

**STATE OF LOUISIANA  
DEPARTMENT OF TRANSPORTATION AND  
DEVELOPMENT**

**CONSTRUCTION PROPOSAL**



**STATE PROJECT NO. H.972020  
CONTROL SECTION 600-90  
DOTD HEADQUARTERS BUILDING CHILLER  
REPLACEMENT**

**EAST BATON ROUGE PARISH**



*William D. Drake, Jr.*  
*9/17/2013*

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## NOTICE TO CONTRACTORS (07/13)

Electronic bids and electronic bid bonds for the following project will be downloaded by the Louisiana Department of Transportation and Development (LA DOTD) on **Wednesday, October 23, 2013. Paper bids and paper bid bonds will not be accepted.** Electronic bids and electronic bid bonds must be submitted through [www.bidx.com](http://www.bidx.com) prior to the electronic bidding deadline. Beginning at 10:00 a.m., all bids will be downloaded and posted online at <http://www.dotd.la.gov/cgi-bin/construction.asp>. No bids are accepted after 10:00 a.m.

### STATE PROJECT NO. H.972020

CONTROL SECTION NO. 600-90

DESCRIPTION: DOTD Headquarters Building Chiller Replacement

PARISH: E. Baton Rouge

TYPE: Removal and replacement of two water-cooled centrifugal chillers, pumps, and associated electrical work.

LIMITS FOR H.972020

LIMITS: Control Section No. 600-90: DOTD Headquarters Main Campus located at 1201 Capitol Access Rd., Baton Rouge, LA 70802.

ESTIMATED COST RANGE: **\$500,000.00 - \$1,000,000.00**

*The estimated cost range is for informational purposes only and may be subject to change. The bid prices received from bidders will be evaluated based on the actual estimate value, which will be published at bid opening, for award determination.*

PROJECT ENGINEER: Mr. Nathan Lemoine, Facility Maintenance Manager; 1201 Capitol Access Road, Baton Rouge, LA 70802; Phone (225) 379-1127.

Bids must be prepared and submitted in accordance with Section 102 of the 2006 *Louisiana Standard Specifications for Roads and Bridges* as amended by the project specifications, and must include all information required by the proposal. *Please be advised if your business establishment is the low bidder for this job, you will not be awarded the project if it is found to be "Not in Good Standing" in the Louisiana Secretary of State database.*

Prior to the electronic bid submission deadline, ONLINE BIDDER REGISTRATION for each project bid is REQUIRED. Online Bidder Registration may be accessed via the Internet at [www.dotd.la.gov](http://www.dotd.la.gov). Select the following options: **Doing Business with DOTD**, then **Construction Letting Information**, then **Online Bidder Registration**.

When completed, a registration confirmation notice will be displayed and may be printed by the bidder. When approved for bidding, the bidder's name will be placed on the "List of Prospective Bidders" located on the LA DOTD Internet website. **It is the bidder's responsibility to review the "List of Prospective Bidders" to ensure approval to bid.** If a bidder does not register for a project, the bid will not be accepted by LA DOTD. As per Subsection 102.04(e) of the 2006 edition of the *Louisiana Standard Specifications for Roads and Bridges*, no bidders will be approved for bid registration within 24 hours before the bid opening. All bidders must register to bid before that deadline. If further information is required, please contact Mr. Alfonzo Simon, email: [Alfonzo.Simon@la.gov](mailto:Alfonzo.Simon@la.gov), (225) 379-1111, fax : (225) 379-1857.

## NOTICE TO CONTRACTORS (07/13)

Plans and proposals are available in electronic format ONLY. All Plans, Proposals, Addenda, Amendments, Letters of Clarification, and Withdrawal Notices will be posted online. **Paper notices will not be distributed.**

Construction proposal information may be accessed via the Internet at [www.dotd.la.gov](http://www.dotd.la.gov). From the LA DOTD home page, select the following options: ***Doing Business with DOTD***, then ***Construction Letting Information***. Once the ***Construction Letting Information*** page appears, find the ***Notice to Contractors*** box. From the drop down menu, select the appropriate letting date and press the “Go To” button to open the page, which provides a listing of all projects to be let and a ***Construction Proposal Documents*** link for each project. All project specific notices are found here. **It will be the responsibility of the bidder to check for updates.** Additionally, plans and specifications may be seen in Room 100-A of the LA DOTD Headquarters Building, 1201 Capitol Access Road in Baton Rouge, LA or at the Project Engineer's office. Upon request, the Project Engineer will show the project site.

All questions concerning the plans shall be submitted via the Electronic Plans Distribution Center known as **Falcon**. All submitted questions will be forwarded by email to the Project Manager and the Project Engineer. Questions submitted within 96 hours of the bid deadline may not be answered prior to bidding. Falcon may be accessed via the Internet at [www.dotd.la.gov](http://www.dotd.la.gov). From the home page, select ***Doing Business with DOTD*** from the left-hand menu, then select ***Construction Letting Information*** on the pop-up menu. On the Construction Letting Information page, select the link, ***DOTD's Plan Room***; Login to Falcon (or request an ID if a first-time user). Once logged in, you will have access to view Project Information, submit a question concerning the project, and view the plans. To avoid any suggestion that a potential bidder is using the Falcon system to communicate with other potential bidders, DOTD will not post any question or any statement of fact or opinion not made for the purpose of seeking clarification of plans and/or specifications. Any non-questions posted on falcon will be limited to the statement of an issue considered unresolved by a previous DOTD response.

Bidders assume the responsibility for accessing the Apparent Bid Results and final Bid Results on the Construction Letting Information web page located at [www.dotd.la.gov/cgi-bin/construction.asp](http://www.dotd.la.gov/cgi-bin/construction.asp) to confirm whether they are the apparent low bidder for any given project and the specific due date of Form CS-6AAA. **Apparent Low Bidders on Disadvantaged Business Enterprises (DBE)/Small Business Element (SBE) Goal Projects shall comply fully with the “Required Contract Provisions for DBE/SBE Participation in Federal Aid Construction Contracts (DBE/SBE Goal Project)” contained in Section “G” of the Proposal; and, in accordance therewith, Apparent Low Bidders shall submit the completed Form CS-6AAA and Attachments to the LA DOTD Compliance Programs Office.** The award of the contract will be electronically submitted to the successful low bidder on each project.

The Engineer may suspend operations in accordance with 713.08(f).

The U. S. Department of Transportation (DOT) operates a toll free "Hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m., Eastern Time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should call 1-800-424-9071. All information will be treated confidentially and caller anonymity will be respected.

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**GENERAL BIDDING REQUIREMENTS (08/06):** The specifications, contract and bonds governing the construction of the work are the 2006 Edition of the Louisiana Standard Specifications for Roads and Bridges, together with any supplementary specifications and special provisions attached to this proposal.

Bids shall be prepared and submitted in accordance with Section 102 of the Standard Specifications.

The plans herein referred to are the plans approved and marked with the project number, route and Parish, together with all standard or special designs that may be included in such plans.

The bidder declares that the only parties interested in this proposal as principals are those named herein; that this proposal is made without collusion or combination of any kind with any other person, firm, association, or corporation, or any member or officer thereof; that careful examination has been made of the site of the proposed work, the plans, Standard Specifications, supplementary specifications and special provisions above mentioned, and the form of contract and payment, performance, and retainage bond; that the bidder agrees, if this proposal is accepted, to provide all necessary machinery, tools, apparatus and other means of construction and will do all work and furnish all material specified in the contract, in the manner and time therein prescribed and in accordance with the requirements therein set forth; and agrees to accept as full compensation therefore, the amount of the summation of the products of the quantities of work and material incorporated in the completed project, as determined by the engineer, multiplied by the respective unit prices herein bid.

It is understood by the bidder that the quantities given in this proposal are a fair approximation of the amount of work to be done and that the sum of the products of the approximate quantities multiplied by the respective unit prices bid shall constitute gross sum bid, which sum shall be used in comparison of bids and awarding of the contract.

The bidder further agrees to perform all extra and force account work that may be required on the basis provided in the specifications.

The bidder further agrees that within 15 calendar days after the contract has been transmitted to him, he will execute the contract and furnish the Department satisfactory surety bonds.

If this proposal is accepted and the bidder fails to execute the contract and furnish bonds as above provided, the proposal guaranty shall become the property of the Department; otherwise, said proposal guaranty will be returned to the bidder; all in accordance with Subsection 103.04.

**MANDATORY ELECTRONIC BIDS AND ELECTRONIC BID BONDS SUBMISSION (10/08):** This project requires mandatory electronic bidding. All Specifications, whether Standard, Supplemental or Special Provisions, are hereby amended to delete any references regarding paper bids and the ability to submit paper bid forms.

The contractor shall register online to be placed on the Louisiana Department of Transportation and Development (LA DOTD) prospective bidders list or for information only list.

Modifications to proposal documents will be posted on the Department's website at the following URL address: [www.dotd.la.gov/cgi-bin/construction.asp](http://www.dotd.la.gov/cgi-bin/construction.asp).

LA DOTD shall not be responsible if the bidder cannot complete and submit a bid due to failure or incomplete delivery of the files submitted via the internet.

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**IRREGULAR BIDS (04/10):** Subsection 102.08 is hereby amended to include the following revision to section (g):

(g) If an owner (part or as a whole), registered agent, license holder, manager, organizer, or a principal officer(s) of the bidding entity is an owner (part or as a whole), registered agent, license holder, manager, organizer, or a principal officer(s) of another or the same bidding entity of a contracting entity which has been declared by the Department to be ineligible to bid for any reason.

**CONTRACTOR'S RESPONSIBILITY FOR WORK (07/09):** Section 107 Legal Relations and Responsibility to Public of the 2006 Standard Specifications is amended as follows:

Subsection 107.19, Contractor's Responsibility for Work is amended to delete the first paragraph of Subpart (b) and substitute the following:

Unavoidable damage due to Acts of God such as earthquake, tidal wave, tornado, hurricane, or other cataclysmic phenomenon of nature or acts of governmental authorities, except for materials and equipment that are not incorporated in the work.

**PROSECUTION OF WORK (06/13):** Subsection 108.04, Prosecution of Work of the Standard Specifications as amended by the supplemental specifications thereto, is deleted and replaced by the following.

**108.04(a) General**

The contractor shall provide sufficient materials, equipment, and labor to complete the project in accordance with the plans and specifications within the contract time. If the completed work is behind the approved progress schedule, the contractor shall take immediate steps to restore satisfactory progress and shall not transfer equipment or forces from uncompleted work without prior notice to, and approval of, the engineer. Each item of work shall be prosecuted to completion without delay. If prosecution of the work is discontinued for an extended period of time, the contractor shall give the engineer written notice at least 24 hours before resuming operations.

**108.04(b) Progress and Disqualification**

The contractor's progress will be determined monthly at the time of each partial estimate, and will be based on the total amount earned by the contractor as reflected by the partial estimate. If the contractor's progress is more than 20 percent behind the elapsed contract time, the contractor may be notified that he is not prosecuting the work in an acceptable manner. If requested by the Department the contractor must meet with and provide the project engineer with an acceptable written plan which details how the contractor will regain lost progress and prosecute the remaining work.

A contractor shall be immediately disqualified when, on two or more projects, the contractor is in default in accordance with Subsection 108.09(a) and its progress on each such project is

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deficient by 10 percent or more. The contractor shall remain disqualified until only one overdue project remains incomplete and it has achieved final acceptance of the other project(s).

Should the surety or the Department take over prosecution of a project, the contractor shall remain disqualified for a period of one year from the completion of the project, unless the contractor is debarred.

A contractor may also be disqualified for other causes as provided elsewhere in the contract. During the period of disqualification, except as provided elsewhere, the contractor will not be permitted to bid on Department contracts nor be approved as a subcontractor on Department projects. Any bid submitted by the contractor during the period of disqualification will not be considered and will be returned.

#### **108.04(c) Disqualification Review Board**

After disqualification, the contractor may submit a written appeal to the Chief Engineer on construction projects, the Assistant Secretary, Office of Operations, on maintenance projects, or the District Administrator on district-let contracts for review by the appropriate Departmental Disqualification Review Board. The written appeal shall be submitted within 7 days, excluding weekends and holidays, after issuance of written notice of disqualification and the contractor may either request a meeting with the review board or that the review board consider a written appeal only. A meeting of the review board will be scheduled within 5 days, excluding weekends and holidays, after receipt of appeal.

The Department's headquarters review board will be composed of the Chief Engineer, or his designee, and five other members appointed by the Secretary. The Chief Engineer, or his designee, and two other members will constitute a quorum.

After all pertinent information has been considered, the contractor will be notified of the decision of the review board in writing within 5 days, excluding weekends and holidays. The decision of the review board will not operate as a waiver by the Department of its rights concerning the assessment of stipulated damages as specified under 108.08.

When the Department of Transportation and Development is not the contracting agency on a project, the contracting agency will make any disqualification determination and the contractor shall submit its appeal to the appropriate agency representative for that agency to address. The contracting agency will request that the Department concur with their decision prior to notifying the Contractor in writing. The DOTD's concurrence is advisory and will not make the DOTD a party to the contracting agency's construction contract.

