipment storage, and maintenance areas). No equipment or personnel shall enter the support zone from the exclusion zone without passing through the personnel or equipment decontamination zone. Eating, drinking, smoking, etc., shall be allowed only in this zone.

   The Contractor shall ensure each worker has the proper personal protective equipment for the zone and location in which he/she is to perform construction or material management activities. The Contractor shall be responsible for providing all personal protective equipment required by the Department and Contractor personnel. The Contractor shall define the provisions for personal protective equipment in the SCHASP.

   The Contractor, through the SCHASP, shall determine the appropriate level of protection. The Contractor shall ensure the appropriate protective equipment is being used during activities in the exclusion zone and decontamination zone. The Contractor shall notify the Engineer of any variations from the defined levels of protection as stipulated in the Contractor's health and safety plan in writing before implementation of the modifications.

B. Decontamination. All personnel who have participated in construction or soil management activities within the exclusion zone shall go through decontamination. Additionally, the Contractor shall perform a wet and/or dry decontamination process on excavation and construction equipment as specified when equipment is in contact with contaminated material. No equipment or vehicle shall track visible material from a contaminated facility.

1. Personnel Decontamination. All outer protective clothing used by personnel who contact contaminated material while in the exclusion zone shall be collected in plastic bags and placed in leak-proof sealable containers, such as 55 gal (208 L) open-top drums. The Contractor shall transport all containers to a secure staging area for temporary storage. The Contractor shall inform the Engineer of the time and manner of disposal of containers containing contaminated protective clothing. The Contractor shall be responsible for transporting and disposing of the containers. The Contractor shall be responsible for ensuring the personnel decontamination portion of this zone contains clean, unused 6 mil (150 micron) polyethylene sheeting.

2. Equipment Decontamination.

   a. Dry Decontamination. The Contractor shall perform dry decontamination on equipment that has contacted material classified as a non-special waste, special waste, or hazardous waste before moving that equipment to any other location, whether the new location is contaminated or uncontaminated. Dry equipment decontamination shall consist of the removal of material from excavation and construction equipment parts, such as shovels, wheel tracks, and buckets. During dry decontamination, the Contractor shall ensure that removed contaminated material does not contact the ground surface. The Contractor shall place all contaminated material removed during dry decontamination with contaminated material of similar classification and dispose of it with other excavated material from the facility location.

   b. Wet Decontamination. The Contractor shall perform the wet documentation process when construction/soil management activities associated with non-special waste, special waste, or hazardous waste are followed by construction/soil management activities associated with uncontaminated excavation or fill material. If the Engineer observes residual and/or non-special waste, special waste, or hazardous waste material during the initial (or subsequent) inspection of equipment, the Engineer will require the Contractor to perform either wet and/or dry decontamination before approving equipment for use at another location. Before departure from the project area, all equipment and vehicles contacting contaminated material shall be wet decontaminated by the Contractor.

      Personnel shall perform all wet equipment decontamination within the decontamination zone on equipment decontamination pad(s). The Contractor shall be responsible for the construction and maintenance of the decontamination pad(s) and for all equipment, materials, and personnel. The pad(s) shall be designed to prevent loss of decontamination liquids to the surrounding environment through vertical infiltration and/or surface runoff from any part of the pad(s).

Figure 6: BDE Form 2730 - Regulated Substances Pre-Construction Plan (RSPCP), page 6

The Contractor shall place all removed wastes from the decontamination pad(s) in leak-proof containers and store temporarily in a secure staging area. The Contractor shall containerize the solids separate from the liquids. The Contractor shall be responsible for the transport and disposal of all waste generated from the decontamination process.

C. Health and Safety Training. The Contractor shall indicate the designated environmental professional and the project safety officer responsible for monitoring activities within designated exclusion or decontamination zones have successfully completed the initial 40-hour Health and Safety Training Course and are current with refresher training pursuant to applicable federal, State and/or local standards, including OSHA requirements under 29 CFR 1910.120 (HAZWOPER). The personnel required to have training in accordance with 29 CFR 1910.120 shall have certifications of completion for the Annual 8-Hour HAZWOPER Refresher with them on the jobsite while working in areas regulated under the special provision(s). The designated environmental professional responsible for monitoring activities shall also have successfully completed an additional 8-Hour Supervisor Training Course pursuant to applicable federal, State and/or local standards, including OSHA requirements under 29 CFR 1910.120. The Contractor is responsible for ensuring that other contractor and subcontractor personnel required to be trained under 29 CFR 1920.120 have received required training and updates.

D. Medical Exams. The Contractor shall indicate all personnel in his/her work force who are required to have the training described in Section 4C of this form have received and passed a current medical examination as required under applicable federal, State and/or local standards. The Contractor is responsible for ensuring that other contractor and subcontractor personnel subject to medical monitoring under 29 CFR 1910.120 have received and passed a current medical examination under applicable federal, State, and/or local standards.

SCHASP is attached: ☐ Yes ☐ No

Medical exams are current for field personnel: ☐ Yes ☐ No

Section 5. Site Contamination Erosion Control Plan (SCECP)

The Contractor shall prevent flow of precipitation storm water into excavated contaminated areas. The Contractor shall divert all storm water away from the exclusion and decontamination zones using appropriate storm water erosion control methods.

Provide a description of how the Contractor plans to prevent precipitation storm water flowing into excavated areas and how all storm water will be diverted away from the exclusion and decontamination zones.

Failure to use appropriate measures to divert storm water will subject the Contractor to removing and properly containing the water at their own expense. The Contractor shall provide pumps and collect standing water from the excavation before continuing removal activities or other construction activities. The Contractor shall collect the removed water, place it in leak-proof storage containers, and store it in a secure staging area for future testing by the Contractor. The Contractor shall ensure the storage containers have access points to facilitate sampling. The Contractor shall inform the Engineer about management and disposal requirements for the water following the evaluation of the analytical results.

Provide a description of the Contractor's plan to collect, transfer, test, store, and dispose of potentially impacted water from construction areas.

The Contractor shall control and minimize the release of dust during non-special waste, special waste, or hazardous waste removal activities. The Contractor may use water or acceptable chemicals to control dust emissions. Within the SCECP, the Contractor shall include a description of intended dust control measures.

Provide a description of the Contractor's plan for dust control measures.

DESU shall submit this form to the RE to return to the Contractor.

Reviewed By	Title	Date

BDE 2730 Recommended for acceptance by:	Date	
		OR

Rejected By	Date

☐ By checking this box and typing my name below, I certify this form has been reviewed and approved by the Resident Engineer.

Resident Engineer Name	Date

Figure 7: IDOT BDE Form 2732 - Regulated Substances Monitoring Daily Record (RSMDR), page 1

Illinois Department of Transportation

Regulated Substances Monitoring Daily Record (RSMDR)

A Regulated Substances Monitoring Daily Sheet (RSMDS) shall be completed and submitted to the Resident Engineer (RE) for all project locations regulated under a regulated substances special provision by the monitoring personnel who completed the field work.

Date	Contract Number	Route	Marked Route

Payment Item No.	Description	Excavation Contractor

On-Site Monitoring Personnel	Monitoring Company/Firm

Time On-Site (24 hr format)	Time Offsite (24 hr format)

	Contractor's Monitoring Equipment				
	Equipment Used On Site	Model No.	Serial No.	Equipment Operator	Firms Name
-					

Add

	PID/FID Calibration Gas	Time (24 hr)	Reading
-			

Add

Weather	Time (24 hr)	Temp. (F)	Conditions

Note: The FID/PID should be calibrated regularly, including, the start of work day, significant temperature changes, precipitation event, change in wind direction, barometric pressure or humidity, change in work location, non-zeroing meter, equipment malfunction, etc.

Provide a narrative of the activities completed during the daily monitoring activities.

Variations From Special Provisions			
Authorized By:	Station/PESA, Site No.	Station/PESA, Site No.	Station/PESA, Site No.
☐ None Found Today			
☐ Found variations that require corrective action or deduction			
-			

Add

*Note: Areas shown in the Special Provision shall not be reduced without prior approval.

Narrative of Variations From Regulated Substances Special Provision

Other	Remarks
1. Provide photo log sheet(s), as an attachment showing primary activities. Include captions, date/time, direction, PESA site number, pertinence of information, etc. 2. Attach copies of associated manifests. 3. Attach copies of disposal weight tickets.	

☐ By checking this box and typing my name below, I certify this form is accurate to the best of my knowledge.

Prepared By	Company/Firm	Date

☐ By checking this box and typing my name below, I certify this form has been reviewed and approved by the Resident Engineer.

Accepted by IDOT RE/RT Name	Date

Figure 8: IDOT BDE Form 2732 - Regulated Substances Monitoring Daily Record (RSMDR), page 2

Regulated Substances Daily Monitoring Record

	Field Data										Office Follow-Up	
	Time (24 Hour)	Station From (include off-set)	Station To (include off-set)	PESA Site Number	Classification from Special Provision	PID/FID Reading (MU)	Manifest Number	Volume (CY)	Management Method	Management Facility	Landfill Weight Ticket Number	Disposal Weight (Tons)
-												
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Add

NSW Landfill - Non-Special Waste Landfill (manifest not required)
SW Landfill - Special Waste Landfill (manifest required)
HW Landfill - Hazardous Waste Landfill (manifest required)
CCDD - Clean Construction / Demolition Debris
USFO - Uncontaminated Soil Fill Operation
MU - Meter Unit
Other - Provide a full description and copy of written authorization for alternative disposal method.
CY - Cubic Yard

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Figure 9: IDOT BDE Form 2733 - Regulated Substances Final Construction Report (RSFCR), page 1

Illinois Department of Transportation

Regulated Substances
Final Construction Report (RSFCR)

The Contractor shall prepare and submit one hard copy and one electronic copy of the Regulated Substances Final Construction Report (RSFCR) to the resident engineer (RE) describing the regulated substances related activities conducted during the life of the project. The RSFCR shall describe the methods and manners in which impacted and potentially impacted materials were managed during construction activities.

Section 1.

A. Project Information

District | Route | Marked Route | Section

Job Number | County | Municipality(ies)

Contract Number | PESA Site Number(s) | PESA Date(s)

Bureau of Design and Environment (BDE) Use Only

BDE Sequence Number | BDE PTB Item/ WO Number | OR | RMP Number

B. Endorsement

Print Name | Title | Company/Firm

☐ By checking this box and typing my name below, I certify this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted, is to the best of my knowledge, true, accurate and complete.

Signature | Date

IL PE/PG Registration Number | IL PE/PG License Expiration Date

C. Contractors and Subcontractors Completing Regulated Substances Work

List personnel and firm name that conducted monitoring on the regulated substances project.

Name | Company/Firm

Add Personnel | Remove Personnel

Section 2.

A. Background

1. Mark all Regulated Substances Management concerns that were addressed.

☐ Soil Management
☐ UST Removal
☐ Engineered Barriers
☐ Monitoring Well Abandonment
☐ Railroad Ties
☐ Landfill Waste Disposal Characterization Sample(s)
☐ Other, describe below
☐ Groundwater Management
☐ Backfill Plugs
☐ Radiation Monitoring
____ Number of samples to be collected for landfill waste disposal characterization

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Figure 10: IDOT BDE Form 2733 - Regulated Substances Final Construction Report (RSFCR), page 2

2. Contractor shall provide a narrative discussing the regulated substances concerns applied to the project and how they were addressed. (Best Management Practice - List each Regulated Substances Special Provision and how the material was managed)

B. Describe the measures taken to mark, monitor, handle, and dispose of soil and/or groundwater containing regulated substances to prevent further migration of regulated substances and to protect workers. Provide Regulated Substances Daily Monitoring Record (BDE 2732). Each BDE 2732 shall be signed by the qualified monitoring personnel completing the monitoring, and shall have been accepted by the RE.
This information shall be provided as Attachment 1.

1. Were there any deviations of the management of soils and/or groundwater from the contract Regulated Substances Special Provisions?

☐ Yes ☐ No

2. If yes, describe the deviation(s) from the special provision.

3. If yes, provide a copy of the prior written documentation from the Bureau of Design and Environment (BDE) allowing a deviation from the special provision as Attachment 1A.

C. In a tabular format, provide the costs charged to IDOT for marking, monitoring, handling, transporting and disposing of soil and/or groundwater containing regulated substances; the cost of preventing further migration of regulated substances; and the cost for worker protection from the regulated substances. All costs shall be in the format of the contract pay items listed in the contract plans. This information shall be provided as Attachment 2.

D. Provide copies of plan sheet excerpts showing the areas containing the regulated substances as defined in the contract special provisions with delineation of actual removal boundaries. Backfill plugs (unit/location) and all other regulated substances management concerns identified in Section 2.A.1. of this RSFCR, if applicable shall also be shown on plan sheets as well as the PESA site number, stationing, and off-sets. This information shall be provided as Attachment 3.

E. Provide the field sampling and testing results collected by Contractor for landfill characterization and disposal as Attachment 4. In the event unexpected regulated substances were encountered, additional filed sampling and testing results used to identify the nature and extent of the regulated substances shall be provided as Attachment 4A. This attachment shall also include the date the amended Regulated Substances Pre-Construction Plan (RSPCP) was submitted to IDOT and the date that IDOT accepted the amended RSPCP.

F. Provide copies of waste manifests for special or hazardous waste disposal. This information shall be provided as Attachment 5. Provide a comprehensive summary table of all soil removal associated with a special provision. The table shall include: Date removed, ticket ID, manifest number, customer, waste profile number, PESA site number and weight in tons.

G. Provide copies of landfill tickets (identified by PESA site number with stationing and off-sets) for non-special, special or hazardous waste disposal. This information shall be provided as Attachment 6. Provide a comprehensive summary table of all soil removal associated with a special provision. The table shall include: Date removed, ticket ID, manifest number, customer, profile number, PESA site number and weight in tons.

H. Provide UST system removal results and diagram, when applicable. Representative photographs shall be provided with captions including date/time, direction, PESA site number, pertinence of information, etc. This information shall be provided as Attachment 8.

I. Provide any additional information relevant to regulated substances activities not described in the above sections (e.g., technical data sheets, well abandonment forms, drawings, photographs, groundwater discharge permit application, and approval, when applicable, etc.

Reviewed By	Title	Date

BDE 2733 Recommended for acceptance by:	Date	
		OR

Rejected By	Date

☐ By checking this box and typing my name below, I certify this form has been reviewed and approved by the Resident Engineer.

Resident Engineer Name	Date

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End 02 61 13

OUTLINE SPECIFICATIONS

DIVISION 00: PROCUREMENT AND CONTRACTING REQUIREMENTS

A. Design Builder; Produce required CDB Division 00 specifications as required for project.

00 01 10 TABLE OF CONTENTS

A. Partially edited CDB standard section included within this project manual.

00 01 15 DRAWINGS SCHEDULES AND DETAILS

A. Partially edited CDB standard section included within this project manual.

00 31 32 GEOTECHNICAL DATA

A. Geotechnical Report prepared by Intertek-PSI and dated 10/30/19 is included in this project manual.

DIVISION 01: GENERAL REQUIREMENTSEXISTING CONDITIONS

A. Design Builder; Produce required CDB Division 01 specifications as required for project.

01 11 00 PROJECT SUMMARY

A. Partially edited CDB standard section included within this project manual.

01 23 00 BETTERMENTS

A. Betterment No. G-1: Access driveway directly from Joliet Road, to include pavement, fencing and gate scope similar to the other property access drives that are included in the base scope.

01 41 00 REGULATORY REQUIREMENTS

A. Partially edited CDB standard section included within this project manual.

01 45 29 TESTING LABORATORY SERVICES

A. Partially edited CDB standard section included within this project manual.

DIVISION 02: EXISTING CONDITIONS

A. Design Builder; Produce all required specifications for division 2 through 50 as required for project.

02 41 16 - STRUCTURE DEMOLITION

A. Remove existing Cold Storage Building (D0140) and Salt Ramp.

B. Remove all below-grade building materials and foundations. Backfill with appropriate fill.

C. Disconnecting, capping or sealing, and abandoning in-place and/or removing site utilities.

02 41 19 - SELECTIVE DEMOLITION

A. Demolition and removal of North wing of existing building (D0139).

02 61 13 - EXCAVATION & HANDLING OF CONTAMINATED MATERIALS

A. As supplied by CDB and attached to this document, section 02 61 13 is included in this project manual.

DIVISION 03: CONCRETE

03 31 00 – STRUCTURAL CONCRETE

A. Use 4,000 psi concrete with a maximum slump of 4". Contractor is responsible for providing the mix design. Use Grade 60 reinforcing steel (epoxy coated where specified in drawings). Contractor is responsible for all concrete testing (strength, slump, and air content). Actual type and size of footing and foundation system used will be based on soil borings. Slab on grade floors will require 12" of aggregate base course below. The ready mix plant must be IDOT approved. The minimum standards of ACI 318 are to be met and installers shall be ACI Certified. The following ASTM standards are to be met where applicable:

1. ASTM International (ASTM):
   a. ASTM A82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
   b. ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
   c. ASTM A184 – Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
   d. ASTM A497 – Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
   e. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   f. ASTM A704 – Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
   g. ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
   h. ASTM A775 – Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
   i. ASTM A884 – Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
   j. ASTM A934 – Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars.
   k. ASTM A1064 - Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   l. ASTM C33 – Standard Specification for Concrete Aggregates.
   m. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
   n. ASTM C150 – Standard Specification for Portland Cement.
   o. ASTM C156 – Standard Test Method for Water Loss (From a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.
   p. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
   q. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
   r. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
   s. ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.
   t. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete.

u. ASTM C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars.
v. ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
w. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.
x. ASTM C1240 – Standard Specification for Silica Fume Used in Cementitious Mixtures.
y. ASTM C1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.
z. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
aa. ASTM D3963 – Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
bb. ASTM E1155 – Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers.
cc. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
dd. ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

DIVISION 04: MASONRY

04 01 20.63 - BRICK MASONRY REPAIR

A. Repair portion of existing building where exposed by partial demolition.

04 21 13 - BRICK MASONRY

A. Brick masonry where shown. Facing brick complying with ASTM C 216, Grade SW, Type FBX. Mortar ASTM C270. Unit testing shall be in accordance with ASTM C67.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

C. Ties and Anchors: Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.

D. Flashings: Stainless Steel Type 304.

E. All masonry shall be designed in accord with building code requirements for masonry structures (ACI 530) and standards set forth by the Brick Industry Association (BIA) technical notes.

04 22 00 - CONCRETE UNIT MASONRY

A. Concrete masonry units – exterior and interior, load bearing and non-load bearing, non-fire rated, 1 HR fire rated and 2HR fire rated, insulated and standard units

B. ASTM C90, normal weight, Type I, concrete masonry units. Mortar ASTM C270. Grout ASTM C476, 2000 psi. Reinforcing ASTM A615, Grade 60. Concrete masonry walls are to be reinforced as required with spacing not to exceed 48” o.c. Unit testing shall be in accordance with ASTM C140.

C. All masonry shall be designed in accord with building code requirements for masonry structures (ACI 530) and standards set forth by the Brick Industry Association (BIA) technical notes.

DIVISION 05: METALS

05 12 00 - STRUCTURAL STEEL - GENERAL

A. Structural steel frame (beams and columns) and miscellaneous members to conform to ASTM A992, 50 ksi. Bolts to conform to either ASTM A307 or A325. Painting to consist of 1-coat of rust-inhibitive primer. In the work and storage bays, 2 finish coats are required do to exposure. Fabrication of structural steel members shall be in accordance with AISC Specifications and AISC Code of Standard Practice for Steel Buildings and Bridges. An AISC certified fabricator and erector must be utilized. The following ASTM standards are to be met where applicable:

1. ASTM International (ASTM):

ASTM A36 - Standard Specification for Carbon Structural Steel.
ASTM A53 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
ASTM A108 - Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength.
ASTM A500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
ASTM A563 – Standard Specification for Carbons and Alloy Steel Nuts.
ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
ASTM A673 – Standard Specification for Sampling Procedure for Impact Testing of Structural Steel.
ASTM A992 - Standard Specification for Structural Steel Shapes.
ASTM F436 – Standard Specification for Hardened Steel Washers.
ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

05 21 00 - STEEL JOIST FRAMING

A. Open web steel joists with bridging, attached seats, chord extensions, and anchors. Joist fabricators must be a member of SJI. The following ASTM standards are to be met where applicable:

1. ASTM International (ASTM):

ASTM A36 - Standard Specification for Carbon Structural Steel.
ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
ASTM A992 - Standard Specification for Structural Steel Shapes.

05 31 23 - STEEL ROOF DECKING

A. 1-1/2” x 20 gage wide rib, galvanized metal roof deck, ASTM A653 and A924

05 40 00 - COLD-FORMED METAL FRAMING

A. Exterior non-load-bearing wall framing, framing accessories, anchors, clips, and fasteners, miscellaneous materials.

B. Cold-Formed Steel Framing complying with AISI S100, AISI S200 unless more stringent requirements are necessary for the design elements.

C. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as required.

05 50 00 - METAL FABRICATIONS

A. Entrance canopy, Ships ladder with landing, metal stair and other metal fabrications as required

B. Performance Requirements:
1. Delegated Design: Engage a structural engineer licensed in the State of Illinois to design entrance canopy, ladders, and metal stairs.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G. Abrasive-Surface Floor Plate: Steel plate with abrasive material metallically bonded to steel.

H. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

J. Zinc-Coated Steel Wire Rope: ASTM A 741.

K. Wire-Rope Fittings: Hot-dip galvanized-steel connectors with capability to sustain, without failure, a load equal to minimum breaking strength of wire rope with which they are used.

L. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

M. Size of Channels: As required.

N. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel or Type B structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; thickness as required for application.

O. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B or structural steel, Grade 33 (Grade 230); thickness as required for application; finish as required for application.

P. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated

Q. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

DIVISION 06: WOOD, PLASTICS, & COMPOSITES

06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

A. Wood furring, blocking and nailers as required for roofing, cabinetry and other systems requiring concealed blocking and nailers.

B. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

C. Dimension lumber size, provide Construction or No. 2

D. Equipment Backing Panels: DOC PS 1, Exterior, AC.

E. Flexible Flashing: Self-adhesive butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

06 41 16 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Plastic-laminate-clad architectural cabinets for kitchenette in break room.
   1. High-Pressure Decorative Laminate: NEMA LD 3. Laminate grade shall have a class 1, class A fire rating in accordance with ASTM E84.
   2. Particleboard shall meet the minimum standards listed in ASTM D1037
   3. Architectural Woodwork Standards Grade: Custom

DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 18 00 - TRAFFIC COATINGS

A. Traffic Coating: Manufacturer's standard, traffic-bearing, seamless, high-solids-content, cold liquid-applied, elastomeric, water-resistant membrane system with integral wearing surface for vehicular traffic service condition; according to ASTM C957/C957M.

B. Provide at vehicle maintenance areas, storage bays and wash bays.

072100 - THERMAL INSULATION

A. Extruded polystyrene board ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84 perimeter insulation at foundations. 2-1/2-inch thick (R-11)

B. Batt insulation for exterior walls and roofs of prefabricated metal buildings. Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
   1. Comply with IECC for insulation values for metal buildings.

C. Polyisocyanurate Board Insulation: ASTM C 1289 insulation board for low sloped roofs. (R-30) minimum.

07 26 00 - VAPOR RETARDERS

A. Reinforced-Polyethylene Vapor Retarders: Sheet with outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 20 lb/1000 sq. ft., with maximum permeance rating of 0.1 perm below all concrete slabs.

07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS

A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
   1. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E2178.
   2. Ultimate Elongation: Minimum 350 percent; ASTM D412, Die C.
   3. Adhesion to Substrate: Minimum 16 lbf/sq. in. when tested according to ASTM D4541.
   4. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
   5. UV Resistance: Can be exposed to sunlight for 180 days according to manufacturer's written instructions.

07 54 19 - PVC-KEE Membrane Roofing

A. Comply with CDB Roofing Handbook.

B. Fully adhered 60 mil polyvinyl chloride (PVC) roofing system over mechanically fastened substrate board, vapor retarder, roof insulation, and cover board.
   1. Minimum of 20-year NDL warranty for membrane systems
   2. Provide walkways around all mechanical equipment from roof access door.
   3. Provide PVC clad metal flashings as required.

07 62 00 - SHEET METAL FLASHING AND TRIM

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
   1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   2. 20-year warranty.

D. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested in accordance with ANSI/SPRI/FM 4435/ES-1.

07 72 00 - ROOF ACCESSORIES

A. Roof Curbs: Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation, and integrally formed deck-mounting flange at perimeter bottom.

B. Material: Zinc-coated (galvanized) steel sheet, thickness as required for application.

C. Finish: Baked enamel or powder coat.

07 84 13 - PENETRATION FIRE STOPPING

A. Penetrations in fire-resistance-rated walls.
   1. 1HR and 2HR rated CMU walls that will have penetrations

B. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

C. Penetrations in Fire-Resistance-Rated Walls: Ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

07 92 00 - JOINT SEALANTS

A. Provide sealants for joints as appropriate for application from the following sealant types:
   1. Silicone joint sealants. ASTM C920
   2. Nonstaining silicone joint sealants. ASTM C920
   3. Urethane joint sealants. ASTM C920
   4. Mildew-resistant joint sealants. ASTM C920
   5. Latex joint sealants. ASTM C834

07 92 19 - ACOUSTICAL JOINT SEALANTS

A. Acoustical joint sealants ASTM C834 at the material lab and office spaces to address acoustical concerns.

B. Provide acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies according to ASTM E 90.

DIVISION 8: OPENINGS

08 11 00 - METAL DOORS AND FRAMES

A. Hollow metal doors and frames at all interior and exterior doors including access door to flat roof.

B. Interior Doors and Frames:
   1. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
      a. Physical Performance: Level A according to SDI A250.4.
      b. Doors:
         1) Type: As indicated in the Door and Frame Schedule.
         2) Thickness: 1-3/4 inches.
         3) Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inchEdge Construction: Model 2, Seamless.
         4) Core: Manufacturer's standard.
      c. Frames:
         1) Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
         2) Construction: Full profile welded.

C. Exterior Hollow-Metal Doors and Frames:
   1. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.
      a. Physical Performance: Level A according to SDI A250.4.
      b. Doors:
         1) Thickness: 1-3/4 inches.
         2) Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
         3) Edge Construction: Model 2, Seamless.
         4) Core: Polyisocyanurate.
      c. Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btuwhen tested according to ASTM C 1363.
      d. Frames:
         1) Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40coating.
         2) Construction: Full profile welded.
         3) Thermally broken frames.

D. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

08 11 19 - STAINLESS STEEL DOORS AND FRAMES

A. Wash Bay doors and frames are Stainless Steel Type 316

B. Construct stainless steel door and frame assemblies to comply with NAAMM-HMMA 866 for the application indicated, including materials, fabrication methods, hardware reinforcement, tolerances, and clearances, and as specified. Comply with SDI ANSI/A250.4, for Physical Performance Level A.

1. Stainless Steel Doors:

a. Type: As indicated in the Door and Frame Schedule.
b. Thickness: 1-3/4 inches.
c. Face Sheets: Type 316 stainless steel sheet, minimum thickness 0.062 inch.
d. Edge Construction: Continuously welded with no visible seam.
e. Top and Bottom Edges: Closed with continuous stainless steel channels with minimum thickness of 0.062 inch, welded to face sheets.
1) Provide flush top and bottom closures for exterior doors, with weep holes at bottom edge.
f. Core Construction: Polyisocyanurate, polystyrene, or polyurethane laminated to face sheets.
g. Fire-Rated Core: Manufacturer's standard laminated mineral board core for fire-rateddoors.

2. Stainless Steel Frames:
a. Materials: Type 316 stainless steel sheet.
b. Door Frames for Openings 48 Inches Wide or Less: Fabricate from stainless steel sheet, minimum thickness 0.078 inch.
c. Construction: Full profile welded.
3. Hardware Reinforcement: Stainless steel sheet.
4. Finish: ASTM A480/A480M No. 6, Dull Satin

08 36 13 - SECTIONAL DOORS

A. General Performance: Sectional doors shall comply with performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Structural Performance, Exterior Doors: Capable of withstanding the design wind loads.

C. Insulated overhead doors with single row of glazing. 26’x14’ and 18’x14’.

D. Insulated overhead doors without glazing.10’x10’

E. Steel Sectional Door: Sectional door formed with hinged sections and fabricated according to DASMA 102 unless otherwise indicated.

F. Operation Cycles: Door components and operators capable of operating for not less than 50,000.

G. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. Insert value at 15 and 25 mph when tested according to ASTM E 283 or DASMA 105.

H. R-Value: As required by IECC.

I. Steel Sections: Zinc-coated (galvanized) steel sheet with G90 zinc coating.
1. Interior Facing Material: Zinc-coated (galvanized) steel sheet.

J. Electrically operated doors.

08 70 00 - HARDWARE

A. Latch sets, hinges, stops, plates, pulls etc. in oil rubbed and oxidized satin bronze (BHMA 613 or US10B) finish. Use levers on all latch and lock sets, except at service or utility areas use spherical knobs. Master key all locks to the system in use or as requested by using agency.

B. Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

C. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.

D. Exit Devices and Auxiliary Items: BHMA A156.3.

E. Operating Trim: BHMA A156.6; stainless steel.

F. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

G. Wall- and Floor-Mounted Stops: BHMA A156.16;

H. Overhead Stops and Holders: BHMA A156.8.

I. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

J. Thresholds: BHMA A156.21; fabricated to full width of opening indicated, thermally broken.

K. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch-thick stainless steel; with manufacturer's standard machine or self-tapping screw fasteners.

08 80 00 - GLAZING

A. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.

B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

D. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190. Provide 1-inch sealed insulated glass, made up of 1/4-inch thick clear float glass with e2 coating on interior panes of South and East walls. Provide heat mirror glass units on North walls. Use tempered glass where required.

DIVISION 9: FINISHES

09 22 16 - NON-STRUCTURAL METAL FRAMING

A. Non-load-bearing steel framing systems for interior gypsum board assemblies.

B. Suspension systems for interior gypsum ceilings and soffits.

C. Framing Members, General: Comply with ASTM C754.

D. Steel Studs and Runners: ASTM C 645.
   1. Protective Coating: ASTM A653/A653M, G60.

E. Firestop Tracks: Manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

09 29 00 - GYPSUM BOARD

A. Use 5/8" regular gypsum board on designated interior walls and on all ceilings. 5/8" water resistant gypsum board in wet areas. Use cementitious glass mesh mortar units on walls designated to have ceramic tile applied. Use Type X gypsum board on partitions requiring fire rating.

B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

C. Gypsum Wallboard: ASTM C1396/C1396M.

D. Gypsum Board, Type X: ASTM C1396/C1396M.

E. Water-Resistant Gypsum Backing Board: ASTM C1396/C1396M, with manufacturer's standard edges.

F. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.

G. Interior Trim: ASTM C1047.

H. Joint Treatment Materials:
   1. General: Comply with ASTM C475.

09 30 13 - CERAMIC TILE

A. Floors and walls in showers.
   1. Porcelain tile.
   2. Stone thresholds.
   3. Waterproof membrane.
   4. Crack isolation membrane.
   5. Metal edge strips.

B. Installer Qualifications:
   1. Installer is a Five-Star member of the National Tile Contractors Association or a Trowel of Excellence member of the Tile Contractors' Association of America.
   2. Installer's supervisor for Project holds the International Masonry Institute's Foreman Certification.
   3. Installer employs only Ceramic Tile Education Foundation Certified Installers or installers recognized by the U.S. Department of Labor as Journeyman Tile Layers for Project.
   4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of gauged porcelain tile/gauged porcelain tile panels and slabs.

C. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

D. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

E. Waterproof Membrane:
   1. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

F. Crack Isolation Membrane:
   1. General: Manufacturer's standard product that complies with ANSI A118.12 for high performance and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

G. Metal Edge Strips: Angle or L-shaped, height to match tile and setting-bed thickness, metallic or combination of metal and PVC or neoprene base, designed specifically for flooring applications; stainless steel, ASTM A276/A276M or ASTM A666, 300 Series exposed-edge material.

09 51 13 - ACOUSTIC PANEL CEILINGS

A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E1264.
   2. Smoke-Developed Index: 50 or less.

B. 2x2 ceiling tile and grid in all offices, hallways, locker rooms, restrooms, break room and lab space.

C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

D. Acoustical Panel Standard: Comply with ASTM E 1264.

E. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance.

F. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

G. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C635/C635M and designated by type, structural classification.

09 65 13 - RESILIENT BASE AND ACCESSORIES

A. Thermoset-rubber base in office areas and break room.

B. Product Standard: ASTM F1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

C. Thickness: 0.125 inch.

D. Height: 6 inches.

09 65 00 - RESILIENT TILE FLOORING

A. Vinyl composition floor tile in office areas and break room.

B. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
   2. Tile Standard: ASTM F1066.
   3. Wearing Surface: Smooth.
   4. Thickness: 0.125 inch.
   5. Size: 12 by 12 inches

C. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

D. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

09 91 13 - EXTERIOR PAINTING

A. Exterior building elements not part of the metal building package and other site items as noted.

B. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

C. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

09 91 23 - INTERIOR PAINTING

A. CMU walls

B. Gypsum Walls

C. Gypsum ceilings

D. Epoxy paint on all surfaces of wash bay – CMU walls interior surface of pre-fabricated metal building

E. HM doors and frames.

F. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

G. Material Compatibility:
   1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

DIVISION 10: SPECIALITIES

10 11 00 - VISUAL DISPLAY UNITS

A. Markerboards – provided by using agency.

B. Installed by Contractor.

101423.16 - ROOM-IDENTIFICATION PANEL SIGNAGE

A. Provided by using agency.

B. Installed by Contractor.

10 21 13.14 - STAINLESS STEEL TOILET COMPARTMENTS

A. Floor mounted and overhead braced stainless-steel partitions with self-closing doors with latches and coat hooks. Use full height stainless steel mounting angles.

B. Stainless-steel urinal screens.

C. Stainless-Steel Finish: No. 4 bright, directional polish.

D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

E. Stainless Steel Castings: ASTM A743/A743M.

102116.14 - STAINLESS-STEEL SHOWER AND DRESSING COMPARTMENTS

A. Shower stalls and accessories.

B. Stainless-Steel Finish: No. 4 bright, directional polish.

C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.

D. Stainless Steel Castings: ASTM A743/A743M.

10 28 13 - TOILET ACCESSORIES

A. Provided by Using Agency: Toilet Paper holders, Soap dispensers, Trash receptacles

B. Provided by Contractor: Grab Bars, Mirrors, Hand Dryers

C. All toilet accessories Installed by Contractor.

10 44 13 - FIRE PROTECTION CABINETS

A. Provided by using agency.

B. Installed by Contractor.

10 44 16 - FIRE EXTINGUISHERS

A. Provided by using agency.

B. Installed by Contractor.

10 51 13 - METAL LOCKERS

A. Some will be repurposed from the existing building; some will be provided by using agency. Size: 18x18.

B. Match existing style, material and finish.

C. Installed by Contractor.

10 75 16 – GROUND SET FLAGPOLES

A. Aluminum ground-set flagpole located near front entrance. Height 35 feet.

B. Aluminum Flagpoles: Cone-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B241/B241M, Alloy 6063, with a minimum wall thickness of 3/16 inch

10 90 10 - LUBRICANT DISTRIBUTION SYSTEM

A. Storage tanks, piping, fittings, specialties and pumps used for the complete lubricant systems including but not limited to the following:
   1. Lubricant Piping.
   2. Grease Piping.
   3. Hose Reel Assemblies.
   4. Pumps.
   5. Pipe wrap.
   6. Double wall storage tanks.
   7. Storage tank gauge.
   8. Pipe identification.
   9. Sealing and Firestopping.

DIVISION 12: FURNISHINGS

12 24 13 - ROLLER WINDOW SHADES

A. Manual shades for exterior fixed windows in the break room and private offices.
   1. Manually operated roller shades with single rollers.

B. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

   1. Bead Chains: Stainless steel.

C. Loop Length: Full length of roller shade.

D. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

E. Shadebands:

   1. Shadeband Material: Light-filtering fabric

12 36 23.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

A. For kitchenette in break room.

B. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.

C. Grade: Custom

D. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.

E. Core Material: MDF made with exterior glue or exterior-grade plywood.

12 48 13 - ENTRANCE FLOOR MATS AND FRAMES

A. Provided by using agency.

B. Installed by Contractor.

C. Roll-up removable mats.

DIVISION 13: SPECIAL CONSTRUCTION

13 34 19 - METAL BUILDING SYSTEMS

A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

B. Manufacturer Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

C. Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 25 years from date of Substantial Completion.

D. Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

E. Performance Requirements

1. Delegated Design: Engage a qualified professional engineer to design metal building system.
2. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."
3. Design Loads: As indicated on Drawings.
4. Deflection and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."
5. Overall building deflection criteria must be limited to H/400. Any wind girts or members bracing masonry components are to limit deflection to L/600 min.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.