#### **ITEM NS-MNT-07020, BUILDING REPAIR**

**Description:** This work shall be in accordance with the 2006 Louisiana Standard Specifications for Roads and Bridges, the plans and plan specifications, and as directed by the Project Engineer.

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The Contractor shall remove two (2) existing water-cooled centrifugal chillers, chilled water pumps, valves, chilled water piping, electrical equipment, and other appurtenances marked for demolition in the plans.

The Contractor shall provide two (2) new water-cooled centrifugal chillers, chilled water pumps, associated electrical work and control wiring, and all required piping and valves as detailed in the plans. The contractor shall integrate the two new chillers into the existing Building Automation System (BAS). The Contractor shall provide required HVAC testing, balancing, and adjusting and electrical testing as detailed in the specifications.

It will be the responsibility of the contractor to visit the construction site to determine and verify existing conditions and dimensions, and shall allow for such conditions in computing his bid.

Payment will be made under:

NS-MNT-07020, Building Repair, per lump sum

**CONTRACT TIME:** The entire contract shall be completed in all details and ready for final acceptance in accordance with Subsection 105.17(b) within **Twenty (20) working days.**

Prior to assessment of contract time, the contractor will be allowed 90 calendar days from the date stipulated in the Notice to Proceed to commence with portions of the contract work including but not limited to assembly periods, preparatory work for materials fabrication such as test piles, or other activities which hinder progress in the beginning stages of construction. Prior to issuance of the Notice to Proceed, the Department will consider extending the assembly period upon written request from the contractor justifying the need for additional time.

If the contractor begins regular construction operations prior to expiration of the assembly period, the assessment of contract time will commence at the time construction operations are begun.



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**TECHNICAL SPECIFICATIONS FOR  
DOTD HEADQUARTERS BUILDING CHILLER  
REPLACEMENT**

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### **1. SECTION 011000 - SUMMARY**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
1. Project information.
  2. Access to site.
  3. Coordination with occupants.
  4. Work restrictions.
  5. Specification and drawing conventions.

##### **1.2 PROJECT INFORMATION**

- A. Project Identification: "DOTD Headquarters Chiller Replacement" H.972020.
1. Project Location: 1201 Capitol Access Rd., Baton Rouge, LA 70802.
- B. Owner: Louisiana Department of Transportation and Development (hereinafter referred to as "Department.")
1. Design Engineer: Brett Brabham, P.E., 225-379-1082; Brett.Brabham@la.gov.
  2. Project Manager: Andrew Sanders, 225-379-1952; Andrew.Sanders@la.gov.
  3. Maintenance Manager: Nathan Lemoine, 225-379-1127; Nathan.Lemoine@la.gov.

##### **1.3 ACCESS TO SITE**

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Limits: Confine construction operations to the inside first floor mechanical and electrical equipment area and directly outside.

##### **1.4 COORDINATION WITH OCCUPANTS**

- A. Full Owner Occupancy: The Department will occupy site and existing building(s) during entire construction period. Cooperate with the Department during construction operations to minimize conflicts and facilitate Department usage. Perform the Work so as not to interfere with the Department's day-to-day operations. Maintain existing exits unless otherwise indicated.

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1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Facilities Maintenance Department.
2. Notify Facilities Maintenance Manager not less than 48 hours in advance of activities that will affect the Department's operations.

#### **1.5 WORK RESTRICTIONS**

- A. Work Restrictions, General: Comply with restrictions on construction operations.
  1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours, unless otherwise indicated or agreed to.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by the Department or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
  1. Notify Facilities Maintenance Manager not less than one week in advance of proposed utility interruptions.
  2. Obtain Department's written permission before proceeding with utility interruptions.

#### **1.6 SPECIFICATION AND DRAWING CONVENTIONS**

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
  1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.

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3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

END OF SECTION 011000

# **SPECIAL PROVISIONS**

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### **2. SECTION 013300 - SUBMITTAL PROCEDURES**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. In accordance with Louisiana Revised Statute (R.S.) 38:2212.1, the product names listed in the Drawings and Specifications are used to denote the quality standard of the item specified. The Contractor has the right to submit alternate equipment provided that submitted alternate equipment conforms to the written specifications and meets or exceeds the quality standard set forth by the specified product as determined by the Design Engineer.

##### **1.2 DEFINITIONS**

- A. Action Submittals: Written and graphic information and physical samples that require Design Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Design Engineer's responsive action. Submittals may be rejected for not complying with requirements.

##### **1.3 ACTION SUBMITTALS**

- A. General Requirements: All submittal work shall comply with Section 801 – "General Requirements for Structures," subsection 801.03 – "Shop Drawings, Working Drawings, and Other Submittals" in the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition. The Contractor shall submit shop drawings, equipment submittals, descriptive data, brochures and samples as soon as possible after award of the contract and before beginning work. The name of the project, project number, part number, fabricator or manufacturer's name, and the parish in which the project is located shall be shown on each sheet of every submittal. Shop drawings and equipment submittals shall measure either 8-1/2 by 11 inches or 11 by 17 inches. Equipment submittals shall be clearly marked as to the specific size and/or model being submitted and for what purpose it is to be used on the project. All submittals shall give the location(s) where the product will be used.
- B. Submittal Procedures: The Contractor shall provide electronic submittals as Portable Document Format (PDF) documents to the Design Engineer. Submittals 10 megabytes or less can be transmitted through email. All larger submittals shall be sent through DOTD's Large File Transfer System. Other methods will be considered upon request. Submittals will then be marked and returned to the Contractor electronically. The Contractor shall make the required revisions, if any, on the returned submittals and resubmit. This process will repeat until the Department has no comments. Submittals will then be stamped "No Exceptions Taken," initialed, and dated and distributed electronically by Bridge Design.

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- C. Corrections and/or comments made on submittals are not intended to relieve the Contractor from compliance with the contract documents. Approval of the submittals and drawings does not imply that the equipment or materials described is complete, can be constructed or installed, will operate successfully, or will coordinate with existing or other equipment specified. The Contractor shall remain responsible for confirming and correlating all quantities and dimensions, for selecting fabrication processes and techniques of construction, for coordination and for satisfactory installation and operation of equipment. If a submitted and returned "No Exceptions Taken" manufactured item is discontinued prior to ordering equipment, the Contractor shall resubmit the new item. Replacement models may not necessarily be acceptable if it does not meet the specifications.
- D. The Design Engineer reserves the right to request additional submittals if required or necessary to complete review.

#### **1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Design Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Design Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Design Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
- C. Options: Identify options requiring selection by Design Engineer.
- D. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- E. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Design Engineer's action stamp ("No Exceptions Taken").

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**PART 2 - EXECUTION**

**2.1 CONTRACTOR'S REVIEW**

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions.
- B. Operation and Maintenance Manual Submittals: See requirements in Section 017823 "Operation and Maintenance Data."

**2.2 DESIGN ENGINEER ACTION**

- A. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- B. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

**2.3 SUBMITTAL SCHEDULE**

- A. Shop drawings, certified dimensional drawings, product description brochures, installation procedures, samples and color patterns shall be submitted for below as indicated (X):

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<b>Mechanical/Electrical Submittal Requirements</b>				
Item	Shop Dwg.	Dimen. Dwg	Prod. Desc.	Install. Proced.
500 Ton Water-Cooled Chiller		X	X	X
Butterfly Valve		X	X	
Balance Valve		X	X	
Check Valve		X	X	
Y-pattern Strainer		X	X	
Centrifugal Pump		X	X	X
Flexible Pump Connectors		X	X	
Concrete Equipment Pad	X			
Steel Piping and Supports			X	X
Pipe Insulation and Jacket			X	X
Flow Switch		X	X	X
Temperature Gage			X	
Pressure Gage and Accessories			X	
Pipe Identification Labels		X	X	X
Mechanical-Type Pipe Couplings			X	X
R.G.S. Conduit and Fittings			X	X
L.F.M.C. and Fittings			X	X
Conductors			X	X
Combination Motor Starters		X	X	X
Nameplates		X	X	X
Warning Labels		X	X	X

END OF SECTION 013300



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### **3. SECTION 014200 - REFERENCES**

#### **PART 1 - GENERAL**

##### **1.1 DEFINITIONS**

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "No Exceptions Taken": When used to convey Design Engineer's action on Contractor's submittals, applications, and requests, "No Exceptions Taken" does not guarantee that the submitted items conform to the requirements of the Contract Documents, or that the items can be satisfactorily installed and operated in accordance with the intent of the Contract Documents. The Contractor's obligation to perform and complete the work in the Contract Documents is absolute. The Contractor is always fully responsible for ensuring that all items used on the project comply with the requirements of the Contract Documents, and can be satisfactorily installed and operated without adversely affecting the installation and operation of other items. If at any time, the Department discovers that an item does not meet the requirements of the Contract Documents, the Contractor will be required to replace the item, or perform some other agreed upon remedy that will cause the work to comply with the Contract Documents, at no additional cost or contract time to the Department even though the item was previously reviewed by the Department, and the item has already been installed on the project. This includes all redesign/modifications/replacement of other items required to complete the replacement of the incorrect item.
- C. "Returned for Correction": Submittals stamped "Returned for Correction" have been rejected by the Department. A submitted item may be rejected because it is not equal to or better than the item specified in the Contract Documents, it may not be installed correctly, pertinent information may not be included in the submittal, or some other error.
- D. "Directed": A command or instruction by Design Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- E. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- F. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- G. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- H. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- I. "Provide": Furnish and install, complete and ready for the intended use.

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- J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### **1.2 INDUSTRY STANDARDS**

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### **1.3 ABBREVIATIONS AND ACRONYMS**

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
  2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
  3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
  4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
  6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
  7. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org).
  8. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
  9. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
  10. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
  11. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
  12. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
  13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
  14. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
  15. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
  16. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
  17. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).

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18. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
19. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
20. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
21. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
22. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
23. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
24. API - American Petroleum Institute; [www.api.org](http://www.api.org).
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
28. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
31. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
32. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).
33. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).
34. ASTM - ASTM International; (American Society for Testing and Materials International); [www.astm.org](http://www.astm.org).
35. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
36. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
37. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
39. AWPAA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); [www.awpa.com](http://www.awpa.com).
40. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
41. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
42. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
43. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
44. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.com](http://www.bifma.com).
46. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bwfbadminton.org](http://www.bwfbadminton.org).
49. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
50. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
51. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
52. CFFA - Chemical Fabrics & Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
53. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
54. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
55. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
56. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
57. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
58. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).

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- 59. CPA - Composite Panel Association; [www.pbmdf.com](http://www.pbmdf.com).
- 60. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
- 61. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
- 62. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
- 63. CSA - Canadian Standards Association; [www.csa.ca](http://www.csa.ca).
- 64. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
- 65. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).
- 66. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
- 67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
- 68. CWC - Composite Wood Council; (See CPA).
- 69. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
- 70. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
- 71. ECA - Electronic Components Association; [www.ec-central.org](http://www.ec-central.org).
- 72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
- 73. EIA - Electronic Industries Alliance; (See TIA).
- 74. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
- 75. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
- 76. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
- 77. ESTA - Entertainment Services and Technology Association; (See PLASA).
- 78. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
- 79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
- 80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
- 81. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
- 82. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
- 83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; [www.floridarooft.com](http://www.floridarooft.com).
- 84. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
- 85. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
- 86. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
- 87. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
- 88. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
- 89. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
- 90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
- 91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
- 92. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).
- 93. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
- 94. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
- 95. IAS - International Approval Services; (See CSA).
- 96. ICBO - International Conference of Building Officials; (See ICC).
- 97. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
- 98. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
- 99. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
- 100. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
- 101. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
- 102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
- 103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).

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104. IESNA - Illuminating Engineering Society of North America; (See IES).
105. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
106. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
107. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
108. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
113. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
116. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
119. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
120. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).
121. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
122. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
123. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
124. MIA - Marble Institute of America; [www.marble-institute.com](http://www.marble-institute.com).
125. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); [www.wmmpa.com](http://www.wmmpa.com).
126. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
128. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
129. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
130. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
131. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
132. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
133. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
134. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
135. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
136. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
137. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
138. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
139. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
140. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
141. NFPA - NFPA; (National Fire Protection Association); [www.nfpa.org](http://www.nfpa.org).
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
144. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
145. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).

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146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
148. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
149. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
150. NSF - NSF International; (National Sanitation Foundation International); [www.nsf.org](http://www.nsf.org).
151. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
152. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
154. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
155. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
156. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
158. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
159. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
160. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
161. SAE - SAE International; (Society of Automotive Engineers); [www.sae.org](http://www.sae.org).
162. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
163. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
164. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
165. SEFA - Scientific Equipment and Furniture Association; [www.sefalabs.com](http://www.sefalabs.com).
166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
168. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
169. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
171. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
172. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
173. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
174. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
175. SRCC - Solar Rating and Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
176. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
177. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
178. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
179. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
180. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
181. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
182. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); [www.tileusa.com](http://www.tileusa.com).
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
184. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
185. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
186. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
187. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
188. TPI - Turfgrass Producers International; [www.turfgrassprod.org](http://www.turfgrassprod.org).