G. Fire-Resistance Ratings: Where assemblies are indicated to have a fire-resistance rating, provide metal panel assemblies identical to those of assemblies tested for fire resistance per ASTM E119 or ASTM E108 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory," FM Global's "Approval Guide," or from the listings of another qualified testing agency.

DIVISION 21: FIRE SUPPRESSION

SECTION 21 05 00 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

A. Pipe, fittings, and valves.

B. Connections for combination sprinkler and standpipe systems.

Valves

A. Gate Valves:
   1. Up to and including 2 inches: Bronze body and trim, rising stem, hand wheel, solid wedge or disc, threaded ends.
   2. Over 2 inches: Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid bronze or cast iron wedge, flanged or grooved ends.
   3. Over 4 inches: Iron body, bronze trim, non-rising stem with bolted bonnet, solid bronze wedge, flanged ends, iron body indicator post assembly.

B. Globe or Angle Valves:
   1. Up to and including 2 inches: Bronze body, bronze trim, rising stem and hand wheel, inside screw, renewable rubber disc, threaded ends, with back seating capacity packable under pressure.
   2. Over 2 inches: Iron body, bronze trim, rising stem, hand wheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.

C. Ball Valves:
   1. Up to and including 2 inches: Bronze two piece body, brass, chrome plated bronze, or stainless steel ball, teflon seats and stuffing box ring, lever handle, threaded ends.
   2. Over 2 inches: Manufacturers: Cast steel body, chrome plated steel ball, teflon seat and stuffing box seals, lever handle, flanged.

D. Butterfly Valves:
   1. Bronze Body: Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, hand wheel and gear drive and integral indicating device, and built-in tamper proof switch rated 10 amp at 115 volt AC.
   2. Cast or Ductile Iron Body: Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or grooved ends. With extended neck, hand wheel and gear drive and integral indicating device, and external tamper switch rated 10 amp at 115 volt AC.

E. Check Valves:
   1. Up to and including 2 inches: Bronze body and swing disc, rubber seat, threaded ends.
   2. Over 2 inches: Iron body, bronze trim, swing check with rubber disc, renewable disc and seat, flanged ends with automatic ball check.
   3. 4 inches and Over: Iron body, bronze disc with stainless steel spring, resilient seal, threaded, wafer, or flanged ends.

F. Drain Valves:
   1. Compression Stop: Bronze with hose thread nipple and cap.
   2. Ball Valve: Brass with cap and chain, 3/4 inch hose thread.

Above Ground Piping (Wet System)

A. Schedule 10 or 40 black steel Pipe: ASTM A53/A53M, Grade B; ASTM A135; ASTM A135 UL listed, threadable; ASTM A795; or ASME B36.10;.
   1. 2” and smaller: Schedule 40, threaded fittings or grooved fittings/couplings.
   2. 2-1/2” and larger: Schedule 10, grooved fittings/couplings.
   3. Steel Fittings: ASTM A234/A234M, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel socket welded and threaded.
   4. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings; ASME B16.4, threaded fittings.
   5. Malleable Iron Fittings: ASME B16.3, threaded fittings.
   6. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   7. Mechanical Formed Fittings: Carbon-steel housing with integral pipe stop and O-ring pocked and O-ring uniformly compressed into permanent mechanical engagement onto pipe.

Above Ground Piping (Dry System)

A. Schedule 10 or 40 Galvanized Steel Pipe, ASTM A53/A53M, Grade B; ASTM A135; ASTM A135 UL listed, threadable; ASTM A795; or ASME B36.10.
   1. 2” and smaller: Schedule 40, threaded galvanized fittings or grooved fittings/couplings.
   2. 2-1/2” and larger: Schedule 10, grooved fittings/couplings.
   3. Steel Fittings: ASTM A234/A234M, wrought carbon steel and alloy steel; ASME B16.5, steel flanges and fittings; ASME B16.11, forged steel threaded, galvanized.
   4. Malleable Iron Fittings: ASME B16.3, threaded fittings, galvanized.
   5. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

Fire Department Connection

A. Contractor shall coordinate the exact type of fire department connection with the Fire Department.
   1. Type: Flush mounted wall type.
   2. Outlets: Two way with thread size to suit fire department hardware; threaded dust cap and chain of matching material and finish or as required by city Fire Department.
   3. Drain: 3/4 inch automatic drip, outside.
   4. Label: "Sprinkler - Fire Department Connection".

Pipe Hangers and Supports

A. Conform to NFPA 13 and NFPA 14.

B. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.

C. Hangers for Pipe Sizes 2 inch and Over: Carbon steel, adjustable, clevis.

D. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

E. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

F. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

G. Vertical Support: Steel riser clamp.

H. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

SECTION 21 13 13 - WET-PIPE SPRINKLER SYSTEMS

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

Sprinklers

A. Provide quick response sprinkler heads for all applications.

B. Suspended Ceiling Type:
   1. Type: Concealed pendant type with matching push on escutcheon plate.
   2. Finish: Brass.
   3. Escutcheon Plate Finish: Chrome plated.
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Exposed Area Type:
   1. Type: Standard upright type.
   2. Finish: Brass or as selected by the architect.
   3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Side wall Type:
   1. Type: Semi-recessed horizontal side wall type with matching push on escutcheon plate.
   2. Finish: Brass.
   3. Escutcheon Plate Finish: Chrome plated.
   4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Guards: Finish to match sprinkler finish.

Piping Specialties

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with pressure retard chamber and variable pressure trim; with test and drain valve.

B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

C. Valve Supervisory Switches:
   1. Switch shall be contained in a weatherproof housing, which shall provide a ¾-inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
   2. Provide two sets of SPDT contacts, tamperproof, and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
   3. Switch housing to be finished in red enamel.
   4. Supervisory switches for ball and butterfly valves may be integral with the valve.

D. Pressure Switches:
   1. Provide with 1/2-inch NPT male pressure connection. Switch shall be activated by any flow of water equal to or in excess of the discharge form one sprinkler.

2. Maximum service rating of 175 psig, factory adjusted to operate at a pressure of 4 to 8 psi. Provide unit with two sets of SPDT contacts.
3. Furnish switch in red baked enamel, weatherproof, oil resistant housing with tamper resistant screws.

E. Automatic Ball Drips: Cast brass ¾-inch in-line automatic ball drip with both ends threaded with iron pipe threads.

F. Identification Signs: Provide control valves, drain valves, test and drain connections and alarm devices with identification signs (enamel on metal).

G. Self-Contained Test and Drain Assembly:
1. Ductile iron body with bronze “Drain” and “Test” valve bonnets. Acrylic sight glass for viewing test flow. Various sized orifice inserts to stimulate flow through each size diameter sprinkler heads, 1-1/4-inch female threaded outlets or 1-1/4-inch one-quarter turn locking lug outlets for plain end pipe (end preparation in accordance with manufacturers recommendation).
2. Bronze body, with chrome plated bronze ball, brass stem, steel handle, PTFE seat, and site glass. Provide valve with three position indicator plate (off, test, drain), 1/4-inch tapping for pressure gauge and various sized orifice inserts to simulate flow through each size diameter sprinkler heads.

Electrical Characteristics and Components

A. Controls: Supervisory switches, Water Level Supervisory Switches, Tank Temperature Supervisory Switches, Room Temperature Supervisory Switches.

SECTION 21 13 16 - DRY-PIPE SPRINKLER SYSTEMS

A. Dry-pipe sprinkler system.

B. System design, installation, and certification.

Sprinklers

A. Manufacturers:
1. Ansul Incorporated
2. Automatic Sprinkler Corp.
3. Grinnell Corp.
4. Reliable Sprinkler Corp.

B. Suspended Ceiling Type:
1. Type: Concealed pendant type with matching push on escutcheon plate.
2. Finish: Chrome plated.
3. Escutcheon Plate Finish: Chrome plated.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

C. Exposed Area Type:
1. Type: Standard upright type.
2. Finish: Brass or as selected by the architect.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Side wall Type:
1. Type: Semi-recessed horizontal side wall type.
2. Finish: Chrome plated.

3. Escutcheon Plate Finish: Chrome plated.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.

E. Specific Application Type (Attic – where applicable):
1. Type: Back to Back Attic Sprinkler.
2. Finish: Brass.
3. Fusible Link: Glass bulb type temperature rated for specific area hazard.

F. Guards: Finish to match sprinkler finish.

Piping Specialties

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm and electric alarm, with accelerator; with test and drain.

B. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy red enameled gong and motor housing, nylon bearings, and inlet strainer.

C. Electric Alarm: Electrically operated red enameled gong with pressure alarm switch.

D. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

Air Compressor

A. Riser mounted compressor.

B. Compressor: Single unit, electric motor driven, motor, motor starter, safety valves, check valves, air maintenance device incorporating electric pressure switch and unloading valve.

Electrical Characteristics and Components

A. Controls: Supervisory switches, Water Level Supervisory Switches, Room Temperature Supervisory Switches.

B. Disconnect Switch: Factory mount in control panel.

SECTION 21 05 48 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

A. Inertia bases and vibration isolators.

SECTION 21 05 13 - COMMON MOTOR REQUIREMENTS FOR FIRE-SUPPRESSION EQUIPMENT

A. Single- and three-phase motors for application on equipment provided under other sections.

DIVISION 22: PLUMBING

SECTION 22 05 13 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

A. Single- and three-phase motors for application on equipment provided under other sections.

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

A. Pipe hangers and supports.

B. Hanger rods.

C. Inserts.

D. Flashing.

E. Sleeves.

F. Mechanical sleeve seals.

G. Formed steel channel.

H. Firestopping relating to plumbing work.

I. Firestopping accessories.

J. Equipment bases and supports.

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

F. Labels.

G. Lockout devices.

SECTION 22 07 00 - PLUMBING INSULATION

A. Piping system insulation.

B. Equipment insulation.

C. Pipe insulation jackets.

D. Equipment insulation jackets.

E. Insulation accessories including vapor retarders and accessories.

SECTION 22 11 00 – FACILITY WATER DISTRIBUTION

Domestic Water Piping, Below Grade

A. Copper Tubing: ASTM B88, Type L, drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.

2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

Domestic Water Piping, Above Grade

A. Copper Tubing: ASTM B88, Type L, drawn.
   1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
   2. Joints: ASTM B32, Alloy Grade Sb5 tin-antimony, or Alloy Grade Sn95 tin-silver, lead free solder.

Flue and Combustion Air Piping

A. Stainless Steel Duct or PVC pipe as required by the water heater manufacturer.

Unions and Flanges

A. Unions for Pipe 2 inches and Smaller:
   1. Copper Piping: Class 150, bronze unions with soldered
   2. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flanges for Pipe 2-1/2 inches and Larger:
   1. Copper Piping: Class 150, slip-on bronze flanges.
   2. Gaskets: 1/16 inch thick preformed neoprene gaskets.

Globe Valves

A. 2 inches and Smaller: Class 125 SWP, bronze body, bronze trim, threaded bonnet, hand wheel, Buna-N composition disc, threaded ends.

B. 2-1/2 inches and Larger: Class 125 SWP, cast iron body, bronze trim, hand wheel, outside screw and yoke, flanged ends.

Ball Valves

A. 2 inches and Smaller: Class 150, bronze, two piece body, stainless steel ball, full port, teflon seats, blow-out proof stem, threaded ends, lever handle.

Butterfly Valves

A. 2-1/2 inches and Larger: Class 150.
   1. Body: Cast or ductile iron, wafer ends, stainless steel stem, extended neck.
   2. Disc: Aluminum bronze.
   3. Seat: Resilient replaceable EPDM.
   4. Handle and Operator: 10 position lever handle.

Check Valves

A. Horizontal Swing Check Valves:
   1. 2 inches and Smaller: Class 150, bronze body and cap, bronze seat, Buna-N disc, threaded ends.
   2. 2-1/2 inches and Larger: Class 125, cast iron body, bolted cap, bronze or cast iron disc, renewable disc seal and seat, flanged ends.

B. Spring Loaded Check Valves:

1. 2 inches and Smaller: Class 250, bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, threaded ends.
2. 2-1/2 inches and Larger: Class 125, wafer style, cast iron body, bronze seat, center guided bronze disc, stainless steel spring and screws, flanged ends.

Pressure Gages

A. Gage: ASME B40.1, UL 393 with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   1. Case: Stainless steel.
   2. Bourdon Tube: Phosphor bronze.
   3. Dial Size: 3-1/2 inch diameter.
   4. Mid-Scale Accuracy: One percent.
   5. Scale: Psi.

Pressure Gage Taps

A. Ball Valve: Brass 1/4 inch NPT for 250 psi.

B. Pulsation Damper: Pressure snubber, brass with 1/4 inch NPT connections.

Stem Type Thermometers

A. Thermometer: ASTM E1, red appearing mercury, lens front tube, cast aluminum case with enamel finish.
   1. Size: 9 inch scale.
   2. Window: Clear Lexan.
   3. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.
   4. Accuracy: ASTM E77, 2 percent.
   5. Calibration: Degrees F.

Water Pressure Reducing Valves

A. 2 inches and Smaller: Bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded and single union ends.

B. 2 inches and Larger: cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.

Relief Valves

A. Pressure Relief:
   1. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated at maximum 60 psi, UL listed for fuel oil, capacities ASME certified and labeled.

B. Temperature and Pressure Relief:
   1. ANSI Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME certified and labeled.

Strainers

A. 2 inch and Smaller: Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.

B. 1-1/2 inch to 4 inch: Class 125, flanged iron body, Y pattern with 1/16-inch stainless steel perforated screen.

Hydrants

A. Wall Hydrant, WH: ASSE 1019; non-freeze, self-draining type with chrome plated hose thread spout, lock shield and removable key, and integral vacuum breaker.

Backflow Preventers

A. Reduced Pressure Backflow Preventers (Fire Protection Service):
   1. Comply with ASSE 1013.
   2. Bronze body, with bronze internal parts and stainless steel springs.
   3. Two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve opening under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

B. Double Check Valve (Large Hose Valves/HVAC/Ice Maker):
   1. Comply with ASSE 1015.
   2. Bronze body, with corrosion resistant internal parts and stainless steel springs.
   3. Two independently operating check valves with intermediate atmospheric vent.

Recessed Valve Box

A. Refrigerator: Plastic preformed rough-in box with brass valves with wheel handle slip in finishing cover.

Thermostatic Mixing Valves

A. System Valve:
   1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment. Conform to ASSE 1070 to temper water to maximum 140 degrees F.
   2. Maximum Pressure Drop: 5 psi at 20 gpm.
   3. Accessories:
      a. Check valve on inlets.
      b. Volume control shut-off valve on outlet.
      c. Stem thermometer on outlet.

B. Point of Use (Single Fixture).
   1. Valve: Bronze body, stainless steel springs, integral temperature adjustment with vandal resistant lock screw, maximum operating pressure of 125 psi, compression connection.
   2. Capacity: 0.5 GPM.
   3. Accessories:
      a. Integral check stops on inlets.
      b. Cold water bypass.
      c. Mounting bracket.

C. Point-of-Use (Multiple Fixtures):
   1. Valve: Bronze or rough brass body, stainless steel or copper alloy bellows, screwdriver temperature adjustment dial with scale, maximum operating pressure of 125 psi, threaded or solder connection.
   2. Capacity: 0.5 minimum/6.0 maximum GPM. As required based on number of fixtures served.

3. Accessories:
    a. Combination integral check stops on inlets.
    b. Volume control shut-off valve on outlet.

Diaphragm-Type Compression Tanks

A. Construction: Welded steel, tested and stamped in accordance with ASME Section VIII; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gage and air-charging fitting, tank drain; pre-charge to 12 psig.

In-Line Circulator Pumps

A. Casing: Bronze rated for 125 psig working pressure.

B. Impeller: Bronze.

C. Shaft: Alloy steel with integral thrust collar and two, oil lubricated bronze sleeve bearings.

D. Seal: Carbon rotating against stationary ceramic seat.

E. Drive: Flexible coupling.

SECTION 22 13 00 – FACILITY SANITARY SEWERAGE

Sanitary Sewer Piping, Buried Within 5 Feet Of Building

A. Cast Iron Soil Pipe: ASTM A74, plain ends.
    1. Fittings: Cast iron, ASTM A74.
    2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hub-less.
    1. Fittings: Cast iron, CISPI 301.
    2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

C. Plastic Pipe: ASTM D2665, polyvinyl chloride (PVC) material.
    1. Fittings: PVC, ASTM D2665.
    2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

Sanitary Sewer Piping, Above Grade

A. Cast Iron Pipe: ASTM A74, service weight.
    1. Fittings: Cast iron, ASTM A74.
    2. Joints: ASTM C564, rubber gasket joint devices or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hub-less, service weight.
    1. Fittings: Cast iron, CISPI 301.
    2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. PVC Pipe: ASTM D2665, polyvinyl chloride (PVC) material.
    1. Fittings: ASTM D2665, PVC.
    2. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

Unions and Flanges

A. Unions for Pipe 2 inches and Smaller:
   1. PVC Piping: PVC.

B. Flanges for Pipe 2-1/2 inches and Larger:
   1. PVC Piping: PVC flanges.
   2. Gaskets: 1/16 inch thick preformed neoprene gaskets.

C. PVC Pipe Materials: For connections to equipment and valves with threaded connections, furnish solvent-weld socket to screwed joint adapters and unions, or ASTM D2464, Schedule 80, threaded, PVC pipe.

Floor Drains

A. Floor Drain (FD-1): ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and 6 inch round, adjustable nickel-bronze strainer.

B. Floor Drain (FD-2): ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and 12 inch round, adjustable nickel-bronze strainer.

C. Floor Drain (FD-3): ASME A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and 6" round, adjustable nickel-bronze strainer with 4” diameter funnel.

D. Floor Drain (FD-4): ASME A112.21.1; ; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and 6" round, adjustable nickel-bronze strainer and sediment bucket.

E. Floor Drain (FD-5): ASME A112.21.1; ; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and 6" round, adjustable nickel-bronze strainer with protective cover.

Trench Drains

A. Trench Drain (TD): Polyester polymer concrete with 14,000 psi compressive strength, frost proof, salt proof – B117 Salt spray test, 8” wide (nominal), modular channel body with interlocking ends, radiused bottom, and 0.6-0.75% built-in slope. Grate Openings: Monolithically cast as part of trench drain body with 30% openings.

B. Accessories:
   1. Closed End caps.
   2. Bottom Outlet.
   3. Access Channels.
   4. Outlet channels.

Oil Interceptors

A. Construction:
   1. Material: Epoxy coated fabricated steel.
   2. Rough in: Flush with floor (deep rough-in) installation with anchor flange.

B. Accessories: Integral deep seal trap, removable integral flow control, adjustable draw-off assembly, sediment bucket.

C. Cover: Steel, epoxy coated, non-skid with gasket, securing handle, and enzyme injection port recessed for floor finish.

D. Unit Rating: 125 gpm flow and 150 gal. water capacity, 3” outlet.

Cleanouts

A. Interior Finished Floor Areas (CO): Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round scored cover with gasket in service areas and round depressed cover with gasket to accept floor finish in finished floor areas.

B. Interior Finished Wall Areas (WCO): Line type with lacquered cast iron body and round epoxy coated cover with gasket, and round stainless steel access cover secured with machine screw.

C. Interior Unfinished Accessible Areas (LCO): Calked or threaded type.

D. Exterior Areas (YCO): Line type with lacquered cast iron body and round epoxy coated cover with gasket.

Bedding and Cover Materials

A. Bedding: Fill Type A6.

B. Cover: Fill Type A6.

C. Backfill from Above Pipe to Finish Grade: Fill Type A6.

SECTION 22 14 00 – FACILITY STORM SEWERAGE

A. Storm sewer piping buried within 5 feet of building.

B. Strom sewer piping above grade.

C. Unions and flanges.

D. Combination Roof drains.

E. Downspout nozzles.

F. Cleanouts.

G. Bedding and cover materials.

SECTION 22 34 00 – FUEL FIRED DOMESTIC WATER HEATERS

A. Instantaneous gas fired water heaters.

Commercial Gas Fired Water Heaters

A. Type: Commercial, Automatic, natural gas-fired, high-efficiency, condensing, tankless on-demand, direct-vented.

B. Capacity: As scheduled on drawings.

C. Certification: ANSI Z21.10.3.

D. Heating: Copper/Stainless steel heat exchanger.

E. Controls: Automatic water thermostat, temperature range adjustable from 100 to 180 degrees F. Communication cable to link multiple units and operate them simultaneously.

F. Intake and Flue vent with PVC venting.

G. Built-in safety controls to monitor exhaust temperature.

H. Electric ignition. Built-in freeze protection sensors, auto-firing system and heating blocks.

I. Manufacturer's safety relief valve.

SECTION 22 40 00 - PLUMBING FIXTURES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Sinks.

E. Service sinks.

F. Electric water coolers.

G. Showers.

DIVISION 23: HEATING, VENTILATING, AND AIR CONDITIONING

SECTION 23 05 13 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

A. Single- and three-phase motors for application on equipment provided under other sections.

SECTION 23 05 16 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

A. Flexible pipe connectors.

B. Expansion joints.

C. Expansion compensators.

D. Pipe alignment guides.

E. Swivel joints.

F. Pipe anchors.

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

A. Hanger rods.

B. Inserts.

C. Flashing.

D. Sleeves.

E. Formed steel channel.

F. Firestopping relating to HVAC work.

G. Firestopping accessories.

H. Equipment bases and supports.

I. Pipe hangers and supports.

J. Mechanical sleeve seals.

K. Duct hangers and supports.

L. Equipment curbs.

SECTION 23 05 48 - VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

A. Inertia bases.

B. Vibration isolators.

SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

A. Nameplates.

B. Tags.

C. Stencils.

D. Pipe markers.

E. Ceiling tacks.

F. Labels.

G. Lockout devices

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

A. Testing adjusting, and balancing of hydronic systems.

B. Testing adjusting, and balancing of air systems.

SECTION 23 07 00 - HVAC INSULATION

C. Equipment insulation.

D. Equipment insulation jackets.

E. Insulation accessories including vapor retarders and accessories.

F. Piping system insulation.

G. Pipe insulation jackets.

H. Ductwork insulation.

I. Ductwork insulation jackets.

SECTION 23 08 00 - COMMISSIONING OF HVAC

A. HVAC commissioning responsibilities.

SECTION 23 09 00 - INSTRUMENTATION AND CONTROL FOR HVAC

A. Control panel enclosures.

B. Humidistats.

C. Thermostats.

D. Control air dampers.

E. Electric damper actuators.

F. Control valves.

G. Electric valve actuators.

H. Outside air measuring and modulation device.

I. Direct digital control system components.

J. Differential pressure monitor.

SECTION 23 09 23 - DIRECT-DIGITAL CONTROLS

A. Contractor shall provide control equipment and software as required for a complete and operational, stand-alone control system.

System Description

A. The contractor shall provide a web based Building Automation Controls System compatible with Tridium N4 Framework.

B. Network controller(s) provided under this contract shall connect to field devices via BACnet/MSTP field bus and provide all Building level integration/supervisory functionality as well as serve up graphics. All control sequences and graphics shall therefore reside on building Network controller(s) in fully distributed control architecture.

C. The license supplied with JACE controller(s) shall be completely open for integration with the Tridium server and workbench engineering toolset. JACE controller(s) provided under this

contract shall be open to any engineering tool and fully featured and licensed to communicate to other JACE controllers.

D. The Contractor shall surrender all programming files used in the project and shall guarantee that the products installed will be at current revisions, and provide updates for repairs made to software for 1 year.

E. All controllers performing algorithmic calculations and control of the air-handling and other mechanical equipment shall have BACnet Class 3 performance as a minimum.

F. The sequence of operation for every system shall be included in the Building Automation System on the same screen showing that system graphic.

G. All BACnet devices shall include all hardware and software necessary to integrate the controls with the BACnet over Ethernet or IP network and meet the systems functional specification.

H. Any BACnet device that exists on a common BACnet inter-network must have a unique address, referred to as its Device Instance. Coordinate the Device Instance numbering system with the Owner.

I. Mechanical equipment controllers shall be connected to the system through the local network to the system backbone, provide all BACnet System defined functionality for each piece of mechanical equipment. The operator shall have direct access to all network devices at this point of entry.

J. The HVAC temperature control hardware will be native BACNet. The native BACnet means that the database objects in the controller can be seen by other BACnet systems.

K. All BACnet wiring must be shielded 22 AWG Level 4.

L. Provide computer software, hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

M. Provide controls for air-handling units, variable air volume terminals, pre-heat and reheat coils, pumps, boilers and air-cooled chillers, when directly connected to control units.

N. Provide control systems consisting of thermostats, space temperature sensors, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories to operate mechanical systems, and to perform functions specified.

O. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

Direct Digital Controls

A. Manufacturers:
   1. Schneider Electric
   2. Siemens
   3. Distech Controls
   4. American Auto-matrix
   5. Alpha Controls
   6. Johnson Controls (FX-PCG controller, BACnet MS/TP, Tridium N4)

Network Server

A. Load the Enterprise server software onto the user furnished, network connected personal computer. Furnish each operator workstation consisting of the following:

B. Workstation Client Hardware Stations: The system shall be capable of supporting at least 64 clients (minimum of 16 simultaneous users) using a standard Web browser such as Internet Explorer™ or Netscape Navigator™ operating on any standard computer that supports the current version of Internet Explorer™ or Netscape Navigator™.

C. Server Application Software: Include the following:

1. Input/output capability from operator station for monitoring and controlling all of the points listed in the input/output point list. The operator shall be able to monitor and access all points by means of clear concise English names without having to understand or reference hardware point locations or controller programs.

2. The server shall employ browser-like functionality for ease of navigation. It shall include a tree view (similar to Windows Explorer) for quick viewing of, and access to, the hierarchical structure of the database. In addition, menu-pull downs, and toolbars shall employ buttons, commands and navigation to permit the operator to perform tasks with a minimum knowledge of the HVAC Control System and basic computing skills. These shall include, but are not limited to, forward/backward buttons, home button, and a context sensitive locator line (similar to a URL line), that displays the location and the selected object identification.

3. Real-Time Displays. The server, shall at a minimum, support the following graphical features and functions:

    a. Graphic screens shall be developed using any drawing package capable of generating a GIF, BMP, or JPG file format. Use of proprietary graphic file formats shall not be acceptable. In addition to, or in lieu of a graphic background, the server shall support the use of scanned pictures.
    b. Graphic screens shall contain objects for text, real-time values, animation, color spectrum objects, logs, graphs, HTML or XML document links, schedule objects, hyperlinks to other URL's, and links to other graphic screens.
    c. Graphics shall support layering and each graphic object shall be configurable for assignment to one a layer. A minimum of six layers shall be supported.
    d. Modifying common application objects, such as schedules, calendars, and set points shall be accomplished in a graphical manner.
        1) Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
        2) Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

4. Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.
5. Adjustments to analog objects, such as set points, shall be done by right-clicking the selected object and using a graphical slider to adjust the value. No entry of text shall be required.
6. System Configuration. At a minimum, the server shall permit the operator to perform the following tasks, with proper password access:

    a. Create, delete or modify control strategies.
    b. Add/delete objects to the system.
    c. Tune control loops through the adjustment of control loop parameters.
    d. Enable or disable control strategies.
    e. Generate hard copy records or control strategies on a printer.
    f. Select points to be alarmable and define the alarm state.
    g. Select points to be trended over a period of time and initiate the recording of values automatically.

7. On-Line Help. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext. All system documentation and help files shall be in HTML format.
8. Security. Each operator shall be required to log on to that system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system administrator shall have the ability to set passwords and security levels for all other operators. Each operator password shall be able to restrict the operators' access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto log-off time shall be set per operator password. All system security data shall be stored in an encrypted format.
9. System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
10. Database Backup and Restore. The system shall automatically back up each Universal Network Controller's (UNC) database on a defined frequency. If the system senses a loss of a UNC database, the Workstation shall automatically download and restore the archived database to the subject controller.
11. Archiving/Relational Database. The system shall provide a full relational database (ODBC, SQL or IBM) supporting multiple user access. Standard SQL Query statements shall be supported for access. All logs, alarms and operator commands/actions shall be automatically archived to the relational database. Database shall be ODBC compliant database or must be capable of supporting an ODBC data access mechanism to read and write data stored within it.
12. Alarm Console

    a. The system will be provided with a dedicated alarm window or console. This window will notify the operator of an alarm condition, and allow the operator to view details of the alarm and acknowledge the alarm. The use of the Alarm Console can be enabled or disabled by the system administrator.

D. When the Alarm Console is enabled, a separate alarm notification window will supercede all other windows on the desktop and shall not be capable of being minimized or closed by the operator. This window will notify the operator of new alarms and un-acknowledged alarms.

E. Web Browser Clients

1. The system shall be capable of supporting at least 64 clients using a standard Web browser such as Internet Explorer™ or Netscape Navigator™. Systems requiring additional software (to enable a standard Web browser) to be resident on the client machine, are only acceptable if 64 licensed copies of the client machine software are provided, installed, and tested.
2. The Web browser software shall run on any operating system and system configuration that is supported by the Web browser. Systems that require specific machine requirements in terms of processor speed, memory, etc., in order to allow the Web browser to function with the FMCS, shall only be acceptable if 64 workstation or workstation hardware upgrades are provided.
3. The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different views or that require different means of interacting with objects such as schedules, or logs, shall not be permitted.
4. The Web browser client shall support at a minimum, the following functions:

a. User log-on identification and password shall be required. If an unauthorized user attempts access, a blank web page shall be displayed. Security using Java authentication and encryption techniques to prevent unauthorized access shall be implemented.

b. Graphical screens developed for the server shall be the same screens used for the Web browser client. Any animated graphical objects supported by the server shall be supported by the Web browser interface.

c. HTML programming shall not be required to display system graphics or data on a Web page. HTML editing of the Web page shall be allowed if the user desires a specific look or format.

d. Storage of the graphical screens shall be in the Building Control Units, without requiring any graphics to be stored on the client machine. Systems that require graphics storage on each client are not acceptable.

e. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.

f. Users shall have administrator-defined access privileges. Depending on the access privileges assigned, the user shall be able to perform the following:

(1)Modify common application objects, such as schedules, calendars, and set points in a graphical manner.
Schedule times will be adjusted using a graphical slider, without requiring any keyboard entry from the operator.
Holidays shall be set by using a graphical calendar, without requiring any keyboard entry from the operator.

(2)Commands to start and stop binary objects shall be done by right-clicking the selected object and selecting the appropriate command from the pop-up menu. No entry of text shall be required.

(3)View logs and charts

(4)View and acknowledge alarms

g. The system shall provide the capability to specify a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to just their defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

h. Graphic screens the Web Browser client shall support hypertext links to other locations on the Internet or on Intranet sites, by specifying the Uniform Resource Locator (URL) for the desired link. As a minimum they shall include link to locations for fan/motors/belt information, air filter information, building plan files etc.

Universal Network Controllers (UNC)

A. The Universal Network Controllers (UNC) shall provide the interface between the LAN or WAN and the field control devices, and provide global supervisory control functions over the control devices connected to the UNC. It shall be capable of executing application control programs to provide:
   1. Calendar functions.
   2. Scheduling.
   3. Trending.
   4. Alarm monitoring and routing.
   5. Time synchronization by means of an Atomic Clock Internet site including automatic synchronization.
   6. Integration of BACnet controller data.

B. The Universal Network Controllers must provide the following hardware features as a minimum:
   1. One Ethernet Port – 10/100 Mbps.
   2. One RS-232 port.

3. Battery Backup.
4. Flash memory for long term data backup (If battery backup or flash memory is not supplied, the controller must contain a hard disk with at least 1 gigabyte storage capacity).

C. UNC shall provide the capability for multiple user access to the system and support for relational database access (ODBC, SQL or IBM). A database resident on the UNC shall be ODBC compliant database or must be capable of supporting an ODBC data access mechanism to read and write data stored within it.

D. UNC shall provide the capability to support standard Web browser access via the Intranet/Internet. It shall support a minimum of 16 simultaneous users.

E. Event Alarm Notification and actions:
1. The UNC shall provide alarm recognition, storage; routing, management, and analysis to supplement distributed capabilities of equipment or application specific controllers.
2. The UNC shall be able to route any alarm condition to any defined user location whether connected to a local network or remote via dial-up telephone connection, or wide-area network.
3. Alarm generation shall be selectable for annunciation type and acknowledgement requirements including but limited to:
    a. To alarm
    b. Return to normal
    c. To fault
4. Provide for the creation of a minimum of eight of alarm classes for the purpose of routing types and or classes of alarms, i.e.: security, HVAC, Fire, etc.
5. Provide timed (schedule) routing of alarms by class, object, group, or node.
6. Provide alarm generation from binary object “runtime” and /or event counts for equipment maintenance. The user shall be able to reset runtime or event count values with appropriate password control.
7. Control equipment and network failures shall be treated as alarms and annunciated.
8. Alarms shall be annunciated in any of the following manners as defined by the user:
    a. Screen message text
    b. Email of the complete alarm message to multiple recipients. Provide the ability to route and email alarms based on:
        1) Day of week
        2) Time of day
        3) Recipient
9. Pagers via paging services that initiate a page on receipt of email message.
10. Graphic with flashing alarm object(s).
11. Printed message, routed directly to a dedicated alarm printer.
12. The following shall be recorded by the UNC for each alarm (at a minimum):
    a. Time and date
    b. Location (building, floor, zone, office number, etc.)
    c. Equipment (air handler #, pump #, etc.)
    d. Acknowledge time, and date, and user who issued acknowledgement.
    e. Number of occurrences since last acknowledgement.
13. Alarm actions may be initiated by user defined programmable objects created for that purpose.
14. Defined users shall be given proper access to acknowledge any alarm, or specific types or classes of alarms defined by the user.
15. A log of all alarms shall be maintained by the UNC and/or a server (if configured in the system) and shall be available for review by the user.
16. Provide a “query” feature to allow review of specific alarms by user defined parameters.
17. A separate log for system alerts (controller failures, network failures, etc.) shall be provided and available for review by the user.

18. An Error Log to record invalid property changes or commands shall be provided and available for review by the user.

F. Data Collection and Storage
   1. The UNC shall have the ability to collect data for any property of any object and store this data for future use.
   2. The data collection shall be performed by log objects, resident in the UNC that shall have, at a minimum, the following configurable properties:
      a. Designating the log as interval or deviation.
      b. For interval logs, the object shall be configured for time of day, day of week and the sample collection interval.
      c. For deviation logs, the object shall be configured for the deviation of a variable to a fixed value. This value, when reached, will initiate logging of the object.
      d. For all logs, provide the ability to set the maximum number of data stores for the log and to set whether the log will stop collecting when full, or rollover the data on a first-in, first-out basis.
      e. Each log shall have the ability to have its data cleared on a time-based event or by a user-defined event or action.

G. All log data shall be stored in a relational database in the UNC and the data shall be accessed from a server (if the system is so configured) or a standard Web Browser.

H. All log data, when accessed from a server, shall be capable of being manipulated using standard SQL statements.

I. All log data shall be available to the user in the following data formats:
   1. HTML
   2. XML
   3. Plain Text
   4. Comma or tab separated values

J. Systems that do not provide log data in HTML and XML formats at a minimum shall provide as an alternative Microsoft SQL Server®, Oracle 8i or Express®, Hyperion Solutions™ SQL Server.

K. The UNC shall have the ability to archive its log data either locally (to itself), or remotely to a server or other UNC on the network. Provide the ability to configure the following archiving properties, at a minimum:
   1. Archive on time of day
   2. Archive on user-defined number of data stores in the log (buffer size)
   3. Archive when log has reached its user-defined capacity of data stores
   4. Provide ability to clear logs once archived

L. AUDIT LOG
   1. Provide and maintain an Audit Log that tracks all activities performed on the UNC. Provide the ability to specify a buffer size for the log and the ability to archive log based on time or when the log has reached its user-defined buffer size. Provide the ability to archive the log locally (to the UNC), to another UNC on the network, or to a server. For each log entry, provide the following data:
      a. Time and date
      b. User ID
      c. Change or activity: i.e., Change setpoint, add or delete objects, commands, etc.

M. DATABASE BACKUP AND STORAGE

1. The UNC shall have the ability to automatically backup its database. The database shall be backed up based on a user-defined time interval.
2. Copies of the current database and, at the most recently saved database shall be stored in the UNC and in the primary Server. The age of the most recently saved database is dependent on the user-defined database save interval.
3. The UNC database shall be stored, at a minimum, in XML format to allow for user viewing and editing, if desired. Other formats are acceptable as well, as long as XML format is supported.