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189. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
190. UBC - Uniform Building Code; (See ICC).
191. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
192. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
193. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
194. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
195. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
196. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
197. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
198. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
199. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
200. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); [www.wicnet.org](http://www.wicnet.org).
201. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
202. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
203. WPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).
2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
4. DOD - Department of Defense; <http://dodssp.daps.dla.mil>.
5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
8. FG - Federal Government Publications; [www.gpo.gov](http://www.gpo.gov).
9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <http://eetd.lbl.gov>.
12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
13. SD - Department of State; [www.state.gov](http://www.state.gov).
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; [www.trb.org](http://www.trb.org).
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).

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17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
  18. USP - U.S. Pharmacopeia; [www.usp.org](http://www.usp.org).
  19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).
- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
  3. DSCC - Defense Supply Center Columbus; (See FS).
  4. FED-STD - Federal Standard; (See FS).
  5. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
    - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
    - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
    - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/ccb](http://www.wbdg.org/ccb).
  6. MILSPEC - Military Specification and Standards; (See DOD).
  7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

END OF SECTION 014200



# **SPECIAL PROVISIONS**

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### **4. SECTION 017823 - OPERATION AND MAINTENANCE DATA**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Operation manuals for systems, subsystems, and equipment.
  - 3. Product maintenance manuals.
  - 4. Systems and equipment maintenance manuals.

##### **1.2 OPERATION AND MAINTENANCE MANUAL SUBMITTAL PROCEDURE**

- A. Submit the initial copy of the manual as a single, color, Portable Document Format (PDF) file. The electronic file shall be organized and formatted to present itself as a finished operation and maintenance manual. For bidding purposes, allow a review period of ten (10) working days.
- B. The entire maintenance manual will be considered one item. Only the title sheet shall be stamped "Returned for Corrections" or "No Exceptions Taken."
- C. If the operation and maintenance manual is rejected for review, the title sheet will be stamped "Returned for Corrections," will be initialed and dated by the reviewer, will have comments marked in red, and will be returned electronically.
- D. Correct errors and resubmit electronically to the Design Engineer for review. This process will repeat until the Department has no comments. The title sheet will then be stamped "No Exceptions Taken," initialed and dated by the reviewer, and distributed electronically by Bridge Design.
  - 1. After manual is returned electronically "No Exceptions Taken," submit two paper copies in accordance with Paragraph F under Section 2.1.

#### **PART 2 - PRODUCTS**

##### **2.1 REQUIREMENTS FOR OPERATION AND MAINTENANCE MANUALS**

- A. All sheets included in the manual must be of good quality and easily readable. Poor quality can be reason for rejection. Any sheets with color must be scanned/printed in color.
- B. Directory: Prepare a single, comprehensive directory of operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

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- C. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
1. Title page.
  2. Table of contents.
  3. Content.
- D. Title Page: Include the following information:
1. Owner name: "Louisiana Department of Transportation and Development."
  2. Title of manual: "Operation and Maintenance Manual."
  3. State project number.
  4. Parish name.
  5. Building name and address.
  6. Year in which the project was completed.
  7. Name and contact information for Contractor.
- E. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- F. Manuals, Paper Copy: Submit two final forms as hard copies, bound and labeled volumes. The title sheet shall bear the "No Exceptions Taken" stamp.
1. Binders: Heavy-duty, three-ring (D-ring), lockable, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and project number. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text. Drawings shall measure a maximum of 11 by 17 inches.
    - a. Fold drawings to same size as text pages and use as foldouts.

## **2.2 OPERATION SECTION**

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

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1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Operating standards.
3. Operating procedures.
4. Operating logs.
5. Wiring diagrams.
6. Control diagrams.
7. Piped system diagrams.
8. Precautions against improper use.

**B. Descriptions: Include the following:**

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

**C. Operating Procedures: Include the following, as applicable:**

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

**D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.**

**E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.**

## **2.3 PRODUCT MAINTENANCE SECTION**

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.**
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and**

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telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

#### **2.4 SYSTEMS AND EQUIPMENT MAINTENANCE SECTION**

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.

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2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

#### **2.5 RECORD DRAWINGS**

- A. Include 11 x 17 inch, signed Record Drawings (As-builts). Comply with Section 17839 "Project Record Documents."

### **PART 3 - EXECUTION**

#### **3.1 MANUAL PREPARATION**

- A. Product Maintenance: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

END OF SECTION 017823

# **SPECIAL PROVISIONS**

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### **5. SECTION 017839 - PROJECT RECORD DOCUMENTS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

##### **1.2 CLOSEOUT SUBMITTALS**

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record Drawings for review.
      - 2) Design Engineer will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit one half-size (11-inches by 17-inches) paper-copy set(s) of marked-up record Drawings for each hard copy of the operation and maintenance manual.

#### **PART 2 - PRODUCTS**

##### **2.1 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
  - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

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- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Record data as soon as possible after obtaining it.
    - c. Record and check the markup before enclosing concealed installations.
  2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  3. Mark record sets with erasable, red-colored pen or pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  4. Note Construction Change Order numbers and similar identification where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Final Acceptance, review marked-up record prints with Design Engineer and Project Engineer. When authorized, prepare a full set of corrected digital data files of the Contract Drawings for initial review, as follows:
1. Format: Annotated PDF electronic file.
  2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
  3. Refer instances of uncertainty to Project Engineer or Design Engineer for resolution.

## **PART 3 - EXECUTION**

### **3.1 RECORDING AND MAINTENANCE**

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

END OF SECTION 017839

# **SPECIAL PROVISIONS**

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### **6. SECTION 024119 - SELECTIVE DEMOLITION**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Salvage of existing items to be reused or recycled.

##### **1.2 DEFINITIONS**

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to the Department.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

##### **1.3 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For refrigerant recovery technician.
- B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician.

##### **1.4 CLOSEOUT SUBMITTALS**

- A. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

##### **1.5 QUALITY ASSURANCE**

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.



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#### **1.6 FIELD CONDITIONS**

- A. The Department will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so the Department's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by the Department as far as practical.
- C. Notify Design Engineer of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

#### **1.7 WARRANTY**

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

### **PART 2 - PRODUCTS**

#### **2.1 PERFORMANCE REQUIREMENTS**

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Design Engineer.

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#### **3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS**

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
  - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. The Department will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies.
  - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
    - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to the Department.
    - f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

#### **3.3 PREPARATION**

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes

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to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

#### **3.4 SELECTIVE DEMOLITION, GENERAL**

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  - 2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - 3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  - 4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - 5. Dispose of demolished items and materials promptly.

#### **3.5 DISPOSAL OF DEMOLISHED MATERIALS**

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

#### **3.6 CLEANING**

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

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### **7. SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

##### **1.2 COORDINATION**

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
  - 1. Motor controllers.
  - 2. Torque, speed, and horsepower requirements of the load.
  - 3. Ratings and characteristics of supply circuit and required control sequence.
  - 4. Ambient and environmental conditions of installation location.

#### **PART 2 - PRODUCTS**

##### **2.1 GENERAL MOTOR REQUIREMENTS**

- A. Comply with NEMA MG 1 unless otherwise indicated.

##### **2.2 MOTOR CHARACTERISTICS**

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

##### **2.3 POLYPHASE MOTORS**

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.

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- D. Multispeed Motors: Variable torque.
  - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
  - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
  - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
  - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron.

#### **2.4 SINGLE-PHASE MOTORS**

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
  - 1. Permanent-split capacitor.
  - 2. Split phase.
  - 3. Capacitor start, inductor run.
  - 4. Capacitor start, capacitor run.
- B. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- C. Motors 1/20 HP and Smaller: Shaded-pole type.
- D. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

#### **PART 3 - EXECUTION (Not Applicable)**

END OF SECTION 230513

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**8. SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

A. Section Includes:

1. Sleeves.
2. Grout.

**1.2 ACTION SUBMITTALS**

A. Product Data: For each type of product indicated.

**PART 2 - PRODUCTS**

**2.1 SLEEVES**

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

**2.2 GROUT**

- A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

**PART 3 - EXECUTION**

**3.1 SLEEVE INSTALLATION**

A. Install sleeves for piping passing through penetrations in walls.

END OF SECTION 230517

**SPECIAL PROVISIONS  
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**9. SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Escutcheons.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.

**PART 2 - PRODUCTS**

**2.1 ESCUTCHEONS**

- A. One-Piece, Stainless Steel Type: With satin finish and spring-clip fasteners.
  - 1. Use 300 series stainless steel.
  - 2. Minimum material thickness of 16 gage.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

- A. Install escutcheons for piping penetrations of walls.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

**3.2 FIELD QUALITY CONTROL**

- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 230518

# **SPECIAL PROVISIONS**

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### **10. SECTION 230519 - METERS AND GAGES FOR HVAC PIPING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Liquid-in-glass thermometers.
  - 2. Dial-type pressure gages.
  - 3. Gage attachments.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.

##### **1.3 CLOSEOUT SUBMITTALS**

- A. Operation and maintenance data.

#### **PART 2 - PRODUCTS**

##### **2.1 LIQUID-IN-GLASS THERMOMETERS**

- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
  - 1. Standard: ASME B40.200.
  - 2. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
  - 3. Case Form: Adjustable angle unless otherwise indicated.
  - 4. Tube: Glass with magnifying lens and blue or red organic liquid.
  - 5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
  - 6. Window: Plastic.
  - 7. Stem: Stainless steel and of length to suit installation.
    - a. Design for Thermowell Installation: Bare stem.
  - 8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
  - 9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.



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#### **2.2 THERMOWELLS**

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Steel Piping: Stainless steel.
4. Type: Stepped shank unless straight or tapered shank is indicated.
5. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
7. Bore: Diameter required to match thermometer bulb or stem.
8. Insertion Length: Length required to match thermometer bulb or stem.
9. Lagging Extension: Include on thermowells for insulated piping and tubing.
10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

#### **2.3 PRESSURE GAGES**

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Dry type; stainless steel; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: plastic.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

#### **2.4 GAGE ATTACHMENTS**

- A. Snubbers: ASME B40.100, brass; with NPS 1/4, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.
- B. Valves: Stainless-steel needle, with NPS 1/4, ASME B1.20.1 pipe threads.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

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- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- G. Install valve and snubber in piping for each pressure gage for fluids (except steam).
- H. Install thermometers in the following locations:
  - 1. Two inlets and two outlets of each chiller.
- I. Install pressure gages in the following locations:
  - 1. Inlet and outlet of each chiller chilled-water and condenser-water connection.
  - 2. Suction and discharge of each pump indicated in the schedule below.

### **3.2 CONNECTIONS**

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

### **3.3 ADJUSTING**

- A. After installation, calibrate meters according to manufacturer's written instructions.
- B. Adjust faces of meters and gages to proper angle for best visibility.

### **3.4 THERMOMETER SCHEDULE**

- A. Thermometers at inlets and outlets of each chiller shall be the following:
  - 1. Industrial-style, liquid-in-glass type.

### **3.5 THERMOMETER SCALE-RANGE SCHEDULE**

- A. Scale Range for Chilled-Water Piping: 0 to 100 deg F.
- B. Scale Range for Condenser-Water Piping: 0 to 100 deg F.

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**3.6 PRESSURE-GAGE SCHEDULE**

- A. Pressure gages at inlet and outlet of each chiller chilled-water and condenser-water connection shall be the following:
  - 1. Dry type, direct-mounted, metal case.
  - 2. Provide pressure gages for new Annex Building pumps (2), chilled-water pumps CHW-11 and CHW-12 in East Annex Pump Room (4), primary chilled-water pumps CHW-1 and CHW-2 in first floor mechanical room (4), secondary chilled-water pumps CHW-5 and CHW-6 in first floor mechanical room (4).

**3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE**

- A. Scale Range for Chilled-Water Piping: 0 to 160 psi.
- B. Scale Range for Condenser-Water Piping: 0 to 160 psi.

END OF SECTION 230519

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### **11. SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Bronze ball valves.
  - 2. Iron, single-flange butterfly valves.
  - 3. Iron, grooved end, manual balancing valves.
  - 4. Iron swing check valves.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of valve indicated.

##### **1.3 QUALITY ASSURANCE**

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

#### **PART 2 - PRODUCTS**

##### **2.1 GENERAL REQUIREMENTS FOR VALVES**

- A. Refer to HVAC valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
  - 1. Butterfly Valves: With extended neck.
- E. Valve-End Connections:
  - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
  - 2. Grooved: Mechanical-type.

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#### **2.2 BRONZE BALL VALVES**

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Description:

- a. Basis of Design Product: Nibco, Inc. T-580-70-66 or comparable product from other manufacturers.
- b. Standard: MSS SP-110.
- c. SWP Rating: 150 psig.
- d. CWP Rating: 600 psig.
- e. Body Design: Two piece.
- f. Body Material: Bronze.
- g. Ends: Threaded.
- h. Seats: PTFE or TFE.
- i. Stem: Stainless steel.
- j. Ball: Stainless steel, vented.
- k. Port: Full.