Local Area Networks (LAN)

A. Capacity for a minimum of 64 client workstations connected to multiuser, multitasking environment with concurrent capability to access DDC network or control units.
   1. Enterprise Network LAN
      a. Media: Ethernet (IEEE 802.3), peer-to-peer CSMA/CD, operating at 10 or 100 Mbps, cable 10 Base-T, UTP-8 wire, category 5
   2. Remote Connection
      a. ISDN, ADSL, T1 or dial-up connection, monthly charges paid by building owner

Custom Application Control Units (CAC)

A. Modular, comprising processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control applications. CAC's shall be provided for Roof Top Units, Boiler Plant, Chiller Plant and other applications as shown on drawings and shall have device resource files and external interface definitions:
   1. Units monitor or control each input/output point; process information; and at least 50 expressions for customized HVAC control including mathematical equations, boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, enthalpy calculation, counters, interlocks, ramps, drivers, schedules, calendars, OSS, compare, limit, curve fit, and alarms.
   2. Stand alone mode control functions operate regardless of network status. Functions include the following:
      a. Automatic communications loss detection to maintain normal control functionality regardless of available network communications.
      b. Discrete/digital, analog, and pulse input/outputs.
      c. Monitoring, controlling, or addressing data points.
      d. Local energy management control strategies.

B. Local operator interface port provides for download from and connection to portable workstation.

C. Communication: The Custom Application Controller shall communicate via the Primary Controller Network between BMS Controllers. CAC's shall communicate with the UNC's and ASC's at a baud rate of not less than 78.8K baud using communications protocol (EIA 709.1).

D. All CAC's shall support the portable workstation to provide uploading/downloading of Custom Application Controller databases, monitoring of all Standard Network Variables Types (SNVTs) including display of all bound SNVTs, monitoring and overrides of all controller physical input/output points, and editing of controller resident time schedules. POT connectivity shall be via digital wall sensor connected to controller.

E. The Controls Contractor shall provide a Data Table showing all DDC points and information pertaining to all points. The tables shall reference points with respect to the names established on the project drawings and specifications.

F. The Controls Contractor shall provide network cable to the Integrator's Universal Network Controller by leaving minimum of 10' of coiled cable at the NCU. Final connection to the NCU will be by the Integrator.

Application Specific Control Units (ASC)

A. Single board construction comprising processor board with programmable, nonvolatile, RAM/EEPROM memory for custom control and unitary applications. ASCs shall be provided for Unit Ventilators, Fan Coils, Heat Pumps, VAV Terminal Boxes, Rooftop Units and other applications as shown on the drawings. ASCs shall be based on the Echelon Neuron 3150 microprocessor working with the ASCs stand alone control program.
   1. Units monitor or control each input/output point; process information; and download from the operator station.
   2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
      a. Peer to peer primary network level communications with automatic communications loss detection to maintain normal control functionality regardless of available network communications.
      b. Discrete/digital, analog, and pulse input/output.
      c. Monitoring, controlling, or addressing data points.
   3. The local operator interface ports located on ASC and ASC sensors provide for download from, or upload to portable workstation.
   4. Communication: ASC's shall communicate with the UNC's and CAC's at a baud rate of not less than 78.8K baud using communications protocol (EIA 709.1).
   5. ASC units monitor or control each input/output point; process information; and at least 50 expressions for customized HVAC control including mathematical equations, boolean logic, PID control loops with anti-windup, sequencers, timers, interlocks, thermostats, counters, interlocks, compare, limit, and alarms.
   6. All ASC Controller setpoints shall be digital display setpoints with dual setpoint limits (integral hard limits which the user cannot exceed above and below and independent soft limits which are hidden from the user). All digital setpoints shall be network retentive after power outages and after replacement of sensor.
   7. All ASC's shall support the portable workstation to provide uploading/downloading of Application Specific Controllers databases, Standard Network Variables Types (SNVTs) including display of all bound SNVTs, monitoring and overrides of all controller physical input/output points, and editing of controller resident time schedules. POT connectivity shall be via digital wall sensor connected to controller.

HVAC Control Programs

A. General:
   1. Use Inch-pound measurement and have S.I. (metric) units of measurement available.
   2. Identify each HVAC Control system.

B. Optimal Run Time:
   1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
   2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
   3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
   4. Use outside air temperature to determine early shut down with ventilation override.
   5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.
   6. Operator commands:
      a. Define term schedule.

b. Add/delete fan status point.
c. Add/delete outside air temperature point.
d. Add/delete mass temperature point.
e. Define heating/cooling parameters.
f. Define mass sensor heating/cooling parameters.
g. Lock/unlock program.
h. Request optimal run-time control summary.
i. Request optimal run-time mass temperature summary.
j. Request HVAC point summary.
k. Request HVAC saving profile summary.

7. Control Summary:
   a. HVAC Control system begin/end status.
   b. Optimal run time lock/unlock control status.
   c. Heating/cooling mode status.
   d. Optimal run time schedule.
   e. Start/Stop times.
   f. Selected mass temperature point ID.
   g. Optimal run-time system normal start-times.
   h. Occupancy and vacancy times.
   i. Optimal run time system heating/cooling mode parameters.
8. Mass temperature summary:
   a. Mass temperature point type and ID.
   b. Desired and current mass temperature values.
   c. Calculated warm-up/cool-down time for each mass temperature.
   d. Heating/cooling season limits.
   e. Break point temperature for cooling mode analysis.
9. HVAC point summary:
   a. Control system identifier and status.
   b. Point ID and status.
   c. Outside air temperature point ID and status.
   d. Mass temperature point ID and status.
   e. Calculated optimal start and stop times.
   f. Period start.

C. Supply Air Reset:
1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot deck and cold deck temperatures on dual duct and multizone systems, single zone unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
   a. Raising cooling temperatures to highest possible value.
   b. Reducing heating temperatures to lowest possible level.
3. Operator commands:
   a. Add/delete fan status point.
   b. Lock/unlock program.
   c. Request HVAC point summary.
   d. Add/Delete discharge controller point.
   e. Define discharge controller parameters.
   f. Add/delete air flow rate.
   g. Define space load and load parameters.
   h. Request space load summary.
4. Control summary:
   a. HVAC control system status (begin/end).
   b. Supply air reset system status.
   c. Optimal run time system status.
   d. Heating and cooling loop.

e. High/low limits.
f. Deadband.
g. Response timer.
h. Reset times.

5. Space load summary:
   a. HVAC system status.
   b. Optimal run time status.
   c. Heating/cooling loop status.
   d. Space load point ID.
   e. Current space load point value.
   f. Control heat/cool limited.
   g. Gain factor.
   h. Calculated reset values.
   i. Fan status point ID and status.
   j. Control discharge temperature point ID and status.
   k. Space load point ID and status.
   l. Airflow rate point ID and status.

Programming Application Features

A. Trend Point:
   1. Output trend logs as line-graphs or bar graphs. Output graphic on terminal, with each point for line and bar graphs designated with a unique pattern and color, vertical scale either actual values or percent of range, and horizontal scale time base. Print trend logs up to 12 columns of one point/column.

B. Alarm Messages:
   1. Assign alarm messages to system messages including point's alarm condition, point's off-normal condition, totaled point's warning limit, hardware elements advisories.
   2. Output assigned alarm with "message requiring acknowledgment".
   3. Operator commands include define, modify, or delete; output summary listing current alarms and assignments; output summary defining assigned points.

C. Weekly Scheduling:
   1. Automatically initiate equipment or system commands, based on selected time schedule for points specified.
   2. Program times for each day of week, for each point, with one minute resolution.
   3. Automatically generate alarm output for points not responding to command.
   4. Allow for holidays, minimum of 366 consecutive holidays.
   5. Operator commands:
      a. System logs and summaries.
      b. Start of stop point.
      c. Lock or unlock control or alarm input.
      d. Add, delete, or modify analog limits and differentials.
      e. Adjust point operation position.
      f. Change point operational mode.
      g. Open or close point.
      h. Enable/disable, lock/unlock, or execute interlock sequence or computation profile.
      i. Begin or end point totals.
      j. Modify total values and limits.
      k. Access or secure point.
      l. Begin or end HVAC or load control system.
      m. Modify load parameter.
      n. Modify demand limiting and duty cycle targets.
   6. Output summary: Listing of programmed function points, associated program times, and respective day of week programmed points by software groups or time of day.

D. Interlocking:
   1. Permit events to occur, based on changing condition of one or more associated master points.
   2. Binary contact, high/low limit of analog point or computed point capable of being used as master. Master capable of monitoring or commanding multiple slaves.
   3. Operator commands:
      a. Define single master/multiple master interlock process.
      b. Define logic interlock process.
      c. Lock/unlock program.
      d. Enable/disable interlock process.
      e. Execute terminate interlock process.
      f. Request interlock type summary.

SECTION 23 11 23 – FACILITY NATURAL GAS PIPING

A. Natural gas piping above grade.

B. Unions and flanges.

C. Valves.

D. Pipe hangers and supports.

E. Strainers.

F. Natural gas pressure regulators.

SECTION 23 15 00 – GENERAL SERVICE COMPRESSED AIR SYSTEMS

A. Compressed air piping.

B. Unions and flanges.

C. Valves.

D. Strainers.

E. Flexible connectors.

F. Relief valves.

G. Compressed air outlets.

H. Air pressure reducing valve.

I. Pressure regulators.

J. Compressed air filters.

K. Hose connectors.

L. Air Compressor with refrigerated cooler and dryer.

M. Air receiver.

SECTION 23 21 13 - HYDRONIC PIPING

A. Heating water piping, above ground.

B. Chilled water piping, above grade.

C. Equipment drains and over flows.

D. Unions and flanges.

E. Valves.

SECTION 23 21 16 - HYDRONIC PIPING SPECIALTIES

A. Pressure gages.

B. Pressure gage taps.

C. Thermometers.

D. Termometer supports.

E. Test plugs.

F. Diaphragm-type expansion tanks.

G. Air vents.

H. Air separators.

I. Strainers.

J. Pump suction fittings.

K. Flow meters.

L. Relief valves.

SECTION 23 21 23 - HYDRONIC PUMPS

A. In-line circulators.

SECTION 23 25 00 - HVAC WATER TREATMENT

A. System cleaner.

B. Closed system treatment (water).

C. Steam system treatment.

D. Chemical feeder equipment including associated feeders, pumps, tanks, controls, meters and valves.

E. Test equipment.

SECTION 23 31 00 - HVAC DUCTS AND CASINGS

A. Duct Materials.

B. Flexible ducts – maximum 5 foot length.

C. Insulated flexible ducts – maximum 5 foot length.

D. Single wall spiral round ducts.

E. Transverse duct connection system.

F. Casings.

G. Ductwork fabrication.

SECTION 23 32 00 – VEHICLE EXHAUST SYSTEMS

A. Vehicle Exhaust Ductwork.

B. Vehicle Exhaust Hose Reel.

C. Vehicle Exhaust Fan.

SECTION 23 33 00 - AIR DUCT ACCESSORIES

A. Back-draft dampers.

B. Duct access doors.

C. Static fire dampers.

D. Volume control dampers.

E. Flexible duct connections.

F. Duct test holes.

G. Static pressure gages.

SECTION 23 34 00 - HVAC FANS

A. Centrifugal fans.

B. Downblast centrifugal roof fans.

C. Upblast centrifugal roof fans.

D. Ceiling fans.

SECTION 23 36 00 - AIR TERMINAL UNITS

A. Variable volume terminal units.

SECTION 23 37 00 - AIR OUTLETS AND INLETS

A. Diffusers.

B. Registers

C. Grilles.

D. Door grilles.

E. Louvers.

F. Roof hoods.

SECTION 23 52 34 – HIGH EFFICIENCY CONDENSING BOILERS

High efficiency condensing boilers.

A. Product Description: natural gas packaged, modulating, sealed combustion, power-vented, high efficiency gas-fired boiler(s) with cast aluminum sectional heat exchangers.

B. Boiler(s) shall be 93% minimum I=B=R thermal efficient as required by BTS 2000.

C. Boiler shall be capable of full modulation firing with a turn down of up to 5 to 1.

D. Boiler(s) shall be manufactured by ISO 9001 registered company to conform to Section IV of the ASME Boiler and Pressure Vessel Code:
   1. Stainless Steel heat exchanger fire tested and hydrostatically pressure tested at factory in accordance with ASME requirements.
   2. Maximum allowable working pressure 80 PSIG water as listed on the rating label.
   3. Factory Assembled and Tested.

E. Boiler(s) main components:
   1. Sealed combustion chamber with separation from sediment and lime.
   2. Gas valve designed with negative pressure regulation.
   3. The burner shall be premix combustion type, made with stainless steel providing a wide range of modulating firing rates.
   4. Variable speed blower system, capable of modulating the boiler firing rate from 100% to 10%.
   5. Control feature to allow the air/fuel ratio through a minimum 5 to 1 turndown ratio.
   6. Electronic display for boiler set-up, boiler status, and boiler diagnostics.

F. Venting and Combustion Air:
   1. Capable of using outside air piped directly to boiler for combustion.
   2. The boiler shall be direct vent or direct exhaust using stainless steel, double wall venting.
   3. Integral condensate collector in the vent adapter to capture condensate from the vent system.

G. Boiler Trim
   1. All electrical components to be high quality manufacture and bear UL label.
   2. Boiler must be CSD-1 compliant with factory report for ASME CDS-1.
   3. Water boiler(s) controls furnished:
      a. High limit temperature control with manual reset 190 degrees F maximum allowable boiler water temperature.
      b. Combination pressure-temperature gauge. Gauge dial clearly marked and easy to read.
      c. ASME certified pressure relief valve, set to relieve at 30 PSIG.

d. Flue gas, outlet water temperature, and return water temperature sensors.
e. Low water protection with manual reset.
f. High and Low gas pressure switches with manual reset and indicator lights.
g. Built-in freeze protection.

4. Boiler Control to be UL 353 Listed with:
   a. Furnish interface to Direct Digital Control System. The unit shall be complete with BACnet communication interface that allows direct connection to the BAS network specified in 23 09 23. The controls interface shall allow access by the Direct Digital Controls system specified in 23 09 23 to all internal points available within the unit that can be accessed by the unit manufacturer.
   b. 4 pump contacts.
   c. Indoor outdoor reset.
   d. Interface for all control and sensor points.
   e. Variable temperature zone that requires NO MIXING valves.
   f. Multiple LCD digital temperature access points including supply, return, system temps, flug gas temp.
   g. LCD display and keypad access.
   h. Alarm contact includes flame failure, high temperature and low water cut off.
   i. Remote modulation capable for Multiple Boiler Systems and Building Automation Systems.
   j. Capable of controlling addition multiple boilers by either sending 0-10 volt DC signal or contact closure.

SECTION 23 55 00 – FUEL FIRED MAKE-UP AIR UNITS

Fuel Fired Packaged Air Units – Indirect Fired (MAU-1)

A. Selection:
   1. Heating: In-Direct fired
   2. Airflow arrangement: Recirculation
   3. Dampers: OA and RA control dampers panel controlled actuators.
   4. Filters: 4” MERV 14, sized for intake opening.
   5. Unit arrangement: Horizontal

B. Cabinet
   1. Construction: Double wall with insulated metal cabinet. Exterior panels shall be 18 gauge galvanized steel using internal frame design. Base rails shall be 12 gauge galvanized steel.
   2. Internal Insulation: In accordance with NFPA 90A and tested to meet UL 181 erosion requirements.
   3. Exterior Unit Coating: Corrosion resistant polyester coating meeting a minimum 750 hours according to ASTM B117 with a max creep of no more than 1/16" from either side of the scribe and with not more than 1/8' total maximum.
   4. Access: Hinged doors.
   5. Unit Arrangement: Horizontal.
   6. Discharge Arrangement: Front discharge.

C. Supply Air Fan
   1. Fan: Forward curved centrifugal fan; statically and dynamically balanced, mounted on ground and polished steel fan shafts with permanently lubricated ball bearings. Bearings shall be selected for a minimum L10 life in excess of 100,000 hours at maximum cataloged speeds.
   2. Motor: Permanently lubricated, heavy duty type, matched to the fan load, with EPACT / NEMA Premium 12-11 Table rated efficiency, with a TEFC enclosure. Mounted on an adjustable slide base.

3. Drives: V-Belt drive sized for a minimum of 150% of driven horsepower. Cast pulleys. Adjustable sheaves.
4. Mounting: Fan and motor mounted internally isolated neoprene isolators.
5. Air Flow Arrangement: Capability to be able to provide 100% OA. Operate in return air mode.
6. Outlet Sound Power Level: Maximum 73 dBA at a distance of 5 feet from the discharge.

D. In-Direct Fired Burner
1. Description: Tubular stainless steel heat exchanger with welded construction.
2. Single Furnace encased in weather-tight metal housing..
3. Fuel: Natural gas with a maximum rated inlet gas pressure of 5 psi. Gas pressure regulator shall be provided.
4. Temperature Control: Temperature control by an 8:1 Stage electronic modulating control. Amplifier to include a low fire time delay potentiometer and sensitivity potentiometer.
5. Flue Material: Type B Stainless steel.
6. Safety Controls:
   a. Manual Reset, High Limit Switch: Main gas valve closes if high-limit temperature is exceeded.
   b. Dual safety shutoff valves shall be provided that use 120 VAC control signals.

E. Evaporator Coil:
1. Constructed of seamless copper tubes mechanically expanded into aluminum fins. Factory leak tested under water.
2. Stainless Steel drain pan and piping connection.
3. Furnish for multiple circuited units intertwined row circuiting.

F. Compressors:
1. Hermetically sealed, resiliently mounted with positive lubrication, inverter type, and internal motor overload protection.
2. Factory charged with R-401A.
3. Independent refrigeration cycle for each compressor.
4. Furnish internal vibration isolators.
5. Furnish short cycle protection.
6. Crank cast heater, sight glass, anti-slug protection, time delay to avoid short cycling.

G. Unit Options
1. Dampers: Powered inlet and recirculating damper to allow for 100% EA recirculation. Upon loss of power or unit shutdown, damper shall close.
2. Supply air discharge plenum.
3. Mounting: Brackets, curbs, and attachments for mounting 5 units hung from above, 3 units with curb for floor mounting. Coordinate top or bottom RA inlet based on configuration.

H. Refrigeration circuit:
1. Dehydrate and factory charge each circuit with oil and refrigerant.
2. Furnish the following for each circuit:
   a. Thermostatic expansion device.
   b. Filter-drier.
   c. Suction, discharge, and liquid line service valves with gauge ports.
   d. Sight glass.
   e. High and low pressure safety controls.
3. Furnish capacity control by cycling multi-speed compressors.

I. Condenser:
1. Constructed of copper tubing mechanically bonded to aluminum fins. Factory leak tested under water.

2. Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Motor permanently lubricated with built-in thermal overload protection.
3. Furnish factory installed coil guard.
4. Furnish coil with corrosion resistant coating capable of withstanding salt spray test of 1000 hours in accordance with ASTM B117.

J. Electrical Controls
1. Control Center: Contains magnetic motor starter, 24 VAC control transformers, integral master disconnect switch, flame safeguard, amplifier, and other required components to accomplish control functions. Discharge temperature control shall be factory mounting in unit. Coordinate right hand/ left hand access to the control center.
2. Heating Inlet Air Sensor: Automatically turns the heat on and off based on a field adjustable set point.
3. Remote Starter Control Panel: NEMA 4 control panel to include motor starter, fuses, 24VAC control transformer for low voltage switching, disconnect switch, and terminal block for control wiring.
4. Access door interlock switch, alarm horn with silencer, low temperature limit, and clogged filter switch.

K. Mixing Dampers:
1. Dampers: Outside and return dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper fail to closed position.
2. Gaskets: Fit dampers with edge gaskets, maximum leakage 5 percent at 2 inches wg pressure differential.
3. Damper Operator: 24 volt with gear train sealed in oil with spring return.
4. Mixed Air Control Sequence: Maintain selected supply-air temperature and return dampers to minimum position on call for heating.

L. Controls: Adjustable, room thermostat, low voltage, to control burner operation to maintain space temperature setting.
1. Furnish interface to Direct Digital Control System. The unit shall be complete with communication interface that allows direct connection to the BACnet MSTP/IP network. The controls interface shall allow access by the Direct Digital Controls system to all internal points available within the unit that can be accessed by the unit manufacturer.
2. Control Functions: Furnish the following:
    a. Unit scheduling.
    b. Occupied-unoccupied mode.
    c. Start-up and coast-down modes.
    d. Demand limiting.
    e. Night setback.
    f. Timed override.
    g. Alarm shutdown.
    h. Discharge air set point adjustment.
    i. Static pressure setpoint adjustment.
3. Furnish the following setpoints and diagnostic functions accessible in unit control panel:
    a. Unit operating mode.
    b. Unit failure status.
    c. Supply fan start-stop.
    d. Supply fan status.
    e. Supply fan inlet guide vane position.
    f. Supply air temperature.
    g. Supply air temperature high-low limit with alarm.
    h. Return air temperature.
    i. Return air temperature high-low limit with alarm.
    j. Duct static pressure.
    k. Duct static pressure high-low limit with alarm.

l. Heating control.
m. Heating status.
n. Damper control.
o. Damper positions.
p. Filter status.
q. Smoke detector status.
r. Outside air temperature.

Fuel Fired Packaged Air Units – Indirect Fired (MAU-2)

A. Selection:
1. Heating: In-Direct fired
2. Airflow arrangement: Recirculation
3. Dampers: OA and RA control dampers panel controlled actuators.
4. Filters: 4” MERV 14, sized for intake opening.
5. Unit arrangement: Horizontal

B. Cabinet
1. Construction: Double wall with insulated metal cabinet. Exterior panels shall be 18 gauge galvanized steel using internal frame design. Base rails shall be 12 gauge galvanized steel.
2. Internal Insulation: In accordance with NFPA 90A and tested to meet UL 181 erosion requirements.
3. Exterior Unit Coating: Corrosion resistant polyester coating meeting a minimum 750 hours according to ASTM B117 with a max creep of no more than 1/16" from either side of the scribe and with not more than 1/8' total maximum.
4. Access: Hinged doors.
5. Unit Arrangement: Horizontal.
6. Discharge Arrangement: Front discharge.

C. Supply Air Fan
1. Fan: Forward curved centrifugal fan; statically and dynamically balanced, mounted on ground and polished steel fan shafts with permanently lubricated ball bearings. Bearings shall be selected for a minimum L10 life in excess of 100,000 hours at maximum cataloged speeds.
2. Motor: Permanently lubricated, heavy duty type, matched to the fan load, with EPACT / NEMA Premium 12-11 Table rated efficiency, with a TEFC enclosure. Mounted on an adjustable slide base.
3. Drives: V-Belt drive sized for a minimum of 150% of driven horsepower. Cast pulleys. Adjustable sheaves.
4. Mounting: Fan and motor mounted internally isolated neoprene isolators.
5. Air Flow Arrangement: Capability to be able to provide 100% OA. Operate in return air mode.
6. Outlet Sound Power Level: Maximum 73 dBA at a distance of 5 feet from the discharge.

D. In-Direct Fired Burner
1. Description: Tubular stainless steel heat exchanger with welded construction.
2. Single Furnace encased in weather-tight metal housing..
3. Fuel: Natural gas with a maximum rated inlet gas pressure of 5 psi. Gas pressure regulator shall be provided.
4. Temperature Control: Temperature control by an 8:1 Stage electronic modulating control. Amplifier to include a low fire time delay potentiometer and sensitivity potentiometer.
5. Flue Material: Type B Stainless steel.
Safety Controls:
a. Manual Reset, High Limit Switch: Main gas valve closes if high-limit temperature is exceeded.

b. Dual safety shutoff valves shall be provided that use 120 VAC control signals.

E. Unit Options
1. Dampers: Powered inlet and recirculating damper to allow for 100% EA recirculation. Upon loss of power or unit shutdown, damper shall close.
2. Supply air discharge plenum.
3. Mounting: Brackets, curbs, and attachments for mounting 5 units hung from above, 3 units with curb for floor mounting. Coordinate top or bottom RA inlet based on configuration.

F. Electrical Controls
1. Control Center: Contains magnetic motor starter, 24 VAC control transformers, integral master disconnect switch, flame safeguard, amplifier, and other required components to accomplish control functions. Discharge temperature control shall be factory mounting in unit. Coordinate right hand/ left hand access to the control center.
2. Heating Inlet Air Sensor: Automatically turns the heat on and off based on a field adjustable set point.
3. Remote Starter Control Panel: NEMA 4 control panel to include motor starter, fuses, 24VAC control transformer for low voltage switching, disconnect switch, and terminal block for control wiring.
4. Access door interlock switch, alarm horn with silencer, low temperature limit, and clogged filter switch.

G. Mixing Dampers:
1. Dampers: Outside and return dampers with damper operator and control package to automatically vary outside air quantity. Outside air damper fail to closed position.
2. Gaskets: Fit dampers with edge gaskets, maximum leakage 5 percent at 2 inches wg pressure differential.
3. Damper Operator: 24 volt with gear train sealed in oil with spring return.
4. Mixed Air Control Sequence: Maintain selected supply-air temperature and return dampers to minimum position on call for heating.

H. Controls: Adjustable, room thermostat, low voltage, to control burner operation to maintain space temperature setting.
1. Furnish interface to Direct Digital Control System. The unit shall be complete with communication interface that allows direct connection to the BACnet MSTP/IP network. The controls interface shall allow access by the Direct Digital Controls system to all internal points available within the unit that can be accessed by the unit manufacturer.
2. Control Functions: Furnish the following:
a. Unit scheduling.
b. Occupied-unoccupied mode.
c. Start-up and coast-down modes.
d. Demand limiting.
e. Night setback.
f. Timed override.
g. Alarm shutdown.
h. Discharge air set point adjustment.
i. Static pressure setpoint adjustment.
3. Furnish the following setpoints and diagnostic functions accessible in unit control panel:
a. Unit operating mode.
b. Unit failure status.
c. Supply fan start-stop.
d. Supply fan status.
e. Supply fan inlet guide vane position.
f. Supply air temperature.
g. Supply air temperature high-low limit with alarm.

h. Return air temperature.
i. Return air temperature high-low limit with alarm.
j. Duct static pressure.
k. Duct static pressure high-low limit with alarm.
l. Heating control.
m. Heating status.
n. Damper control.
o. Damper positions.
p. Filter status.
q. Smoke detector status.
r. Outside air temperature.

SECTION 23 56 00 –HEAT RECOVERY UNITS

Heat Recovery Units

A. Product Description: Self-contained, packaged, factory assembled and wired, consisting of roof curb, cabinet, supply fan, inlet guide vanes, gas-fired heating section, air filters, outdoor air section, exhaust-return section, and BACnet MSTP/IP controls and communication interface.

B. Configuration: Down-flow air delivery.

C. Roof Mounting Curb: 14 inch high, galvanized steel, channel frame with gaskets, nailer strips. Full perimeter curb under entire unit.

D. Cabinet:
1. Designed for outdoor installation with weatherproof construction.
2. Base: welded structural steel with integral lifting lugs coated with corrosion resistant paint.
3. Frame: extruded aluminum tubes and cast aluminum corners. Gaskets between tubes and panels and tubes and corners.
4. Panels: 2” thick 18 gauge galvanealed outer wall and 20 gauge inner wall with polyvinyl coating. 16 gauge aluminized steel floors.
5. 2” thick fiber glass insulated floors, walls and roof.

E. Supply Fan:
1. Fan: Backward inclined airfoil type, statically and dynamically balanced, resiliently mounted.
2. Fan Drive: V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.
3. Fan motor: Three phase, NEMA MG1, Design B, continuously rated at 40 degrees C, totally enclosed fan cooled high efficiency, NEMA T frame, with permanently lubricated bearings and integral overload protection.
4. Fan Assembly Mounting: Furnish spring-type vibration isolators.

F. Gas-Fired Heating Section:
1. Fuel: Natural gas.
2. Heat Exchanger: Stainless steel, of welded construction.
3. Gas Burner: Induced draft type burner with adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot.

G. Air Filters: 2 inch thick Aluminum filter at the outside air inlet to the heat exchanger.

H. Outdoor Air Section:
   1. Outside Air Heat Exchanger Damper: Opposed blade with modulating spring return actuator, Automatic with 0 to 100 percent operating range.
   2. Outside Air Heat Exchanger Bypass Damper: Opposed blade with modulating spring return actuator, Automatic with 0 to 100 percent operating range.
   3. Exhaust Air Damper: Parallel blade with two-position spring return actuator with end switch for fan interlock.

I. Exhaust Fan:
   1. Fan: Backward inclined airfoil type, statically and dynamically balanced, resiliently mounted.
   2. Fan Drive: V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.
   3. Fan motor: Three phase, NEMA MG1, Design B, continuously rated at 40 degrees C, totally enclosed fan cooled high efficiency, NEMA T frame, with permanently lubricated bearings and integral overload protection.
   4. Fan Assembly Mounting: Furnish spring-type vibration isolators.

J. Heat Exchanger:
   1. Plates: Flat plate air-to-air type, smooth no change in direction, 008” thick aluminum, folded rib plate separators spaced at 2” intervals.
   2. Inspection window.
   3. Drain pans below supply and exhaust side coated with bitumastic and drain connections.
   4. 10” pressure differentials, operating temperature up to 400F.

K. Controls: Furnish interface to Direct Digital Control System. The unit shall be complete with communication interface that allows direct connection to the BACnet MSTP/IP network specified in 23 09 23. The controls interface shall allow access by the Direct Digital Controls system specified in 23 09 23 to all internal points available within the unit that can be accessed by the unit manufacturer.
   1. Control Functions: Furnish the following:
      a. Unit scheduling.
      b. Occupied-unoccupied mode.
      c. Start-up and coast-down modes.
      d. Demand limiting.
      e. Night setback.
      f. Timed override.
      g. Alarm shutdown.
      h. Discharge air set point adjustment.
      i. Static pressure setpoint adjustment.
      j. Smoke control.
      k. Smoke evacuation.
      l. Smoke pressurization.
   2. Furnish the following setpoints and diagnostic functions accessible in unit control panel:
      a. Unit operating mode.
      b. Unit failure status.
      c. Supply fan start-stop.
      d. Supply fan status.
      e. Supply fan inlet guide vane position.
      f. Exhaust fan start-stop.
      g. Exhaust fan status.
      h. Exhaust fan variable frequency drive percent.
      i. Supply air temperature.
      j. Supply air temperature high-low limit with alarm.

k. Return air temperature.
l. Return air temperature high-low limit with alarm.
m. Duct static pressure.
n. Duct static pressure high-low limit with alarm.
o. Heating control.
p. Heating status.
q. Damper control.
r. Damper positions.
s. Filter status.
t. Smoke detector status.
u. Outside air temperature.
v. Outside relative humidity.

3. Ventilation Override: Factory installed. Binary input from independent fire or life safety panel causes unit to override standard operation and assumes one of two factory preset ventilation sequences - purge or pressurization.

L. Accessories:
1. Convenience Outlet: Factory installed, 115 volt, 15 amp, GFI type, internally mounted. Factory wired from transformer internal to unit.
2. Roof Curb Adaptor Package: Furnish duct support hardware to adapt unit to existing roof curb.

SECTION 23 81 06 – PACKAGED ROOF TOP UNITS

Rooftop Unit

A. Product Description: Self-contained, packaged, factory assembled and wired, consisting of roof curb, supply and return plenum, cabinet, supply fan, inlet guide vanes, variable frequency drive, evaporator coil, compressor, refrigeration circuit, condenser, gas burners, air filters, outdoor air section, exhaust fan, and controls.

B. Compliant with ASHRAE 90.1-2013.

C. Configuration: Downflow air delivery.

D. Mounting Curb:
1. Minimum 12 inch high, galvanized steel, channel frame with gaskets, nailer strips. Full perimeter curb under entire unit, with gasket strip.

E. Cabinet:
1. Designed for outdoor installation with weatherproof construction.
2. Panels: Double wall, Galvanized steel with corrosion resistant baked enamel finish meeting 750 hour salt spray test in accordance with ASTM B117. Furnish hinged access doors with handles and rubber gaskets at edges.
3. Insulation: Factory applied to exposed vertical panels, horizontal panels, and access doors. 2 inch thick, 1.5 pound per cubic foot density, R-13, protected from erosion or sandwich panels with injected foam.

F. Supply Fan:
1. Fan: Airfoil type, statically and dynamically balanced, resiliently mounted.
2. Fan Drive: Direct or V-Belt type, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction. Select Variable and adjustable pitch motor sheave to obtain required rpm with sheaves set at mid-position as recommended by manufacturer.
a. Drive Rating: Minimum 1.5 times nameplate rating of motor.

b. Steel shaft.
c. Bearings with L-50 life at 250,000.

3. Fan motor: Three phase, NEMA MG1, Design B, continuously rated at 40 degrees C, open drip-proof NEMA T frame, with permanently lubricated bearings and integral overload protection.
4. Fan Assembly Mounting: Furnish spring-type vibration isolators.

G. Supply Fan Modulation:
1. Variable Frequency Drive:
a. Furnished for supply fan and return fan.
b. Factory installed, wired, and tested.
c. Full digital control.
d. Insulated Gate Bi-Polar Transistors used to produce output pulse width modulation waveform allowing quiet operation.
e. NEMA 250 Type 1 enclosure.
f. Self-diagnostics.
g. Proportional-integral-derivative setpoint control.
h. Communication port.
i. Electronic thermal overload protection.
2. Controlled from duct static pressure by unit mounted controller. Static pressure sensed by duct mounted sensor.
3. Furnish field adjustable duct high limit safety control to protect duct work from excessive duct pressure.

H. Evaporator Coil:
1. Constructed of seamless copper tubes mechanically expanded into aluminum fins. Factory leak tested under water.
2. Stainless Steel drain pan and piping connection.
3. Furnish for multiple circuited units intertwined row circuiting.

I. Compressors:
1. Hermetically sealed, resiliently mounted with positive lubrication, inverter type, and internal motor overload protection.
2. Factory charged with R-401A.
3. Independent refrigeration cycle for each compressor.
4. Furnish internal vibration isolators.
5. Furnish short cycle protection.
6. Crank cast heater, sight glass, anti-slug protection, time delay to avoid short cycling.

J. Refrigeration circuit:
1. Dehydrate and factory charge each circuit with oil and refrigerant.
2. Furnish the following for each circuit:
a. Thermostatic expansion device.
b. Filter-drier.
c. Suction, discharge, and liquid line service valves with gauge ports.
d. Sight glass.
e. High and low pressure safety controls.
3. Furnish capacity control by cycling multi-speed compressors.

K. Condenser:
1. Constructed of copper tubing mechanically bonded to aluminum fins. Factory leak tested under water.
2. Direct drive propeller fans statically and dynamically balanced. Wired to operate with compressor. Motor permanently lubricated with built-in thermal overload protection.
3. Furnish factory installed coil guard.

4. Furnish coil with corrosion resistant coating capable of withstanding salt spray test of 1000 hours in accordance with ASTM B117.

L. Air Filters: 2 inch thick glass fiber, MERV 8 disposable media in metal frames.

M. Outdoor Air Section:
1. Economizer: Provide economizer components and controls in accordance with ICC IECC. Furnish fully integrated factory installed fully modulating from 0 to 100 percent outside air economizer. Economizer operation through microprocessor based primary temperature controls automatically modulate dampers to maintain space temperature and occupancy conditions.
   a. Outdoor air hood.
   b. Furnish with outdoor, return and exhaust air dampers sized for full economizer mode.
      1) Gasketed design with air leakage rate of less than 1.5 cfm/sq. ft, AMCA 500.
      2) Bird Screen on outdoor and exhaust air dampers.
      3) Factory installed modulating control damper actuators with spring return.
   c. Furnish economizer with dry bulb control.
   d. Furnish adjustable minimum position control located remotely in space.
   e. Furnish spring return motor for outside air damper closure during unit shutdown or power interruption.

N. Exhaust Fan:
1. Fan: Airfoil type, statically and dynamically balanced, resiliently mounted.
2. Fan Drive: Direct drive or V-belt drive, Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Furnish solid shaft construction.
   a. Drive Rating: Minimum 1.5 times nameplate rating of motor.
3. Fan motor: Per Manufacturer, NEMA MG1, Design B, continuously rated at 40 degrees C, open drip-proof
4. Fan Assembly Mounting: Furnish spring-type vibration isolators.

O. Gas Heat Section:
1. Heat Exchanger: Tubular stainless steel heat exchanger with in-shot burner manifold.
2. Natural gas burner with electric ignition
3. Induced draft blower fan.
4. Modulating burner control with roll-out safety protection.
5. Factory installed unit control system to allow gas heat module.

P. Controls:
1. Variable Air Volume Controls: To operate VAV rooftop from supply air temperature including supply air sensor, and variable frequency drive. Microprocessor coordinates economizer control and stages of cooling.
2. Furnish interface to Direct Digital Control System. The unit shall be complete with BACnet communication interface that allows direct connection to the existing controls network. The controls interface shall allow access by the Direct Digital Controls system to all internal points available within the unit that can be accessed by the unit manufacturer.
3. Control Functions by Building Automation System:
   a. Unit scheduling.
   b. Occupied-unoccupied mode.
   c. Start-up and coast-down modes.
   d. Nighttime free-cool purge mode.
   e. Demand limiting.
   f. Night setback.
   g. Timed override.
   h. Alarm shutdown.
   i. Discharge air set point adjustment.

j. Static pressure setpoint adjustment.