#### **2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES**

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Description:

- a. Basis of Design Product: Nibco, Inc. LC 2000 or comparable product from other manufacturers.
- b. Standard: MSS SP-67, Type I.
- c. CWP Rating: 200 psig.
- d. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
- e. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
- f. Seat: EPDM.
- g. Operator: Gear, with handwheel.
- h. Stem: One- or two-piece stainless steel.
- i. Disc: Aluminum bronze.

#### **2.4 IRON, GROOVED END, MANUAL BALANCING VALVES**

A. 375 CWP, Iron, Grooved End, Manual Balancing Valves with Bronze Disc:

1. Description:

- a. Basis of Design Product: Nibco, Inc. G737A or comparable product from other manufacturers.
- b. CWP Rating: 375 psig.
- c. Body Material: ASTM A 536, ductile iron.
- d. Disc: ASTM B 584, bronze.
- e. Seat: Ultra high strength engineered resin.

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- f. Pressure Metering Ports: 2-port, 1/4-inch NPT with EPDM check and gasketed cap.
- g. Handwheel: Ergonomic, with multi-turn handwheel adjustments.
- h. Position Indicator: Micrometer-type.
- i. Memory Stop: Hidden and lockable.

#### **2.5 IRON SWING CHECK VALVES**

- A. Class 125, Iron Swing Check Valves with Metal Seats:

- 1. Description:

- a. Basis of Design Product: Nibco, Inc. F-918-B or comparable product from other manufacturers.
- b. Standard: MSS SP-71, Type I.
- c. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
- d. NPS 14 to NPS 24, CWP Rating: 150 psig.
- e. Body Design: Clear or full waterway.
- f. Body Material: ASTM A 126, gray iron with bolted bonnet.
- g. Ends: Flanged.
- h. Trim: Bronze.
- i. Gasket: Asbestos free.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

#### **3.2 VALVE INSTALLATION**

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

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- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install manual balancing valves on supply condenser-water piping. Install manual balancing valves on chilled-water inlet piping (to chiller).
- E. Install ball valves for drain service for both chilled-water and condenser-water piping.
- F. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

### **3.3 ADJUSTING**

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### **3.4 CHILLED-WATER VALVE SCHEDULE**

- A. Pipe NPS 2-1/2 and Larger:
  - 1. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze disc.
  - 2. Iron, Grooved Ends, Manual Balancing Valves, NPS 2-1/2 to NPS 12: 375 CWP, bronze disc.
  - 3. Ball Valves: Two piece, full port, bronze with stainless-steel trim.
  - 4. Iron Swing Check Valves: Class 125, metal seats.

### **3.5 CONDENSER-WATER VALVE SCHEDULE**

- A. Pipe NPS 2-1/2 and Larger:
  - 1. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze disc.
  - 2. Iron, Grooved Ends, Manual Balancing Valves, NPS 2-1/2 to NPS 12: 375 CWP, bronze disc.
  - 3. Ball Valves: Two piece, full port, bronze with stainless-steel trim.

END OF SECTION 230523

# **SPECIAL PROVISIONS**

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### **12. SECTION 230548.13 - VIBRATION CONTROLS FOR HVAC**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Elastomeric isolation pads.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

#### **PART 2 - PRODUCTS**

##### **2.1 ELASTOMERIC ISOLATION PADS**

- A. Elastomeric Isolation Pads:
  - 1. Fabrication: Single or multiple layers of sufficient durometer stiffness for uniform loading over pad area.
  - 2. Size: Factory or field cut to match requirements of supported equipment.
  - 3. Pad Material: Oil and water resistant with elastomeric properties.
  - 4. Surface Pattern: Smooth pattern.

#### **PART 3 - EXECUTION**

##### **3.1 VIBRATION CONTROL DEVICE INSTALLATION**

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in the Drawings and Standard Specifications.
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.

END OF SECTION 230548.13



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### **13. SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.

##### **1.2 ACTION SUBMITTAL**

- A. Product Data: For each type of product indicated.

#### **PART 2 - PRODUCTS**

##### **2.1 EQUIPMENT LABELS**

- A. Plastic Labels for Equipment:
  - 1. See Mechanical General Requirement plan sheets for plastic label requirements.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

##### **2.2 WARNING SIGNS AND LABELS**

- A. Provide warning signs and labels in accordance with the requirements listed in Section S – "Warning Labels" on sheet M1.3.

##### **2.3 PIPE LABELS**

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

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- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches high.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### **3.2 EQUIPMENT LABEL INSTALLATION**

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

### **3.3 PIPE LABEL INSTALLATION**

- A. Piping Color-Coding:
  - 1. Painting of bare condenser-water piping is specified in Section 232113 "Hydronic Piping."
  - 2. Painting of chilled-water pipe insulation is specified in Section 230719 "HVAC Piping Insulation."
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Show flow patterns during normal operation.
  - 4. Near major equipment items and other points of origination and termination.
- C. Pipe Label Color Schedule:
  - 1. Chilled-Water Piping:

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- a. Background Color: Green.
  - b. Letter Color: White.
2. Condenser-Water Piping:
- a. Background Color: Green.
  - b. Letter Color: White.

END OF SECTION 230553

# **SPECIAL PROVISIONS**

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### **14. SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Balancing Hydronic Piping Systems:
    - a. Constant-flow hydronic systems.

##### **1.2 DEFINITIONS**

- A. AABC: Associated Air Balance Council.
- B. NEBB: National Environmental Balancing Bureau.
- C. TAB: Testing, adjusting, and balancing.
- D. TABB: Testing, Adjusting, and Balancing Bureau.
- E. TAB Specialist: An entity engaged to perform TAB Work.

##### **1.3 INFORMATIONAL SUBMITTALS**

- A. Certified TAB reports.

##### **1.4 QUALITY ASSURANCE**

- A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC, NEBB, or TABB.
  - 1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC, NEBB, or TABB.
  - 2. TAB Technician: Employee of the TAB contractor and who is certified by AABC, NEBB, or TABB as a TAB technician.
- B. Certify TAB field data reports and perform the following:
  - 1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
  - 2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

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- C. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

#### **PART 2 - PRODUCTS (Not Applicable)**

#### **PART 3 - EXECUTION**

##### **3.1 EXAMINATION**

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.
- B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- F. Examine test reports specified in individual system and equipment Sections.
- G. Examine operating safety interlocks and controls on HVAC equipment.
- H. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

##### **3.2 PREPARATION**

- A. Prepare a TAB plan that includes strategies and step-by-step procedures.
- B. Complete system-readiness checks and prepare reports. Verify the following:
  - 1. Permanent electrical-power wiring is complete.
  - 2. Hydronic systems are filled, clean, and free of air.
  - 3. Isolating and balancing valves are open and control valves are operational.

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#### **3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING**

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance", ASHRAE 111, NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems", SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing", and in this Section.
- B. Mark equipment and balancing devices, including damper-control positions, valve position indicators, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- C. Take and report testing and balancing measurements in inch-pound (IP) units.

#### **3.4 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS**

- A. Measure water flow at all primary and secondary chilled-water pumps and condenser-water pumps. Use the following procedures except for positive-displacement pumps:
  - 1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
  - 2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
    - a. Monitor motor performance during procedures and do not operate motors in overload conditions.
  - 3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
  - 4. Report flow rates that are not within plus or minus 10 percent of design.
- B. Set calibrated balancing valves, if installed, at calculated presettings.
- C. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.
- D. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
- E. Check settings and operation of each safety valve. Record settings.

#### **3.5 PROCEDURES FOR MOTORS**

- A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

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1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

#### **3.6 PROCEDURES FOR CHILLERS**

- A. Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.

#### **3.7 TOLERANCES**

- A. Set HVAC system's water flow rates within the following tolerances:

1. Chilled-Water Flow Rate: Plus or minus 10 percent.
2. Condenser-Water Flow Rate: Plus or minus 10 percent.

#### **3.8 FINAL REPORT**

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

- B. Final Report Contents: In addition to certified field-report data, include the following:

1. Manufacturers' test data.
2. Field test reports prepared by system and equipment installers.
3. Other information relative to equipment performance; do not include Shop Drawings and product data.

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C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Engineer's name and address.
6. Contractor's name and address.
7. Report date.
8. Signature of TAB supervisor who certifies the report.
9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
10. Summary of contents including the following:
  - a. Indicated versus final performance.
  - b. Notable characteristics of systems.
  - c. Description of system operation sequence if it varies from the Contract Documents.
11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer's name, type, size, and fittings.
13. Notes to explain why certain final data in the body of reports vary from indicated values.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Water and steam flow rates.
2. Pipe and valve sizes and locations.
3. Position of balancing devices.

END OF SECTION 230593



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### **15. SECTION 230719 - HVAC PIPING INSULATION**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes insulating the following HVAC piping systems:
  - 1. Chilled-water piping, indoors and outdoors.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.

##### **1.3 QUALITY ASSURANCE**

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

#### **PART 2 - PRODUCTS**

##### **2.1 INSULATION MATERIALS**

- A. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- B. Mineral-Fiber, Preformed Pipe Insulation:
  - 1. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

##### **2.2 ADHESIVES**

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

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- C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

#### **2.3 SEALANTS**

- A. Joint Sealants:
  - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
  - 2. Permanently flexible, elastomeric sealant.
  - 3. Service Temperature Range: Minus 100 to plus 300 deg F.
  - 4. Color: White or gray.

#### **2.4 FACTORY-APPLIED JACKETS**

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  - 1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

#### **2.5 FIELD-APPLIED JACKETS**

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
  - 1. Sheet and roll stock ready for shop or field sizing.
  - 2. Finish and thickness are indicated in field-applied jacket schedules.
  - 3. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
  - 4. Factory-Fabricated Fitting Covers:
    - a. Same material, finish, and thickness as jacket.
    - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    - c. Tee covers.
    - d. Flange and union covers.
    - e. End caps.
    - f. Beveled collars.
    - g. Valve covers.
    - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

#### **2.6 SECUREMENTS**

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

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- C. Wire: 0.062-inch soft-annealed, stainless steel.

#### **PART 3 - EXECUTION**

##### **3.1 PREPARATION**

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

##### **3.2 GENERAL INSTALLATION REQUIREMENTS**

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- L. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- M. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

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#### **3.3 GENERAL PIPE INSULATION INSTALLATION**

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
  - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  - 5. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
  - 6. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Install removable insulation covers at locations indicated. Installation shall conform to the following:
  - 1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
  - 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
  - 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
  - 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

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#### **3.4 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION**

- A. Insulation Installation on Straight Pipes and Tubes:
  - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
  - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
- B. Insulation Installation on Pipe Flanges:
  - 1. Install preformed pipe insulation to outer diameter of pipe flange.
  - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
  - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
- C. Insulation Installation on Pipe Fittings and Elbows:
  - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
  - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
  - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
  - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
  - 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
  - 4. Install insulation to flanges as specified for flange insulation application.

#### **3.5 FIELD-APPLIED JACKET INSTALLATION**

- A. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

#### **3.6 FINISHES**

- A. Pipe Insulation: Paint jacket with paint system identified below:
  - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with insulation and finish coat paint. Add fungicidal agent to render fabric mildew proof.

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- a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Color: Final color to match existing.
- C. Do not field paint aluminum or stainless-steel jackets.

**3.7 PIPING INSULATION SCHEDULE, GENERAL**

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range.

**3.8 INDOOR PIPING INSULATION SCHEDULE**

- A. Chilled Water, above 40 Deg F: Insulation shall be the following:
  - 1. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

**3.9 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE**

- A. Chilled Water: Insulation shall be the following:
  - 1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches thick.

**3.10 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE**

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. Piping, Exposed:
  - 1. Aluminum, Smooth: 0.032 inch thick.

END OF SECTION 230719

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### **16. SECTION 232113 - HYDRONIC PIPING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes pipe and fitting materials and joining methods for the following:
  - 1. Chilled-water piping.
  - 2. Condenser-water piping.
  - 3. Refrigerant-relief piping.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of the product listed:

##### **1.3 QUALITY ASSURANCE**

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

#### **PART 2 - PRODUCTS**

##### **2.1 PERFORMANCE REQUIREMENTS**

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
  - 1. Chilled-Water Piping: 150 psig at 200 deg F.
  - 2. Condenser-Water Piping: 150 psig at 150 deg F.
  - 3. Refrigerant Relief Piping: 30 psig at 150 deg F.

##### **2.2 STEEL PIPE AND FITTINGS**

- A. Steel Pipe: ASTM A 53, black steel with plain or grooved ends; Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Grooved Mechanical-Joint Fittings and Couplings:
  - 1. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47, Grade 32510 malleable iron; ASTM A 53, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end

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- couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
2. Couplings: Ductile- or malleable-iron housing and EPDM or nitrile gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings. Nuts and bolts shall be zinc electroplated. Use rigid couplings unless otherwise noted.