4. Furnish the following setpoints and diagnostic functions accessible in unit control panel:
   a. Unit operating mode.
   b. Unit failure status.
   c. Supply fan start-stop.
   d. Supply fan status.
   e. Supply fan inlet guide vane position.
   f. Supply fan variable frequency drive percent.
   g. Exhaust fan start-stop.
   h. Exhaust fan status.
   i. Exhaust fan variable frequency drive percent.
   j. Supply air temperature.
   k. Supply air temperature high-low limit with alarm.
   l. Return air temperature.
   m. Return air temperature high-low limit with alarm.
   n. Mixed air temperature.
   o. Mixed air temperature high-low limit with alarm.
   p. Duct static pressure.
   q. Duct static pressure high-low limit with alarm.
   r. Cooling control.
   s. Cooling status - all stages.
   t. Heating control.
   u. Heating status.
   v. Number of stages activated.
   w. Damper control.
   x. Economizer status.
   y. Requested minimum position.
   z. Damper positions.
   aa. Filter status.
   bb. Smoke detector status.
   cc. Outside air temperature.
   dd. Outside relative humidity.
5. Ventilation Override: Factory installed. Binary input from independent fire or life safety panel causes unit to override standard operation and assumes one of two factory preset ventilation sequences - purge or pressurization.

Q. Accessories:
   1. Convenience Outlet: Factory installed, 115 volt, 15 amp, GFI type, internally mounted. Factory wired from transformer internal to unit.

SECTION 23 82 00 - CONVECTION HEATING AND COOLING UNITS

A. Finned tube radiation.

B. Unit heaters.

C. Cabinet unit heaters.

D. Infrared heating devices.

SECTION 23 90 13 – NOx AND CO GAS DETECTION

A. Heating and Ventilation Contractor provide Carbon Monoxide (CO) and Oxides of Nitrogen (NO_2) gas monitoring and control systems, and associated wiring and interfaces with the BAS Building Automation System.

DIVISION 26: ELECTRICAL

SECTION 26 05 03 - EQUIPMENT WIRING CONNECTIONS

A. Provide equipment wiring connections to all equipment provided under other sections.

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

A. Provide building wire and cable; direct burial cable; service entrance cable; and wiring connectors and connections.

B. Product Requirements: Provide products as follows:
   1. All conductors shall be stranded, except for drops to outlets and switches which may be solid.
   2. Conductor not smaller than 12 AWG for power and lighting circuits.
   3. Conductor not smaller than 14 AWG for control circuits.

C. Wiring Methods: Provide the following wiring methods:
   1. Branch Circuits: Use only building wire, Type THHN/THWN insulation, in raceway.
   2. Feeders inside the building: Use only building wire, Type THHN/THWN insulation, in raceway.
   3. Feeders installed in underground conduit or ductbank: Use only building wire, type XHHW insulation in underground conduit or ductbank.

D. Provide wires, cables, connectors and splices that are UL listed and labeled.

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

A. Provide rod electrodes, wire, grounding well components, mechanical connectors, and exothermic connections.

B. Grounding systems use the following elements as grounding electrodes:
   1. Metal underground water pipe.
   2. Metal building frame.
   3. Rod electrode.

C. Maximum grounding to resistance values are as follows:
   1. Equipment rated 500 kVA and less: 10 ohms.
   2. Equipment rated 500 to 1000 kVA: 5 ohms.

D. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

A. Provide conduit supports, formed steel channel, spring steel clips, sleeves, mechanical sleeve seals, firestopping relating to electrical work, firestopping accessories, and equipment bases and supports.

B. Firestopping Materials: ASTM E119, ASTM E814, UL 263, UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
   1. Ratings may be 3-hours for firestopping in through-penetrations of 4-hour fire rated assemblies unless otherwise required by applicable codes.

C. Surface Burning: ASTM E84, UL 723 with maximum flame spread / smoke developed rating of 25/450.

D. Firestop interruptions to fire rated assemblies, materials, and components.

E. Firestopping: Conform to applicable code for fire resistance ratings and surface burning characteristics.

F. Through Penetration Firestopping of Fire Rated Assemblies: UL 1479 or ASTM E814 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
   1. Wall Penetrations: Fire F-Ratings as indicated on Drawings, but not less than 1-hour.

   2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
      a. Floor Penetrations Within Wall Cavities: T-Rating is not required.

G. Through Penetration Firestopping of Non-Fire Rated Floor and Roof Assemblies: Materials to resist free passage of flame and products of combustion.
   1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
   2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

H. Fire Resistant Joints in Fire Rated Floor, Roof, and Wall Assemblies: ASTM E1966 or UL 2079 to achieve fire resistant rating as indicated on Drawings for assembly in which joint is installed.

I. Fire Resistant Joints Between Floor Slabs and Exterior Walls: ASTM E119 with 0.10 inch water gage minimum positive pressure differential to achieve fire resistant rating as indicated on Drawings for floor assembly.

J. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

SECTION 26 05 33 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

A. Provide conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and fiber reinforced concrete handholes.

B. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

C. Underground: Provide type as indicated on Drawings. Provide cast metal boxes or fiber reinforced concrete handhole.

D. In or Under Slab on Grade: Provide thickwall nonmetallic conduit. Provide cast or nonmetallic metal boxes.

E. Outdoor Locations, Above Grade: Provide rigid steel. Provide cast metal outlet, pull, and junction boxes.

F. In Slab Above Grade: Provide thickwall nonmetallic conduit. Provide cast sheet metal boxes.

G. Wet and Damp Locations: Provide rigid steel conduit. Provide cast metal outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

H. Concealed Dry Locations: Provide electrical metallic tubing, unless otherwise indicated on Drawings. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

I. Exposed Dry Locations: Provide electrical metallic tubing, unless otherwise indicated on Drawings. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.

J. Minimum Raceway Size: 3/4 inch, except for switch legs which may be ½ inch or unless otherwise specified.

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

A. Provide nameplates, labels, wire markers, conduit markers, and underground warning tape.

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

B. Design based on products provided by Wattstopper. Individual Wattstopper product numbers are provided in each section.

Lighting Contactors – Electrically Operated, electrically held contactors in an enclosure.

A. Product Description: NEMA ICS 2, magnetic lighting contactor.

B. Configuration: Electrically held, 2 wire control.

C. Coil Operating Voltage: 120 volts, 60 Hertz.

D. Poles: To match circuit configuration and control function.

E. Contact Rating: Conductor overcurrent protection, considering derating for continuous loads.

F. Accessories:
1. Cover Mounted Pilot Devices: NEMA ICS 5, standard-duty type with Form Z contacts, rated A150.
2. Selector Switch: ON/OFF/AUTOMATIC function, with rotary action.
3. Indicating Light: Green lens, transformer type, with led lamp.
4. Auxiliary Contacts: One normally open in addition to seal-in contact.
5. Relays: NEMA ICS 2.

G. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

Digital Lighting Management (DLM) local network

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.

B. Features of the DLM local network include:

1. Plug n' Go® automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push n' Learn® configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.
4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

C. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize RJ-45 patch cords but do not provide serial communication data from individual end devices are not acceptable.

D. If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the contractor is responsible for testing each cable following installation and supplying manufacturer with test results.

Digital Room Lighting Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control.

A. Digital controllers for lighting automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room controllers shall be provided to match the room lighting control requirements. Room controllers will be preprogrammed to provide control schemes meeting the requirements of IECC 2012 as identified on the plans. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard applications. The control units will include the following features:

1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.

2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf.

3. Multiple room controllers connected together in a local network must automatically prioritize each room controller, without requiring any configuration or setup, so that loads are sequentially assigned using room controller device ID's from highest to lowest.

4. Device Status LEDs to indicate:
   a. Data transmission
   b. Device has power
   c. Status for each load
   d. Configuration status

5. Quick installation features including:
   a. Standard junction box mounting
   b. Quick low voltage connections using standard RJ-45 patch cable

6. Each Load shall be configurable to operate in the following sequences based on occupancy:
   a. Auto-on/Auto-off (Follow on and off)
   b. Manual-on/Auto-off (Follow off only)

7. UL 2043 plenum rated.

8. Manual override and LED indication for each load.

9. Dual voltage 120/277VAC, 60 Hz.

10. Zero cross circuitry for each load.

11. All digital parameter data programmed into an individual room controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

B. On/OFF Room Controllers (Type RC) shall include:
   1. Two relay configuration

   2. Efficient 150 mA switching power supply

   3. Three RJ-45 DLM local network ports with integral strain relief and dust cover.

   4. WattStopper product numbers:
      a. Type RC: LRMC-102

C. Dimming Room Controllers (Type DC) shall include
   1. Two relay configuration

   2. Class 2 dimming control signal: 0-10VDC sink up to 100mA per channel.

   3. Four RJ-45 DLM local network ports with integral strain relief.

   4. Wattstopper product number:
      a. Type DC: LRMC-212

Digital Wall Switches – Self-configuring, digitally addressable pushbutton on/off switches.

A. Low voltage momentary pushbutton switches in 1, 2, 3, and 4 button configuration for connection to the digital room controller. Wall switches shall include the following features:
   1. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.

   2. Configuration LED on each switch that blinks to indicate data transmission.

   3. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.

   4. Two RJ-45 ports for connection to DLM local network.

B. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.

C. WattStopper product numbers:
   1. Type LV1: LMSW-101

2. Type LV2: LMSW-102
3. Type LV4: LMSW-104
4. Type LVD: LMDM-101

D. Provide ivory switches; compatible with ivory wall plates with decorator opening.

Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors.

A. Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor for connection to the digital room controller.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton configuration for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.

   2. Programmable control functionality including:
      a. Each sensor may be programmed to control specific loads within a local network.
      b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
      c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time (default 10 seconds) after turning off.

   3. One or two RJ-45 port(s) for connection to DLM local network.

   4. Device Status LEDs, which may be disabled for selected applications, including:
      a. PIR detection
      b. Ultrasonic detection
      c. Configuration mode
      d. Load binding

   5. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.

   6. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

C. Units shall not have any dip switches or potentiometers for field settings.

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

E. WattStopper product numbers:
   1. Type CS: LMPX-100
   2. Type DS: LMDC-100

Low Voltage Ceiling Occupancy Sensors – stand alone sensors for individual circuit control when paired with relay power packs.

A. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.

B. Sensors shall utilize a digital PIR detector (dual element pyro-electric detector) component, so as to provide a high degree of RF immunity.

C. Sensors shall interconnect with other sensors and power/relay packs with class 2, three-conductor wire.

D. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 mA so that up to 14 sensors may be connected to a single power pack.

E. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.

F. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.

G. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.

H. WattStopper product numbers:
   1. Type PS: CI-200

Relay Power Packs – Combination power supply and relay unit for use with low voltage occupancy sensors.

A. Power packs shall accept and switch 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.

B. Power pack shall securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box shall not be accepted. All class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.

C. Power pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.

D. Power pack shall incorporate a Class 1 relay and an AC electronic switching device. The AC electronic switching device shall make and break the load, while the relay shall carry the current in the on condition. This system shall provide full 20 Amp switching of all load types, and be rated for 400,000 cycles.

E. Power packs shall be single circuit, or two circuits. Slave packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs

must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.

F. WattStopper product number:
   1. Type PP: BZ-50

Wall Mount Vacancy Sensors – Line Voltage wall mount sensors to shut down lighting on vacancy detection.

A. Sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy.

B. The Passive Infrared (PIR) technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception.

C. Sensor shall utilize Zero Crossing circuitry to reduce stress on relay and therefore increase sensor life.

D. To blend in aesthetically, sensor shall not protrude more than 3/8” from the wall and utilize color-matched lens.

E. To assure detection at desktop level uniformly across the space, sensor shall have a 28-segment, two-level, Fresnel injection molded lens.

F. Sensor shall feature a walk-through mode, where lights turn off 3 minutes after the area is initially occupied if no motion is detected after the first 30 seconds, set by a DIP switch.

G. To avoid false on activations and to provide immunity to RFI and EMI, Detection Signature Processing shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.

H. Sensor shall cover up to 1,000 sq. ft. for walking motion, with a field view of 180 degree

I. Sensor shall have automatic-on or manual-on operation adjustable with DIP switch.

J. Sensor shall have a time delay that is adjusted automatically (with the SmartSet setting) and shall have a fixed time delay of 5 to 30 minutes, set by DIP switches.

K. Sensor shall have the option for a visual warning that shall flash lights to warn the end-user before lights turn off automatically.

L. Sensor shall have a LED indicator that remains active at all times in order to verify detection within the area to be controlled.

M. Sensor shall have a service switch to allow end-users to operate the sensor in the unlikely event of a failure, set by a DIP switch.

N. Sensor shall be able to control incandescent, magnetic low voltage, electronic low voltage, and fluorescent loads.

O. Switching mechanism shall be a relay(s). Triac and other harmonic generating devices shall not be allowed. Sensor shall have ground wire and grounded strap for safety.

P. The PIR wall switch sensor shall be a completely self-contained control system that replaces a standard toggle switch

Q. To ensure quality and reliability, sensor shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.

R. WattStopper product number:
1. Type WS: WS-301-I

IDOT Stevenson Interior Lighting Controls Description

Room No.	Room Name	Lighting Control Description
127	OP Manager Office	Dimmable. Manual on/off by switch. Automatic off by occupancy sensor. Automatic raise/lower lumen output based on ambient light level to maintain an adjustable illumination level. Automatic on/off based on adjustable ambient light level.
128	Vestibule	Single level. Automatic on/off with exterior lighting.
129	Break/Day Room	Dimmable. Manual on/off by switch. Automatic off by occupancy sensor. Automatic raise/lower lumen output based on ambient light level to maintain an adjustable illumination level. Automatic on/off based on adjustable ambient light level.
130	Corridor	Single level. Automatic on/off by occupancy sensor.
131	Lead Workstations	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
132	Server	Single level. Manual on/off by switch.
133	Mechanic's Room	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
134	ADA Toilet	Single Level. Automatic on/off by occupancy sensor.
135	Mechanical Room	Single Level. Manual on/off by switch.
136	Small Equipment	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
137	Oil/Lube Room	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
138	Materials Open Office	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
139	Materials Office	Dimmable. Manual on/off by switch. Automatic off by occupancy sensor.

		Automatic raise/lower lumen output based on ambient light level to maintain an adjustable illumination level. Automatic on/off based on adjustable ambient light level.
140	Materials Storage	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
141	Water Service/Meter Room	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
142	Materials Lab	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
143	Shaker Room	Single level. Manual on/off by switch. Automatic off by occupancy sensor.
144	Men's Locker Room	Three Zones: Zone 1: Overhead Lights Restroom Single level. Automatic on/off by occupancy sensor. Zone 2: Overhead Lights Locker Room Single level. Automatic on/off by occupancy sensor. Zone 3: Shower Single Level. Manual on/off by switch. No automatic Control.
145	Women's Locker Room	Three Zones: Zone 1: Overhead Lights Restroom Single level. Automatic on/off by occupancy sensor. Zone 2: Overhead Lights Locker Room Single level. Automatic on/off by occupancy sensor. Zone 3: Shower Single Level. Manual on/off by switch. No automatic Control.
146	Janitor's Closet	Single level. Manual on/off by switch.
147	General Shop	Dual Level - Each north/south row of lights switched separately. Manual on/off by switch. No automatic control.
148	Common Work Area	Dual level - Each north/south row of lights switched separately. Manual on/off by switch. No automatic control.
149	Parts/ Tools Room	Single Level. Manual on/off by switch. Automatic off by occupancy sensor.
150	Tire Storage	Single Level. Manual on/off by switch. Automatic off by occupancy sensor.
151	Maintenance Bays	Three Levels - Each north/south row of lights switched separately.

		Manual on/off by switch. No automatic control.
152	Paint Room	Single Level. Manual on/off by switch. Automatic off by occupancy sensor.
153	Storage Bays	Three Levels - Each set of two adjacent north/south rows of lights switched separately. Manual on/off by switch. Automatic off by occupancy sensor.
154	Wash Bays	Dual Level - Each north/south row of lights switched separately. Manual on/off by switch. Automatic off by occupancy sensor.
SITE	Site Lighting	Single Level. Automatic on/off by time clock.
COLD STORAGE-ENCLOSED WEST	Cold Storage Building Enclosed – West Side	Three Levels - Each east/west row of lights switched separately. Manual on/off by switch. Automatic off by occupancy sensor.
COLD STORAGE-OPEN	Cold Storage Building Open Bays	Dimmable. Manual on/off by switch. Automatic off by occupancy sensor. Automatic raise/lower lumen output based on ambient light level to maintain an adjustable illumination level. Automatic on/off based on adjustable ambient light level.
COLD STORAGE-ENCLOSED EAST	Cold Storage Building Enclosed – East Side	Single Level. Manual on/off by switch. Automatic off by occupancy sensor.
COLD STORAGE-CORRIDOR	Cold Storage Building Corridor – East Side	Single Level. Manual on/off by switch. Automatic off by occupancy sensor.

SECTION 26 22 00 - LOW-VOLTAGE TRANSFORMERS

A. Provide two-winding transformers; shielded transformers; autotransformers; and buck-and-boost transformers.

B. Product Description: NEMA ST 20, NEMA TP-1, factory-assembled, air-cooled, dry type transformers, ratings as indicated on Drawings.

C. Primary Voltage: As indicated on Drawings.

D. Secondary Voltage: As indicated on Drawings.

E. Insulation system and average winding temperature rise for rated kVA as follows:
   1. 1-15 kVA: Class 185 with 115 degrees C rise.
   2. 16-500 kVA: Class 220 with 115 degrees C rise.

F. Case temperature: Do not exceed 35 degrees C rise above ambient at warmest point at full load.

G. Winding Taps:
   1. Transformers Less than 15 kVA: Two 5 percent below rated voltage, full capacity taps on primary winding.
   2. Transformers 15 kVA and Larger: NEMA ST 20.

H. Sound Levels: NEMA ST 20.

I. Basic Impulse Level: 10 kV for transformers less than 300 kVA, 30 kV for transformers 300 kVA and larger.

J. Ground core and coil assembly to enclosure by means of visible flexible copper grounding strap.

K. Mounting:
   1. 1-15 kVA: Suitable for wall mounting.
   2. 16-75 kVA: Suitable for wall or floor mounting.
   3. Larger than 75 kVA: Suitable for floor mounting.

L. Coil Conductors: Continuous copper windings with terminations brazed or welded.

M. Enclosure: NEMA ST 20, Type 1ventilated. Furnish lifting eyes or brackets.

N. Isolate core and coil from enclosure using vibration-absorbing mounts.

O. Nameplate: Include transformer connection data and overload capacity based on rated allowable temperature rise.

SECTION 26 24 16 - PANELBOARDS

A. Provide distribution and branch circuit panelboards.

Distribution Panelboards

A. Product Description: NEMA PB 1, circuit breaker type panelboard.

B. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

C. Minimum integrated short circuit rating: As indicated on Drawings.

D. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Furnish circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

E. Enclosure: NEMA PB 1, Type as indicated on Drawings.

F. Cabinet Front: Surface door-in-door type, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

Branch Circuit Panelboards

A. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

C. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.