## **PART 3 - EXECUTION**

### **3.1 PIPING APPLICATIONS**

- A. Chilled-water piping, aboveground, shall be the following:
  1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints. Use flanged ends where required to connect to flanged valves and fittings.
- B. Condenser-water piping, aboveground, shall be the following:
  1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints. Use flanged ends where required to connect to flanged valves and fittings.
- C. Refrigerant-relief piping, aboveground, NPS 2-1/2 and larger, shall be the following:
  1. Schedule 40 steel pipe; plain, welded and seamless. Use flanges where shown.

### **3.2 PIPING INSTALLATIONS**

- A. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- B. Install piping to permit valve servicing.
- C. Install piping free of sags and bends.
- D. Install fittings for changes in direction and branch connections.
- E. Install piping to allow application of insulation (chilled-water piping only).
- F. Select system components with pressure rating equal to or greater than system operating pressure.
- G. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.



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- H. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- I. Install valves according to Section 230523 "General-Duty Valves for HVAC Piping."
- J. Install sleeves for piping penetrations of walls. Comply with requirements for sleeves specified in Section 230517 "Sleeves for HVAC Piping."
- K. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

### **3.3 HANGERS AND SUPPORTS**

- A. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
  - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
  - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
  - 3. Spring hangers to support vertical runs.

### **3.4 PIPE JOINT CONSTRUCTION**

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- D. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

### **3.5 TERMINAL EQUIPMENT CONNECTIONS**

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."
- D. Install flexible grooved pipe couplings to complete the connection to the chillers.

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#### **3.6 FINISH**

- A. Condenser-water piping: Shall have two-part, 100% solids, liquid epoxy coating on all new piping and areas where existing paint finish has been damaged or removed due to construction. Coating shall be applied to clean pipe in accordance with paint manufacturer's established procedures. Dry film thickness shall not be less than 20 mils.
  - 1. Color: Green, to match existing.
- B. Refrigerant-relief piping: Shall have two-part, 100% solids, liquid epoxy coating on all new piping and areas where existing paint finish has been damaged or removed due to construction. Coating shall be applied to clean pipe in accordance with paint manufacturer's established procedures. Dry film thickness shall not be less than 20 mils.
  - 1. Color: Green, to match existing.

#### **3.7 FIELD QUALITY CONTROL**

- A. Perform the following tests on hydronic piping:
  - 1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
  - 2. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
  - 3. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
  - 4. Prepare written report of testing.
- B. Perform the following before operating the system:
  - 1. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
  - 2. Verify lubrication of motors and bearings.

END OF SECTION 232113

# **SPECIAL PROVISIONS**

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### **17. SECTION 232116 - HYDRONIC PIPING SPECIALTIES**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes special-duty valves and specialties for the following:
  - 1. Chilled-water piping.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of the following:
  - 1. Hydronic specialties.

##### **1.3 CLOSEOUT SUBMITTALS**

- A. Operation and maintenance data.

##### **1.4 QUALITY ASSURANCE**

- A. ASME Compliance: Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

#### **PART 2 - PRODUCTS**

##### **2.1 PERFORMANCE REQUIREMENTS**

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
  - 1. Chilled-Water Piping: 150 psig at 200 deg F.

##### **2.2 VALVES**

- A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Section 230523 "General-Duty Valves for HVAC Piping."

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#### **2.3 HYDRONIC PIPING SPECIALTIES**

**A. Y-Pattern Strainers:**

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
3. Strainer Screen: Stainless-steel, 20-mesh strainer, or perforated stainless-steel basket.
4. CWP Rating: 200 psig.

**B. Stainless-Steel Bellow, Flexible Connectors:**

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket. Provide stationary blades to impart rotation motion to the fluid as it enters the inlet elbow.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

#### **PART 3 - EXECUTION**

##### **3.1 VALVE APPLICATIONS**

- A. Install shutoff-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.
- B. Install check valves at each pump discharge and elsewhere as required to control flow direction.
- C. Provide flexible connectors on both suction and discharge side of pumps. For flexible connectors on suction side of pump, install connector upstream of the inlet elbow.

END OF SECTION 232116

# **SPECIAL PROVISIONS**

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### **18. SECTION 232123 - HYDRONIC PUMPS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

A. Section Includes:

1. Separately coupled, base-mounted, end-suction centrifugal pumps.

##### **1.2 ACTION SUBMITTALS**

A. Product Data: For each type of pump.

B. Shop Drawings: For each pump.

1. Show pump layout and connections.
2. Include diagrams for power, signal, and control wiring.

##### **1.3 CLOSEOUT SUBMITTALS**

A. Operation and maintenance data.

#### **PART 2 - PRODUCTS**

##### **2.1 SEPARATELY COUPLED, BASE-MOUNTED, END-SUCTION CENTRIFUGAL PUMPS**

A. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, separately coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for base mounting, with pump and motor shafts horizontal.

B. Pump Construction:

1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet, drain plug at bottom and air vent at top of volute, and flanged connections. Provide integral mount on volute to support the casing, and provide attached piping to allow removal and replacement of impeller without disconnecting piping or requiring the realignment of pump and motor shaft.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For pumps not frequency-drive controlled, trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.

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4. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
  5. Pump Bearings: Grease-lubricated ball bearings in cast-iron housing with grease fittings.
- C. Shaft Coupling: Molded-rubber insert and interlocking spider capable of absorbing vibration. Couplings shall be drop-out type to allow disassembly and removal without removing pump shaft or motor.
- D. Coupling Guard: Dual rated; ANSI B15.1, Section 8; OSHA 1910.219 approved; steel; removable; attached to mounting frame.
- E. Mounting Frame: Welded-steel frame and cross members, factory fabricated from ASTM A 36 channels and angles. Fabricate to mount pump casing, coupling guard, and motor.
- F. Motor: Single speed, secured to mounting frame, with adjustable alignment.
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
    - a. Enclosure: Totally enclosed, nonventilated or totally enclosed, fan-cooled.
    - b. Enclosure Materials: Cast iron.
    - c. Efficiency: Premium efficient.
    - d. Service Factor: 1.15.
- G. Finish: One-coat high-grade machinery enamel on pump, motor, and mounting frame.

## **PART 3 - EXECUTION**

### **3.1 PUMP INSTALLATION**

- A. Comply with HI 1.4.
- B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- C. Equipment Mounting:
1. Install base-mounted pumps on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in the Drawings and Standard Specifications.
  2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."

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#### **3.2 ALIGNMENT**

- A. Perform alignment service.
- B. Comply with requirements in Hydronics Institute standards for alignment of pump and motor shaft. Add stainless steel shims to the motor feet and bolt motor to base frame. Do not use grout between motor feet and base frame.
- C. Comply with pump and coupling manufacturers' written instructions.
- D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

#### **3.3 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to pump, allow space for service and maintenance.
- C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.
- D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.
- E. Install check, shutoff, and throttling valves on discharge side of pumps.
- F. Install Y-type strainer and shutoff valve on suction side of pumps.
- G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.
- H. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.
- I. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

END OF SECTION 232123

# **SPECIAL PROVISIONS**

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### **19. SECTION 236416 - CENTRIFUGAL WATER CHILLERS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes: Packaged, water-cooled, electric-motor-driven centrifugal chillers.

##### **1.2 REFERENCES**

- A. ANSI/ASHRAE Standard 15 - Safety Code for Mechanical Refrigeration.
- B. ASHRAE 90.1 - Energy Conservation in New Building Design.
- C. ASME Section VIII - Boiler and Pressure Vessel Code.
- D. ANSI/UL 465 - Central Cooling Air Conditioners.
- E. AHRI Standard 550/590 - Centrifugal, Helical rotary, scroll, and reciprocating water chillers.
- F. AHRI Standard 575 Sound
- G. ABMA 9 - Load Ratings and Fatigue Life of Roller Bearings.
- H. ASHRAE Standard 34 - Number Designation and Safety Classification of Refrigerants
- I. ANSI/ASHRAE Standard 147 - Reducing the Release of Halogenated Refrigerants from Refrigerating and Air-Conditioning Equipment and Systems

##### **1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include refrigerant, rated capacities, operating characteristics, unit weight, furnished specialties, and accessories.
  - 1. Submit performance data indicating energy input versus cooling load output from 100 to 25 percent of full load with constant entering condenser water temperature.
  - 2. Submit compressor and product data in table form indicating impeller speed (RPM), number of bearings, type of bearings, high speed impeller shaft RPM, sound pressure level per AHRI 575 (dB), number of stages, number of sets of inlet guide vanes, amount of refrigerant charge (lb), and amount of oil required (gal).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.



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#### **1.4 INFORMATIONAL SUBMITTALS**

- A. Startup service reports.
- B. Warranty.

#### **1.5 CLOSEOUT SUBMITTALS**

- A. Operation and maintenance data.

#### **1.6 QUALITY ASSURANCE**

- A. AHRI Certification: Certify chiller according to AHRI 550 certification program.
- B. AHRI Rating: Rate chiller performance according to requirements in AHRI 506/110.
- C. ASHRAE Compliance:
  - 1. ASHRAE 15 for safety code for mechanical refrigeration.
  - 2. ASHRAE 147 for refrigerant leaks, recovery, and handling and storage requirements.
- D. ASME Compliance: Fabricate and label chillers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, as applicable to chiller design.
- E. Comply with NFPA 70.
- F. Comply with requirements of UL and UL Canada, and include label by a qualified testing agency showing compliance.

#### **1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with manufacturer's installation instructions for rigging, chiller loading, local transportation requirements, unloading, storage, and final setting.
- B. Protect chiller and controls from physical damage. Leave factory shipping covers in place until installation. The entire unit must be shrink wrapped with an environmentally recyclable material standard. The material shall include an imbedded desiccant to minimize/eliminate internal moisture.
- C. The chiller shall ship with a dry nitrogen charge to eliminate potential charge loss during delivery and construction. The refrigerant monitoring system shall be active at the job site prior to the charging of the chiller.
- D. The chiller should ship with a full charge of oil.
- E. Equipment Room Requirements:

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1. Follow minimum standards for refrigeration systems as required by ANSI/ASHRAE Standard 15 paying special attention to requirements for air monitoring, ventilation, self-contained breathing apparatus, and leak detection to assure the safety of chiller plant operating personnel.
2. Install proper outside exhaust of chiller refrigerant relief device(s), discharge header(s), and purge unit(s). Route exhaust to the outside of the building and away from all air intakes in compliance with ANSI/ASHRAE Standard 15. Per ASHRAE Standard 147, medium pressure units with relief valves only shall have rupture discs also to minimize refrigerant leakage.

#### **1.8 WARRANTY**

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of chillers that fail in materials or workmanship within specified warranty period. Warranty shall be by the chiller manufacturer and not a third-party warranty administrator.
  1. Extended warranties include, but are not limited to, the following:
    - a. Complete chiller including refrigerant.
    - b. Complete compressor and drive assembly including shaft seals for open-drive chillers, refrigerant and oil charge.
    - c. Refrigerant charge.
    - d. Parts and labor.
    - e. Loss of refrigerant for any reason.
  2. Warranty Period: Ten years from date of Final Acceptance.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURED UNIT**

- A. Description: Factory-assembled and -tested chiller complete with compressor, compressor motor, compressor motor controller, lubrication system evaporator, condenser, controls, interconnecting unit piping and wiring, and indicated accessories.
  1. Disassemble chiller into major assemblies as required by the installation.
    - a. Disassembly shall be completed by chiller manufacturer personnel.

### **2.2 COMPRESSOR-DRIVE ASSEMBLY**

- A. Description: Multistage, variable-displacement, centrifugal-type compressor driven by an electric motor.
- B. Compressor:

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1. Casing: Cast iron, precision ground.
  2. Impeller: High-strength cast aluminum or cast-aluminum alloy on carbon- or alloy-steel shaft.
- C. Drive: Direct-drive, hermetic design using an electric motor as the driver.
- D. Compressor Motor:
1. Continuous-duty, squirrel-cage, induction-type, two-pole motor with energy efficiency required to suit chiller energy efficiency indicated.
  2. Factory mounted, aligned, and balanced as part of compressor assembly before shipping.
  3. Motor shall be of sufficient capacity to drive compressor throughout entire operating range without overload and with sufficient capacity to start and accelerate compressor without damage.
  4. For chillers with open drives, provide motor with totally enclosed enclosure.
  5. Provide motor with thermistor or RTD in each of three-phase motor windings to monitor temperature and report information to chiller control panel.
  6. Provide motor with thermistor or RTD to monitor bearing temperature and report information to chiller control panel.
- E. Vibration Balance: Balance chiller compressor and drive assembly to provide a precision balance that is free of noticeable vibration over the entire operating range.
1. Overspeed Test: 25 percent above design operating speed.
- F. Service: Easily accessible for inspection and service.
1. Compressor's internal components shall be accessible without having to remove compressor-drive assembly from chiller.
  2. Provide lifting lugs or eyebolts attached to casing.
- G. Economizers: For multistage chillers, provide interstage economizers.
- H. Capacity Control: Modulating, variable-inlet, guide-vane assembly combined with hot-gas bypass, if necessary, to achieve performance indicated.
1. Maintain stable operation that is free of surge, cavitation, and vibration throughout range of operation. Configure to achieve most energy-efficient operation possible.
  2. Operating Range: From 100 to 20 percent of design capacity.
- I. Oil Lubrication System: Consisting of pump, filtration, cooler, factory-wired power connection, and controls.
1. Provide lubrication to bearings, gears, and other rotating surfaces at all operating, startup, coastdown, and standby conditions including power failure.
  2. Manufacturer's standard method to remove refrigerant from oil.
  3. Refrigerant- or water-cooled oil cooler.
  4. Factory-installed and pressure-tested piping with isolation valves and accessories.
  5. Oil compatible with refrigerant and chiller components.
  6. Positive visual indication of oil level.