D. Minimum Integrated Short Circuit Rating: As indicated on Drawings.

E. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

F. Enclosure: NEMA PB 1, Type as indicated on Drawings.

G. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

SECTION 26 27 16 - ELECTRICAL CABINETS AND ENCLOSURES

A. Provide hinged cover enclosures, cabinets, terminal blocks, and accessories.

B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

D. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.

E. Minimum Integrated Short Circuit Rating: As indicated on Drawings.

F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

G. Enclosure: NEMA PB 1, Type as indicated on Drawings.

H. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

SECTION 26 27 26 - WIRING DEVICES

A. Provide receptacles; multioutlet assembly; and device plates and decorative box covers.

B. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

C. Panelboard Bus: Copper, current carrying components, ratings as indicated on Drawings. Furnish copper ground bus in each panelboard.

D. For non-linear load applications subject to harmonics furnish 200 percent rated, plated copper, solid neutral.

E. Minimum Integrated Short Circuit Rating: As indicated on Drawings.

F. Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers as indicated on Drawings. Do not use tandem circuit breakers.

G. Enclosure: NEMA PB 1, Type as indicated on Drawings.

H. Cabinet Front: Flush or Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock keyed alike. Finish in manufacturer's standard gray enamel.

SECTION 26 28 13 - FUSES

A. Provide fuses and spare fuse cabinet.

B. Power Load Feeder Switches Larger than 600 amperes: Class L (time delay).

C. Motor Branch Circuits: Class RK1 (time delay).

D. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated on Drawings.

E. Voltage: Rating suitable for circuit phase-to-phase voltage.

SECTION 26 28 19 - ENCLOSED SWITCHES

A. Provide fusible and non-fusible switches.

Fusible Switch Assemblies

A. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

B. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses.

C. Enclosure: NEMA KS 1, type as indicated on Drawings. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.

D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

Non-Fusible Switch Assemblies

A. Product Description: NEMA KS 1, Type HD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position.

B. Enclosure: NEMA KS 1, type as indicated on Drawings. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.

SECTION 26 28 23 - ENCLOSED BREAKERS

A. Provide molded-case and insulated-case circuit breakers (including electronic trip type breakers) in individual enclosures.

Molded-Case Circuit Breaker

A. Product Description: Enclosed, molded-case circuit breaker conforming to UL 489, suitable for use as service entrance equipment where applied.

B. Solid-State Circuit Breaker: Electronic sensing, timing, and tripping circuits for adjustable current settings; ground fault trip with integral ground fault sensing; instantaneous trip; and adjustable short time trip.

C. Current Limiter: Designed for application with molded case circuit breaker.

D. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker.

E. Interlocks trip circuit breaker and prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.

F. Accessories: As indicated on Drawings

G. Enclosure: UL 489, to meet conditions. Fabricate enclosure from stainless steel.

H. Interior Dry Locations: Type 1.

I. Exterior Locations: Type 4.

J. Industrial Locations: Type 4X.

K. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

Insulated Case Circuit Breaker

A. Product Description: Enclosed, insulated-case circuit breaker conforming to UL 489, suitable for use as service entrance equipment where applied.

B. Trip Unit: Electronic sensing, timing, and tripping circuits for adjustable current settings; [ground fault trip with integral ground fault sensing; instantaneous trip; and adjustable short time trip.

C. Accessories: As indicated on Drawings. Conform to UL 489.

D. Enclosure: UL 489, to meet conditions. Fabricate enclosure from stainless stee].

E. Interior Dry Locations: Type 1.

F. Exterior Locations: Type 4.

G. Industrial Locations: Type 4X.

H. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

SECTION 26 28 26 - ENCLOSED TRANSFER SWITCHES

A. Provide manual transfer switches with integrated quick connects (connecting means for a portable generators) in individual enclosures.

B. Product Description: NEMA ICS 10, manual transfer switch.

C. Configuration: Manually-operated, mechanically-held transfer switch. The switch shall be mechanically interlocked to ensure only one of three possible positions, Source 1, Source 2, or Center Off. Fused disconnect type switches shall not be acceptable.

D. The switch shall be positively locked and unaffected by momentary outages so that contact pressure is maintained at a constant value and temperature rise at the contacts is minimized for maximum reliability and operating life.

E. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented blow-on construction for high withstand current capability and be protected by separate arcing contacts.

F. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors.

G. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

H. Where neutral conductors must be switched, the MTQ shall be provided with fully rated neutral transfer contacts.

I. Where neutral conductors are to be solidly connected, a neutral terminal plate with fully-rated AL-CU pressure connectors shall be provided.

J. The transfer switch shall be tested in accordance with UL 1008 for transfer switches. Switch ratings of 260 amperes and less shall have endurance rating of 6000 cycles, 400 ampere shall have endurance rating of 4000 cycles, and 600 – 3000 ampere shall have endurance rating of 3000 cycles.

K. Enclosure:
   1. Enclosure: ICS 10, Type 4X
   2. Finish: Stainless Steel

L. Additiona Features:
   1. Provide manual transfer switch with integrated quick connects which provides a connecting means for connecting a portable generator.
   2. Quick connects are to be located on Source 2 (emergency) side of the manual transfer switch.
      a. For 400A and below models, there shall be one (1) row of up to five (5) series single pole connections.
      b. For 600A - 800A models, there shall be two (2) rows of up to five (5) single pole connections.
      c. For 1000A-1200A models, there shall be three (3) rows of up to 5 single pole connections.
      d. For 1600A-2000A models, there shall be three (5) rows of up to 5 single pole connections.

3. All electrical connectors shall be 16 Series cam type single pole connectors, available color coded as per industry standard practice:
    a. 240V and below: phase 1 = black, phase 2 = red, phase 3 = blue (if required).
    b. 480V: phase 1 = brown, phase 2 = orange, phase 3 = yellow.
    c. Ground shall always be green.
    d. Neutral shall always be white.

SECTION 26 29 13 - ENCLOSED CONTROLLERS

A. Provide manual and magnetic motor controllers in individual enclosures.

Manual Motor Controller

A. Product Description: NEMA ICS 2, AC general-purpose, Class A, manually operated, full-voltage controller with overload element, red pilot light, and toggle operator. Toggle operator shall be capable of being locked in the OFF position.

B. Enclosure: NEMA ICS 6, Type 1 unless otherwise indicated on Drawings.

Full-Voltage Non-Reversing Controllers

A. Product Description: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower.

B. Control Voltage: 120 volts, 60 Hertz.

C. Starter: NEMA type starter for all motors with minimum of size 1. IEC type starters are not acceptable.

D. Overload Relay: NEMA ICS 2; bimetal or melting alloy.

E. Product Features:
    1. Auxiliary Contacts: NEMA ICS 2, 2 field convertible contacts in addition to seal-in contact.
    2. Cover Mounted Pilot Devices: NEMA ICS 5, heavy duty oiltight type.
    3. Pilot Device Contacts: NEMA ICS 5, Form Z, rated A150.
    4. Pushbuttons: Unguarded type.
    5. Indicating Lights: Transformer LED type.
    6. Selector Switches: Rotary type.
    7. Relays: NEMA ICS 2.
    8. Control Power Transformers: 120 volt secondary, 150 VA minimum, in each motor starter. Furnish fused primary and secondary, and bond unfused leg of secondary to enclosure.

F. Combination Controllers: Combine motor controllers with disconnect in common enclosure, using fusible switch conforming to NEMA KS 1, enclosed knife switch with externally operable handle. Fuse clips: Designed to accommodate NEMA FU 1, Class R fuses. Obtain IEC Class 2 coordinated component protection.

G. Enclosure: NEMA ICS 6, type as indicated on Drawings. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.

SECTION 26 51 00 - INTERIOR LIGHTING

A. Provide interior luminaires, lamps, drivers, and accessories.

SECTION 26 52 00 - EMERGENCY LIGHTING

A. Provide emergency lighting units and exit signs.

B. Emergency lighting to comply with requirements.

SECTION 26 56 00 - EXTERIOR LIGHTING

A. Provide exterior luminaries, poles, and accessories.

DIVISION 27: COMMUNICATIONS

SECTION 27 13 43 - COMMUNICATIONS SERVICES CABLING

A. Service entrance from Telecommunications Utility Company.

B. Service Entrance Pathway: Empty ducts from point of Telephone Utility connection at property line to building service terminal backboard.

C. Backbone Pathway: Conform to TIA/EIA 569 using conduit or sleeves as indicated on Drawings.

D. Horizontal Pathway: Conform to TIA/EIA 569, using raceway, backboards, and cabinets as indicated on Drawings.

E. Entrance Wiring: By Telephone Utility Company.

F. Backbone Wiring: Complete from entrance equipment to each telecommunications closet using unshielded backbone cables.

G. Horizontal Wiring: Complete from telecommunications closet to each outlet using horizontal cables.

H. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

I. Provide combustible electrical equipment exposed within plenums with peak rate of heat release not greater than 100 kW, peak optical density not greater than 0.5, and average optical density not greater than 0.15 when tested in accordance with UL 2043.

DIVISION 28: ELECTRONICS SAFTEY AND SECURITY

SECTION 28 13 00 - ACCESS CONTROL

A. Provide conduit system rough-in for access control equipment provided by the Using Agency.

SECTION 28 31 00 - FIRE DETECTION AND ALARM

A. Fire Alarm Control Panels.

B. Manual fire alarm stations

C. Automatic smoke detectors.

D. Automatic heat detectors.

E. Fire alarm signaling appliances.

F. Auxiliary fire alarm equipment.

G. Power and signal wire and cable
   1. All fire alarm wiring shall be installed in conduit.

System Description

A. Fire Alarm System: NFPA 72, manual and automatic local fire alarm system with connections to municipal system.

B. Alarm Sequence of Operation: Actuation of initiating device causes the following system operations:
   1. Local fire alarm signaling devices sound and display with signal.
   2. Non-coded signal transmits to municipal connection.
   3. Location of alarm zone indicates on fire alarm control panel and on remote annunciator panel.
   4. Signal transmits to building mechanical controls, shutting down fans and operating dampers.
   5. Signal transmits to release door hold-open devices.
   6. Signal releases magnetic door hold opens.
   7. Signal releases electric door locks.

C. Drill Sequence of Operation: Manual drill function causes alarm mode sequence of operation.

D. Trouble Sequence of Operation: System or circuit trouble causes the following system operations:
   1. Visual and audible trouble alarm indicates at fire alarm control panel.
   2. Visual and audible trouble alarm indicates at remote annunciator panel.

E. Zoning: As required.

F. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience, and with service facilities within 100 miles of project.

G. Installer: Certified fire alarm installer with service facilities within 100 miles of Project.

Control Panel

A. Product Description: Modular fire alarm control panel with wall-mounted enclosure.

B. Power supply: Adequate to serve control panel modules, remote detectors, remote annunciators, relays, and alarm signaling devices. Include battery-operated emergency power supply with capacity for operating system in standby mode for 60 hours followed by alarm mode for 10 minutes.

C. System Supervision: Component or power supply failure places system in trouble mode.

D. Initiating Device Circuits: Supervised zone module with alarm and trouble indication; occurrence of single ground or open condition places circuit in trouble mode but does not disable circuit from initiating alarm.

E. Indicating Appliance Circuits: Supervised signal module, sufficient for signal devices connected to system; occurrence of single ground or open condition places circuit in trouble mode but does not disable circuit from signaling alarm.

F. Municipal Trip Circuit: Output connections.

G. Auxiliary Relays: Sufficient SPDT auxiliary relay contacts for each detection zone to provide accessory functions specified.

Manual Fire Alarm Stations

A. Product Description: Manual double-action station with break-glass rod.

B. Mounting: Semi-Flush.

C. Backbox: Manufacturer's standard.

Spot Heat Detector

A. Product Description: Fixed temperature, Combination rate-of-rise and fixed temperature, spot heat detector.

B. Temperature Rating: 135 degrees F.

C. Rate-of-Rise: 15 degrees F.

Ceiling Smoke Detector

A. Product Description: NFPA 72, photoelectric type ceiling smoke detector with the following features:
   1. Adjustable sensitivity.
   2. Plug-in base.
   3. Auxiliary relay contact.
   4. Integral thermal element rated 135 degrees F.
   5. Visual indication of detector actuation.

B. Mounting: 4 inch outlet box.

Duct-Mounted Smoke Detector

A. Product Description: NFPA 72, photoelectric type with the following features:
   1. Auxiliary SPDT relay contact.
   2. Key-operated normal-reset-test switch.
   3. Duct sampling tubes extending width of duct.
   4. Visual indication of detector actuation.
   5. Duct-mounted housing.

Alarm Lights

A. Product Description: NFPA 72, strobe lamp and flasher with red lettered "FIRE" on white lens.

Alarm Horn

A. Product Description: NFPA 72, flush type fire alarm horn with the following features:
   1. Sound Rating: 87dB at 10 feet.

2. Integral strobe lamp and flasher with red lettered "FIRE" on white lens.

Remote Annunciator

A. Product Description: Remote annunciator including audible and visual indication of fire alarm by zone, and audible and visual indication of system trouble.

B. Mounting: Factory mounted in flush wall-mounted enclosure.

DIVISION 31: EARTHWORK

SECTION 31 10 00 - SITE CLEARING

A. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

B. Protect trees and plants remaining on-site.

C. Locate, identify, disconnect, and seal or cap utilities indicated to be abandoned in place.

D. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

E. Remove sod and grass before stripping topsoil.

F. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

G. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

H. Reference: Standard Specifications for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

SECTION 31 20 00 - EARTH MOVING

A. Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

D. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

E. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

F. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

G. Reference: Standard Specification for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

Excavation for Structures

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch.

Excavation for Walks and Pavements

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

B. Proof-roll subgrade to identify soft pockets and areas of excess yielding.
   1. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

Backfill

A. Place and compact backfill in excavations promptly.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

C. Place and compact bedding course on trench bottoms.

SECTION 31 23 19 - DEWATERING

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. CDB/IDOT is not responsible for interpretations or conclusions drawn from this data.

B. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

C. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

D. See Section 02 61 13.

SECTION 31 50 00 - EXCAVATION SUPPORT AND PROTECTION

A. Section includes temporary excavation support and protection systems.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

C. Locate excavation support and protection systems clear of permanent construction, so that construction and finishing of other work is not impeded.

D. Prevent surface water from entering excavations by grading, dikes, or other means.

E. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

F. See Section 02 61 13.

DIVISION 32: EXTERIOR IMPROVEMENTS

SECTION 32 12 16 - ASPHALT PAVING

A. Manufacturer Qualifications: A paving-mix manufacturer registered with the Illinois Department of Transportation.

B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Illinois Department of Transportation.

C. Coarse Aggregate: Per Illinois Department of Transportation's Standard Specifications for Road and Bridge Construction, adopted April 1, 2016 or current edition.

D. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by the Illinois Department of Transportation.

E. Verify that subgrade is dry and in suitable condition to begin paving.

F. Proceed with paving only after unsatisfactory conditions have been corrected.

G. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

H. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

SECTION 32 13 13 - CONCRETE PAVING

A. Concrete Paving Including the Following:

1. Driveways.
2. Parking lots.
3. Curbs and gutters.

B. Prepare design mixtures for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

C. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

D. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

E. Before placing concrete, inspect and complete formwork installation**,** steel reinforcement, and items to be embedded or cast-in.

F. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

G. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

H. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

I. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

J. Reference: Standard Specification for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

SECTION 32 13 73 - CONCRETE PAVING JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant: ASTM D6690, Type I.

B. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

E. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

F. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

G. Reference: Standard Specification for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

SECTION 32 17 13 - PARKING BUMPERS

A. Precast concrete wheel stops.

B. Verify that pavement is in suitable condition to begin installation in accordance with manufacturer's written instructions.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Install wheel stops in accordance with manufacturer's written instructions unless otherwise indicated.

E. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

SECTION 32 17 23 - PAVEMENT MARKINGS

A. Painted markings applied to asphalt paving.

B. Painted markings applied to concrete surfaces.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the Illinois Department of Transportation for pavement-marking work.

D. Verify that pavement-marking substrate is dry and in suitable condition to begin pavement marking in accordance with manufacturer's written instructions.

E. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

F. Allow asphalt paving or concrete surfaces to age for a minimum of 30 days before starting pavement marking.

G. Sweep and clean surface to eliminate loose material and dust.

H. Protect pavement markings from damage and wear during remainder of construction period.

I. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

J. Reference: Standard Specification for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

A. Chain-link fences to meet requirements of Standard Specification for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

B. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

C. Examine areas and conditions for compliance with requirements for a certified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

E. Stake locations of fence lines, gates, and terminal posts.

F. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.

G. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

SECTION 32 91 13 - SOIL PREPARATION

A. Section includes planting soils specified by composition of the mixes.

B. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated.

C. Place planting soil and fertilizers according to requirements of the Illinois Department of Transportation.

D. Verify that no foreign or deleterious material has been deposited in planting soil.

E. Proceed with placement only after unsatisfactory conditions have been corrected.

F. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

SECTION 32 92 00 - TURF AND GRASSES

A. Seeding.

B. Sodding.

C. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

D. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
4. Extended warranty to be provided for 1 year from Substantial Completion plus 1 growing season.

E. See 10/24/19 Geotechnical Report prepared by Intertek-PSI for additional site information.

F. Reference: Standard Specification for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

DIVISION 33: UTLITIES

SECTION 33 41 00 - STORM UTILITY DRAINAGE PIPING

A. Nonreinforced-Concrete Sewer Pipe and Fittings: ASTM C 14.

B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76.

C. Reference: Standard Specification for Road and Bridge Construction, Adopted April 1, 2016, or current edition.

D. Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), current regulations.

Manholes

A. Standard Precast Concrete Manholes:
1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
4. Manholes should follow MWRDGC regulations.

Catch Basins

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C 478 precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
3. Catch basins should follow MWRDGC regulations.

Stormwater Detention Structures

A. Underground Detention Vaults are anticipated for detention volume requirements.

B. Vaults should follow MWRDGC regulations.

SECTION 33 71 73 - ELECTRICAL UTILITY SERVICES

A. Provide arrangement with Utility Company for permanent underground electric service; payment of Utility Company charges for service; service provisions; and utility metering equipment.
   1. Service characteristics: 480Y/277 volts, three phase, four-wire, 60 Hertz.

End of Outline Specifications