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#### **2.3 REFRIGERATION**

- A. Refrigerant:
  - 1. Type: R-123; ASHRAE 34, Class B1.
  - 2. Compatibility: Chiller parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
- B. Refrigerant Flow Control: Manufacturer's standard refrigerant flow-control device satisfying performance requirements indicated.
- C. Pressure Relief Device:
  - 1. Comply with requirements in ASHRAE 15 and in applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
  - 2. For Chillers Using R-123: Rupture disc in series with a spring-loaded, re-seating relief valve to stop the flow of refrigerant to atmosphere below 13 psig. Provide neoprene flexible connector to separate vibrations from the chiller and refrigerant piping.
- D. Purge System:
  - 1. For chillers operating at subatmospheric pressures (using R-123 refrigerant), factory install an automatic purge system for collection and return of refrigerant and lubricating oil and for removal of noncondensables including, but not limited to, water, water vapor, and noncondensable gases.
  - 2. System shall be a thermal purge design, refrigerant or air cooled, equipped with a carbon filter that includes an automatic regeneration cycle.
  - 3. Factory wire to chiller's main power supply and system complete with controls, piping, and refrigerant valves to isolate the purge system from the chiller.
  - 4. Construct components of noncorrodible materials.
  - 5. Controls shall interface with chiller control panel to indicate modes of operation, set points, data reports, diagnostics, and alarms.
  - 6. Efficiency of not more than 0.02 lb of refrigerant per pound of air when rated according to AHRI 580.
  - 7. Operation independent of chiller per ASHRAE 147.

#### **2.4 EVAPORATOR**

- A. Description: Shell-and-tube design with water in tubes and refrigerant surrounding tubes within shell. Shell is separate from condenser.
- B. Shell Material: Carbon-steel rolled plates with continuously welded seams or seamless pipe.
- C. Designed to prevent liquid refrigerant carryover from entering compressor.
- D. Provide evaporator with sight glass or other form of positive visual verification of liquid-refrigerant level.
- E. Tubes:

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1. Individually replaceable from either end and without damage to tube sheets and other tubes.
  2. Mechanically expanded into end sheets and physically attached to intermediate tube sheets.
  3. Material: Copper.
  4. Nominal OD: Manufacturer's choice.
  5. Minimum Wall Thickness: 0.028 inch.
  6. External Finish: Manufacturer's standard.
  7. Internal Finish: Enhanced.
- F. End Tube Sheets: Continuously welded to each end of shell; drilled and reamed to accommodate tubes with positive seal between fluid in tubes and refrigerant in shell.
- G. Intermediate Tube Sheets: Installed in shell and spaced along length of tube at intervals required to eliminate vibration and to avoid contact of tubes resulting in abrasion and wear.
- H. Water Box:
1. Cast-iron or carbon-steel construction; arranged to provide visual inspection and cleaning of tubes from either end without disturbing refrigerant in shell.
  2. Standard type for water box with piping connections. Standard type for water box without piping connections.
  3. Nozzle Pipe Connections: Grooved for mechanical-joint coupling.
  4. Provide water boxes with lifting lugs or eyebolts.
  5. Thermistor or RTD temperature sensor factory installed in each nozzle.
  6. Fit each water box with 3/4- or 1-inch drain connection at low point and vent connection at high point, each with threaded plug.

## **2.5 CONDENSER**

- A. Description: Shell-and-tube design with water in tubes and refrigerant surrounding tubes within shell. Shell is separate from evaporator.
- B. Shell Material: Carbon-steel rolled plates with continuously welded seams or seamless pipe.
- C. Designed to prevent direct impingement of high-velocity hot gas from compressor discharge on tubes.
- D. Provide condenser with sight glass or other form of positive visual verification of refrigerant charge and condition.
- E. Tubes:
1. Individually replaceable from either end and without damage to tube sheets and other tubes.
  2. Mechanically expanded into end sheets and physically attached to intermediate tube sheets.
  3. Material: Copper.
  4. Nominal OD: Manufacturer's choice.
  5. Minimum Wall Thickness: 0.028 inch.

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6. External Finish: Manufacturer's standard.
  7. Internal Finish: Enhanced.
- F. End Tube Sheets: Continuously welded to each end of shell; drilled and reamed to accommodate tubes with positive seal between fluid in tubes and refrigerant in shell.
- G. Intermediate Tube Sheets: Installed in shell and spaced along length of tube at intervals required to eliminate vibration and to avoid contact of tubes resulting in abrasion and wear.
- H. Water Box:
1. Cast-iron or carbon-steel construction; arranged to provide visual inspection and cleaning of tubes from either end without disturbing refrigerant in shell.
  2. Marine type for water box with piping connections. Standard type for water box without piping connections.
  3. Nozzle Pipe Connections: Grooved for mechanical-joint coupling.
  4. Provide water boxes with lifting lugs or eyebolts.
  5. Thermistor or RTD temperature sensor factory installed in each nozzle.
  6. Fit each water box with 3/4- or 1-inch drain connection at low point and vent connection at high point, each with threaded plug.

#### **2.6 INSULATION**

- A. Closed-cell, flexible elastomeric thermal insulation complying with ASTM C 534, Type I for tube and Type II for sheet materials.
1. Thickness: 1 inch minimum.
- B. Adhesive: As recommended by insulation manufacturer.
- C. Field apply insulation over all cold surfaces of chiller capable of forming condensation. Components shall include, but not be limited to, evaporator shell and end tube sheets, evaporator water boxes including nozzles, refrigerant suction pipe from evaporator to compressor, cold surfaces of compressor, refrigerant-cooled motor, and auxiliary piping.
1. Insulation shall be applied by approved chiller manufacturer personnel.
  2. Apply adhesive to 100 percent of insulation contact surface.
  3. Before insulating steel surfaces, prepare surfaces for paint, and prime and paint as indicated for other painted components. Do not insulate unpainted steel surfaces.
  4. Seal seams and joints to provide a vapor barrier.
  5. After adhesive has fully cured, paint exposed surfaces of insulation to match other painted parts.

#### **2.7 ELECTRICAL**

- A. Factory installed and wired, and functionally tested at factory before shipment.
- B. Single-point, field-power connection to circuit breaker. Minimum withstand rating shall be as required by electrical power distribution system, but not less than 75,000 A.

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1. Branch power circuit to each motor, electric heater, dedicated electrical load, and controls with disconnect switch or circuit breaker.
    - a. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
    - b. NEMA AB 1, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit-trip set point.
  2. NEMA ICS 2-rated motor controller for auxiliary motors, hand-off-auto switch, and overcurrent protection for each motor. Provide variable frequency controller for each variable-speed motor furnished.
  3. Control-circuit transformer with primary and secondary side fuses.
- C. Terminal blocks with numbered and color-coded wiring to match wiring diagram. Spare wiring terminal block for connection to external controls or equipment.

#### **2.8 MOTOR CONTROLLER**

- A. Enclosure: Factory installed, unit mounted, NEMA 250, Type 1, with hinged full-front access door.
- B. Control Circuit: Obtained from integral control power transformer with a control power transformer of enough capacity to operate connected control devices.
- C. Overload Relay: Shall be sized according to UL 1995 or shall be an integral component of chiller control microprocessor.
- D. Star-Delta, Reduced-Voltage Controller: NEMA ICS 2, closed transition.
- E. Accessories: Devices shall be factory installed in controller enclosure unless otherwise indicated.
  1. Externally Operated, Door-Interlocked Disconnect: Minimum withstand rating shall be as required by electrical power distribution system, but not less than 75,000 A.
  2. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.
  3. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
  4. Control Relays: Time-delay relays.
  5. Phase-Failure, Phase-Reversal, Undervoltage Relays: Solid-state sensing circuit with adjustable undervoltage setting and isolated output contacts for hardwired connection.
  6. Power Protection: Chiller shall shut down within six cycles of power interruption.

#### **2.9 CONTROLS**

- A. Control: Standalone and microprocessor based, with all memory stored in nonvolatile memory so that reprogramming is not required on loss of electrical power.

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- B. Enclosure: Unit mounted, NEMA 250, Type 1, hinged or lockable; factory wired with a single-point, field-power connection and a separate control circuit.
- C. Operator Interface: Multiple-character digital or graphic display with dynamic update of information and with keypad or touch-sensitive display located on front of control enclosure. In either imperial or metric units selectable through the interface, display the following information:
  - 1. Date and time.
  - 2. Operating or alarm status.
  - 3. Fault history with not less than last 10 faults displayed.
  - 4. Set points of controllable parameters.
  - 5. Trend data.
  - 6. Operating hours.
  - 7. Number of chiller starts.
  - 8. Outdoor-air temperature or space temperature if required for chilled-water reset.
  - 9. Entering- and leaving-fluid temperatures of evaporator and condenser.
  - 10. Difference in fluid temperatures of evaporator and condenser.
  - 11. Fluid flow of evaporator and condenser.
  - 12. Fluid pressure drop of evaporator and condenser.
  - 13. Refrigerant pressures in evaporator and condenser.
  - 14. Refrigerant saturation temperature in evaporator and condenser shell.
  - 15. Evaporator capacity (in tons).
  - 16. Compressor refrigerant suction and discharge temperature.
  - 17. Compressor bearing temperature.
  - 18. Motor bearing temperature.
  - 19. Motor winding temperature.
  - 20. Oil temperature.
  - 21. Oil discharge pressure.
  - 22. Phase current.
  - 23. Percent of motor rated load amperage.
  - 24. Phase voltage.
  - 25. Demand power (kilowatts).
  - 26. Energy use (kilowatt-hours).
  - 27. Power factor.
  - 28. Purge suction temperature if purge system is provided.
  - 29. Purge elapsed time if purge system is provided.
- D. Control Functions:
  - 1. Manual or automatic startup and shutdown time schedule.
  - 2. Entering and leaving chilled-water temperatures, control set points, and motor load limits.
  - 3. Current limit and demand limit.
  - 4. Condenser-fluid temperature.
  - 5. External chiller emergency stop.
  - 6. Variable evaporator flow.
  - 7. Thermal storage.
  - 8. Heat reclaim.



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- E. Manually Reset Safety Controls: The following conditions shall shut down chiller and require manual reset:
  - 1. Low evaporator pressure; high condenser pressure.
  - 2. Low evaporator fluid temperature.
  - 3. Low oil differential pressure.
  - 4. High or low oil pressure.
  - 5. High oil temperature.
  - 6. High compressor-discharge temperature.
  - 7. Loss of condenser-fluid flow.
  - 8. Loss of evaporator fluid flow.
  - 9. Motor overcurrent.
  - 10. Motor overvoltage.
  - 11. Motor undervoltage.
  - 12. Motor phase reversal.
  - 13. Motor phase failure.
  - 14. Sensor- or detection-circuit fault.
  - 15. Processor communication loss.
  - 16. Motor controller fault.
  - 17. Extended compressor surge.
  - 18. Excessive air-leakage detection for chillers using R-123 refrigerant.
- F. Trending: Capability to trend analog data of up to five parameters simultaneously over an adjustable period and frequency of polling.
- G. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: view only; view and operate; and view, operate, and service.
- H. Control Authority: At least four conditions: Off, local manual control at chiller, local automatic control at chiller, and automatic control through a remote source.
- I. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and notebook computer.
- J. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display chiller status and alarms; compatible with current BAS system installed at DOTD headquarters.
  - 1. LonTalk communication interface with the BAS shall enable the BAS operator to remotely control and monitor the chiller from an operator workstation. Control features and monitoring points displayed locally at chiller control panel shall be available through the BAS.

#### **2.10 FINISH**

- A. Paint chiller, using manufacturer's standard procedures, except comply with the following minimum requirements:
  - 1. Provide at least one coat of primer with a total dry film thickness of at least 2 mils.

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2. Provide at least two coats of manufacturer's standard paint finish with a total dry film thickness of at least 4 mils.
  3. Paint surfaces that are to be insulated before applying the insulation.
  4. Paint installed insulation to match adjacent uninsulated surfaces.
  5. Color of finish coat to be manufacturer's standard.
- B. Provide the Department with quart container of paint used in application of topcoat to use in touchup applications after Final Acceptance.

#### **2.11 ACCESSORIES**

- A. Flow Switches:
1. Chiller manufacturer shall furnish a switch for each evaporator and condenser and confirm field-mounting location before installation.
  2. Pressure Differential or Thermal Dispersion-Type Switches:
    - a. Construction: Wetted parts of body and trim constructed of Type 316 stainless steel.
    - b. Performance: Switch shall withstand, without damage, the full-pressure rating of the heat exchanger applied to either port and exhibit zero set-point shift due to variation in working pressure.
    - c. Set Point: Screw type, field adjustable.
    - d. Electrical Connections: Internally mounted screw-type terminal blocks.
    - e. Switch Enclosure: NEMA 250, Type 4.
    - f. Switch Action: Double-pole, double-throw switch with one pole field wired to the chiller control panel and the other pole field wired to the BAS.
- B. Vibration Isolation:
1. Chiller manufacturer shall furnish vibration isolation for each chiller.
  2. Neoprene Pad:
    - a. Two layers of 0.375-inch- thick, ribbed- or waffle-pattern neoprene pads separated by a 16-gage, stainless-steel plate.
    - b. Fabricate pads from 40- to 50-durometer neoprene.
    - c. Provide stainless-steel square bearing plate to load the pad uniformly between 20 and 40 psig with a 0.12- to 0.16-inch deflection.

#### **2.12 SOURCE QUALITY CONTROL**

- A. Perform functional tests of chillers before shipping.
- B. For chillers using R-123 refrigerant, factory test and inspect evaporator and condenser according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Pressure test fluid side of heat exchangers, including water boxes, to 1.5 times the rated pressure. Pressure proof test refrigerant side of heat exchangers to a minimum of 45 psig. Vacuum and pressure test for leaks.

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- C. For chillers located indoors, rate sound power level according to AHRI 575.

## **PART 3 - EXECUTION**

### **3.1 CHILLER INSTALLATION**

- A. Equipment Mounting:
  - 1. Install chillers on existing concrete equipment bases.
- B. Maintain manufacturer's recommended clearances for service, maintenance, and National Electric Code clearances.
- C. Charge chiller with refrigerant and fill with oil if not factory installed.
- D. Install separate devices furnished by manufacturer and not factory installed.

### **3.2 CONNECTIONS**

- A. Comply with requirements for piping specified in Section 232113 "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to chiller to allow service and maintenance.
- C. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, flow switch, thermometer, and plugged tee with shutoff valve and pressure gage. Make connections to chiller with a flexible, mechanical coupling.
- D. Condenser-Fluid Connections: Connect to condenser inlet with shutoff valve, thermometer, and plugged tee with pressure gage. Connect to condenser outlet with shutoff valve, balancing valve, flow switch, thermometer, and plugged tee with shutoff valve and pressure gage. Make connections to chiller with a flexible, mechanical coupling.
- E. Refrigerant Pressure Relief Device Connections: For chillers installed indoors, extend separate vent piping for each chiller to the outdoors without valves or restrictions. Comply with ASHRAE 15. Connect to chiller pressure relief device with flexible connector and dirt leg with drain valve.
- F. For chillers equipped with a purge system, extend separate purge vent piping for each chiller to the outdoors. Comply with ASHRAE 15 and ASHRAE 147.
- G. Connect each chiller drain connection with a union and drain pipe, and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection.

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#### **3.3 STARTUP SERVICE**

- A. Engage a factory-authorized service representative to perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Verify that refrigerant charge is sufficient and chiller has been leak tested.
  - 3. Verify that pumps are installed and functional.
  - 4. Verify that thermometers and gages are installed.
  - 5. Operate chiller for run-in period.
  - 6. Check bearing lubrication and oil levels.
  - 7. Verify that refrigerant pressure relief device is vented outside.
  - 8. Verify proper motor rotation.
  - 9. Verify static deflection of vibration isolators, including deflection during chiller startup and shutdown.
  - 10. Verify and record performance of fluid flow and low-temperature interlocks for evaporator and condenser.
  - 11. Verify and record performance of chiller protection devices.
  - 12. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
  - 13. Verify proper chiller integration into the building's BAS system.
- B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.
- C. Prepare test and inspection startup reports.

#### **3.4 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Department's maintenance personnel to adjust, operate, and maintain chillers (minimum four hours).

END OF SECTION 236416

# **SPECIAL PROVISIONS**

## **STATE PROJECT NO. H.972020**

### **20. SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Building wires and cables rated 600 V and less.
  - 2. Connectors, splices, and terminations rated 600 V and less.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

#### **PART 2 - PRODUCTS**

##### **2.1 CONDUCTORS AND CABLES**

- A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.
- B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type XHHW-2.

##### **2.2 CONNECTORS AND SPLICES**

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

##### **2.3 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

#### **PART 3 - EXECUTION**

##### **3.1 CONDUCTOR MATERIAL APPLICATIONS**

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

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#### **3.2 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- B. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- C. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

#### **3.3 CONNECTIONS**

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.
- B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."
- D. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

#### **3.4 FIELD QUALITY CONTROL**

- A. Cables will be considered defective if they do not pass tests and inspections.

END OF SECTION 260519

# **SPECIAL PROVISIONS**

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### **21. SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. RS-485 cabling.
  - 2. Control-circuit conductors.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

##### **1.3 INFORMATIONAL SUBMITTALS**

- A. Source quality-control reports.
- B. Field quality-control reports.

#### **PART 2 - PRODUCTS**

##### **2.1 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

##### **2.2 RS-485 CABLE**

- A. Plenum-Rated Cable: NFPA 70, Type CMP.
  - 1. Paired, No. 22 AWG, stranded (7x30) tinned-copper conductors.
  - 2. Fluorinated ethylene propylene insulation.
  - 3. Unshielded.
  - 4. Fluorinated ethylene propylene jacket.
  - 5. Flame Resistance: NFPA 262.

##### **2.3 CONTROL-CIRCUIT CONDUCTORS**

- A. Class 2 Control Circuits: Stranded copper, Type XHHW-2, in raceway, complying with UL 44.

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- B. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

- 1. Smoke control signaling and control circuits.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF RACEWAYS AND BOXES**

- A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.
- B. Install manufactured conduit sweeps and long-radius elbows if possible.
- C. Raceway Installation in Equipment Rooms:
  - 1. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

#### **3.2 INSTALLATION OF CONDUCTORS AND CABLES**

- A. Comply with NECA 1 and NFPA 70.
- B. General Requirements for Cabling:
  - 1. Comply with TIA-568-C Series of standards.
  - 2. Terminate all conductors and optical fibers; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and patch panels.
  - 3. Cables may not be spliced.
  - 4. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
  - 6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  - 7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
  - 8. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
  - 9. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.



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**3.3 CONTROL-CIRCUIT CONDUCTORS**

- A. Minimum Conductor Sizes:
  - 1. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.

**3.4 GROUNDING**

- A. For data communication wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.
- B. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

**3.5 IDENTIFICATION**

- A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- B. Identify data and communications system components, wiring, and cabling according to TIA-606-A; label printers shall use label stocks, laminating adhesives, and inks complying with UL 969.

END OF SECTION 260523

# **SPECIAL PROVISIONS**

## **STATE PROJECT NO. H.972020**

### **22. SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section includes grounding and bonding systems and equipment.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.

#### **PART 2 - PRODUCTS**

##### **2.1 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

##### **2.2 CONDUCTORS**

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.

##### **2.3 CONNECTORS**

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

# **SPECIAL PROVISIONS**

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### **PART 3 - EXECUTION**

#### **3.1 APPLICATIONS**

- A. Conductors: Install solid conductors for all wire sizes unless otherwise indicated.
- B. Conductor Terminations and Connections:
  - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

#### **3.2 EQUIPMENT GROUNDING**

- A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
  - 1. Water-cooled chiller motor circuits.
- B. Install bare copper grounding conductors in non-metallic conduits.

#### **3.3 INSTALLATION**

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

#### **3.4 FIELD QUALITY CONTROL**

- A. Perform tests and inspections. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

END OF SECTION 260526

# **SPECIAL PROVISIONS**

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### **23. SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Metal conduits, tubing, and fittings.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For surface raceways.

#### **PART 2 - PRODUCTS**

##### **2.1 METAL CONDUITS, TUBING, AND FITTINGS**

- A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Rigid Galvanized Steel (RGS): Comply with ANSI C80.1 and UL 6.
- C. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- D. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
  - 1. Conduits Entering Enclosures: Threaded, insulated bushings or NEMA 4X Myers hubs with grounding locknuts.
  - 2. Other Fittings: Threaded-type with cast or malleable iron bodies and covers having zinc finish and solid neoprene gaskets.

##### **2.2 BOXES, ENCLOSURES, AND CABINETS**

- A. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.
- B. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

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### **PART 3 - EXECUTION**

#### **3.1 RACEWAY APPLICATION**

- A. When LFMC is specified, BX cable, Metal Clad (MC) cable, and Armor Clad (AC) cable is prohibited.
- B. Outdoors: Apply raceway products as specified below unless otherwise indicated:
  - 1. Exposed Conduit: RGS.
  - 2. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Indoors: Apply raceway products as specified below unless otherwise indicated.
  - 1. Exposed and Subject to Severe Physical Damage: RGS. Raceway locations include the following:
    - a. Mechanical rooms.
- D. Minimum Raceway Size: 3/4-inch trade size.
- E. Raceway Fittings: Compatible with raceways and suitable for use and location.

#### **3.2 INSTALLATION**

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Supports and supporting devices shall be suitable for the environment, be used for the specific purpose for which they were manufactured, be capable of supporting a minimum of five times the actual load of the equipment along with any additional loads likely to be encountered, and be installed in accordance with all applicable codes, manufacturer's instructions, and best prevailing construction trade practices.
- D. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.
- E. Support conduit within 12 inches of enclosures to which attached.
- F. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

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- G. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.
- H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- I. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound.
- J. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 36 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.

### **3.3 PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer or in accordance with Section 811.12 of the Louisiana Standard Specifications for Roads and Bridges, 2006 Edition.
  - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

# **SPECIAL PROVISIONS**

## **STATE PROJECT NO. H.972020**

### **24. SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
  - 2. Grout.

##### **1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

#### **PART 2 - PRODUCTS**

##### **2.1 SLEEVES**

- A. Wall Sleeves:
  - 1. Steel Pipe Sleeves: ASTM A 53, Type E, Grade B, Schedule 40, zinc coated, plain ends.

##### **2.2 GROUT**

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

#### **PART 3 - EXECUTION**

##### **3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS**

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.

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- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
    - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
    - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
  2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
  4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

END OF SECTION 260544



# **SPECIAL PROVISIONS**

## **STATE PROJECT NO. H.972020**

### **25. SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. Section Includes:
  - 1. Identification for conductors.
  - 2. Warning labels and signs.
  - 3. Equipment identification labels.

##### **1.2 QUALITY ASSURANCE**

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

#### **PART 2 - PRODUCTS**

##### **2.1 WARNING LABELS AND SIGNS**

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. See Drawings for warning label and sign requirements.

##### **2.2 EQUIPMENT IDENTIFICATION LABELS**

- A. See Drawings for equipment identification labels.

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### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Location: See Electrical plan sheets for location requirements. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Apply identification devices to surfaces that require finish after completing finish work.
- C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

#### **3.2 IDENTIFICATION SCHEDULE**

- A. Power-Circuit Conductor Identification, 600 V or Less: Conductors shall come color-coded from the manufacturer to identify the phase.
  - 1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
    - a. Color shall be factory-applied. Color coating shall be present throughout the conductor's entire length.
    - b. Colors for 480/277-V Circuits:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
    - c. Equipment grounding conductors shall be green.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
  - 1. Comply with 29 CFR 1910.145.
  - 2. Identify system voltage with black letters on an orange background.
  - 3. Apply to exterior of door, cover, or other access.
- C. Equipment Identification Labels: On each unit of equipment, install unique designation label as indicated on Drawings. Apply labels to motor starters and switchboard.

END OF SECTION 260553

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**26. SECTION 262726 - WIRING DEVICES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes:
  - 1. Weather-resistant receptacles.

**1.2 ACTION SUBMITTALS**

- A. Product Data: For each type of product.

**1.3 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.

**1.4 CLOSEOUT SUBMITTALS**

- A. Operation and maintenance data.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

**2.2 GENERAL WIRING-DEVICE REQUIREMENTS**

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

**2.3 GFCI RECEPTACLES**

- A. General Description:
  - 1. Straight blade, feed-through type.
  - 2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.

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3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
  1. Products: Subject to compliance with requirements, provide product from Leviton Manufacturing Co. or similar product by other manufacturer.

#### **2.4 ACCESSORIES**

- A. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant thermoplastic with lockable cover.
- B. Outlet Box: Surface-mount, single-gang, die-cast aluminum with electrostatic baked powder finish.

#### **2.5 FINISHES**

- A. Device Color:
  1. Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing.
- B. Wall Plate Color: For plastic covers, match device color.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.
- B. Coordination with Other Trades:
  1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
  2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:

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1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
  - a. Cut back and pigtail, or replace all damaged conductors.
  - b. Straighten conductors that remain and remove corrosion and foreign matter.
  - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

#### **D. Device Installation:**

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

#### **E. Receptacle Orientation: To match existing.**

#### **F. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.**

#### **G. Adjust locations of service poles to suit arrangement of partitions and furnishings.**

### **3.2 GFCI RECEPTACLES**

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

### **3.3 FIELD QUALITY CONTROL**

#### **A. Perform the following tests and inspections:**

1. Test Instruments: Use instruments that comply with UL 1436.

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2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
  2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
  3. Ground Impedance: Values of up to 2 ohms are acceptable.
  4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  5. Using the test plug, verify that the device and its outlet box are securely mounted.
  6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 262726

**SPECIAL PROVISIONS  
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**27. SECTION 262913 - ENCLOSED CONTROLLERS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section includes the following enclosed controllers rated 600 V and less:
  - 1. Full-voltage magnetic controllers.

**1.2 DEFINITIONS**

- A. CPT: Control power transformer.
- B. MCCB: Molded-case circuit breaker.
- C. MCP: Motor circuit protector.
- D. N.C.: Normally closed.
- E. N.O.: Normally open.
- F. OCPD: Overcurrent protective device.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of enclosed controller.
- B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.
  - 1. Wiring Diagrams: For power, signal, and control wiring.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Seismic Qualification Certificates: For enclosed controllers, accessories, and components, from manufacturer.
- B. Field quality-control reports.

**1.5 CLOSEOUT SUBMITTALS**

- A. Operation and maintenance data.

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### **1.6 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

## **PART 2 - PRODUCTS**

### **2.1 FULL-VOLTAGE CONTROLLERS**

- A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.
- B. Full-Voltage Pump Controller: Includes combination starter with fusible switch/disconnect, hand-off-automatic selector switch, and start push-button action.
  - 1. Basis of Design Product: Subject to compliance with requirements, provide Eaton Electrical, Inc. ECN series or comparable product from other manufacturers.
    - a. Configuration: Nonreversing.
    - b. Interrupt Rating: 100,000 rms amps.
    - c. NEMA Size: 1.
    - d. Operational Voltage: 480 V.
    - e. Motor Size: 7-1/2 hp.
    - f. Overload Relays: Inverse-time-current characteristics; NEMA ICS 2, Class 10 tripping characteristics; heaters and sensors in each phase, matched to nameplate full-load current of actual protected motor and having appropriate adjustment for duty cycle; external reset push button.
    - g. Surface mounting.
    - h. Pilot light.

### **2.2 ENCLOSURES**

- A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.
  - 1. Outdoor Locations: Type 3R; stainless steel.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Floor-Mounted Controllers: Install enclosed controllers on existing slab.



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1. For supported equipment, install stainless steel anchor bolts that extend through concrete base and anchor into structural concrete floor.
  2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  3. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in each fusible-switch enclosed controller.
- D. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
- E. Comply with NECA 1.

### **3.2 IDENTIFICATION**

- A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
  2. Label each enclosure with engraved nameplate.
  3. Label each enclosure-mounted control and pilot device.

### **3.3 FIELD QUALITY CONTROL**

- A. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Design Engineer before starting the motor(s).
1. Test each motor for proper phase rotation.
  2. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  3. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Enclosed controllers will be considered defective if they do not pass tests and inspections.

### **3.4 DEMONSTRATION**

- A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

END OF SECTION 262913

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**SUPPLEMENTAL SPECIFICATIONS**  
(FOR 2006 STANDARD SPECIFICATIONS)

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**LOUISIANA  
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SUPPLEMENTAL SPECIFICATIONS**

The 2006 Louisiana Standard Specifications for Roads and Bridges and supplemental specifications thereto are amended as follows.

**PART I – GENERAL PROVISIONS**

**SECTION 101 – GENERAL INFORMATION, DEFINITIONS, AND TERMS:**

Subsection 101.03 – Definitions (07/07), Pages 3 – 13.

Delete the definition for “Proposal/Bid Guaranty” and substitute the following.

Proposal / Bid Guaranty. The required security furnished with a bid. The only form of security acceptable is a Bid Bond.

**SECTION 102 – BIDDING REQUIREMENTS:**

Subsection 102.09 – Proposal / Bid Guaranty (07/07), Page 19.

Delete the contents of this subsection and substitute the following.

PROPOSAL/BID GUARANTY. Each bid shall be accompanied by a proposal/bid guaranty in an amount not less than five percent of the total bid amount when the bidder’s total bid amount as calculated by the Department in accordance with Subsection 103.01 is greater than \$50,000. No proposal/bid guaranty is required for projects when the bidder’s total bid amount as calculated by the Department is \$50,000 or less. The official total bid amount for projects that include alternates is the total of the bidder’s base bid and all alternates bid on and accepted by the Department. The proposal/bid guaranty submitted by the bidder shall be a bid bond made payable to the contracting agency as specified on the bid bond form provided in the construction proposal. No other form of security will be accepted.

The bid bond shall be on the "Bid Bond" form provided in the construction proposal, on a form that is materially the same in all respects to the "Bid Bond" form provided, or on an electronic form that has received Department approval prior to submission. The bid bond shall be filled in completely, shall be signed by an authorized officer, owner or partner of the bidding entity, or each entity representing a joint venture; shall be signed by the surety's agent or attorney-in-fact; and shall be accompanied by a notarized document granting general power of attorney to the surety's signer. The bid bond shall not contain any provisions that limit the face amount of the bond.

The bid bond will be written by a surety or insurance company that is in good standing and currently licensed to write surety bonds in the State of Louisiana by the Louisiana Department of Insurance and also conform to the requirements of LSA-R.S. 48:253.

All signatures required on the bid bond may be original, mechanical reproductions, facsimiles or electronic. Electronic bonds issued in conjunction with electronic bids must have written Departmental approval prior to use. The Department will make a listing of approved electronic sureties providers on the Bidx.com site.

## **SECTION 107 – LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC:**

Subsection 107.05 – Federal Aid Participation (04/08), Pages 57 and 58.

Delete the second paragraph.

**SECTION 108 – PROSECUTION AND PROGRESS:**

Subsection 108.04 – Prosecution of Work (03/05) Pages 74 and 75.

Add the following sentence to the third paragraph of Heading (b):

Should the surety or the Department take over prosecution of the work, the contractor shall remain disqualified for a period of one year from the completion of the project, unless debarment proceedings are instituted.

When the Department of Transportation and Development is not the contracting agency on the project, the second paragraph under Heading (c) is deleted.

## PART II – EARTHWORK

**SECTION 202 – REMOVING OR RELOCATING STRUCTURES AND OBSTRUCTIONS:**

Subsection 202.06 – Plugging or Relocating Existing Water Wells (03/04), Page 105.

Delete the first sentence and substitute the following:

All abandoned wells shall be plugged and sealed at the locations shown on the plans, or as directed by the engineer, in accordance with the “Water Well Rules, Regulations, and Standards, State of Louisiana.” This document is available at the Department of Transportation and Development, Water Resources Section, P. O. Box 94245, Baton Rouge, Louisiana 70804-9245. The Water Resource Section’s telephone number is (225) 274-4172.

## PART III – BASE COURSES

**SECTION 302 – CLASS II BASE COURSE:**

Subsection 302.01 – Description (12/08), Page 150.

Add the following to the third paragraph:

### (6) Blended Calcium Sulfate

Subsection 302.02 – Materials (12/08), Pages 150 and 151.

Add the following to the first paragraph:

## Blended Calcium Sulfate

1003.01 & 1003.03 (e)

Subsection 302.04 – General Construction Requirements (12/08), Page 152.

Add the following:

Blended calcium sulfate will be allowed in areas of new alignment, fill areas, and cut areas less than one foot.

In cut areas greater than one foot (300 mm), an additional one foot (300 mm) of undercut will be required prior to placement of BCS. The additional undercut area shall be replaced with non-plastic sand embankment and encapsulated with a Class D geotextile fabric. The additional

non-plastic material, geotextile fabric, and undercut shall be at no additional cost to the Department.

Blended calcium sulfate will not be allowed in areas needed to facilitate traffic control or when a soil cement base course is specified in the plans. Blended calcium sulfate shall not be placed within 10 feet (3.0 m) of metal drainage structures. The contractor will be allowed to substitute any untreated Class II base course material listed in Subsection 302.01. Flowable fill under Section 710, or other approved backfill material in Section 701 shall be used to backfill the drainage structure.

Subsection 302.05 – Mixing (08/06) (12/08), Pages 152 and 153.

Delete the first sentence of Subheading (b)(1), In-Place Mixing, and substitute the following.

In-place mixing shall conform to Heading (a)(1) except that the percentage of Type I portland cement required will be 6 percent by volume.

Add Heading (d) as follows:

(d) Blended Calcium Sulfate: Calcium sulfate shall be blended with an approved aggregate or lime prior to placement. The blended calcium sulfate material shall be uniformly mixed and sampled from dedicated stockpiles. Gradation sampling in accordance with Subsection 1003.03 shall be taken from the dedicated stockpiles at the point of material origin.

Subsection 302.06 – Transporting and Placing on Subgrade (12/08), Page 154.

Add the following:

Water shall be added or other suitable means taken to prevent dust during the transporting and placing of dry blended calcium sulfate.

Subsection 302.07 - Compacting and Finishing (12/08), Pages 154 and 155.

Add Heading (e) as follows:

(e) Blended Calcium Sulfate: Blended calcium sulfate shall be placed and spread on the subgrade and compacted to produce layers not exceeding 12 inches (300 mm) compacted thickness. During placement the material shall be thoroughly wetted by application of water to maintain 2 to 4 percent above optimum moisture. After application of water, allow the moisture to reach equilibrium in the base before applying rolling techniques. Rolling of BCS is required to the edge of the embankment or subgrade. Each layer shall be compacted to at least 95 percent of maximum dry density or compacted by an approved established rolling pattern determined by the project engineer before the next layer is placed. Optimum moisture and maximum density shall be determined in accordance with DOTD TR 418 Method G modified to include a maximum drying temperature of 140°F (60°C).

Add Heading (f) as follows:

(f) Proof Rolling: Proof rolling shall be done by a load of 25 tons (25 Mg) in a 12 to 14 cubic yard (9 to 10.5 cubic meters) tandem dump truck with ten wheels or approved loaded truck

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determined by the project engineer. Proof rolling shall be a minimum of 5 passes in each direction at the same locations and at a maximum vehicle speed of 3 mph (4.8 km/h).

All BCS base will be tested by proof rolling prior to placement of surfacing material, including asphalt binder. Any irregularities or soft spots shall be corrected prior to placement of the surfacing material. Any rain event on the project site between the proof rolling and placement of the surfacing will require an additional proof rolling as noted above.

Subsection 302.09 – Protection and Curing (12/08), Page 155.

Add Heading (c) as follows:

(c) Blended Calcium Sulfate: Protection and curing of blended calcium sulfate shall be in accordance with Subsection 302.09(b).

Subsection 302.12 – Acceptance Requirements (12/08), Pages 156 – 161.

Add the following to Heading (a):

The acceptance requirements for blended calcium sulfate base course shall be the same as stone base course with the following modifications. Upon completion of compaction operations, the density will be determined in accordance with DOTD TR 401 except that all moisture content determinations for density calculations shall be conducted by oven drying the material for 24 hours at 140°F (60°C). A forced draft type oven capable of maintaining the temperature shall be provided by the contractor for field moisture content determination for density control.

**SECTION 305 – SUBGRADE LAYER:**

Subsection 305.06 – Payment (01/08), Page 184.

Delete this subsection and substitute the following.

305.06 Payment. Payment for subgrade layer will be made at the contract unit price which includes lime, lime treatment, cement, cement treatment, water, stone, recycled portland cement concrete, crushed slag, blended calcium sulfate, asphaltic concrete, and asphalt curing membrane or prime coat, subject to the payment adjustment provisions of Section 1002 for specification deviations of asphalt materials and Subsection 303.11(a) for density deficiencies of cement treated materials. Adjustments in pay for increase or decrease in the percent cement ordered by the engineer will be in accordance with Subsection 303.13. Adjustments in pay for increase or decrease in the percent lime ordered by the engineer will be based on the price of lime shown on paid invoices (total of all charges). The Materials and Testing Section will provide the payment adjustment percentage for properties of asphalt materials.

Payment for geotextile fabric will be included in the contract unit price for subgrade layer.

Payment will be made under:

Item No.	Pay Item	Pay Unit
305-01	Subgrade Layer _____ in (mm) Thick	Square Yard (Sq yd)



**SECTION 307 – PERMEABLE BASES:**

Subsection 307.02 – Materials (09/07), Pages 187 and 188.

Delete Heading (b), Asphalt and substitute the following.

(b) Asphalt: The asphalt for asphalt treated permeable base shall be an approved polymer modified asphalt cement, PG 76-22m, or PG 82-22rm complying with Section 1002. The percentage of asphalt cement shall be 2.0 percent to 4.0 percent by weight (mass) of the total mixture. Asphalt cement content and mixing process shall be such that all aggregates are visibly coated. The mixture shall retain 90 percent coating when tested in accordance with DOTD TR 317.

A job mix formula shall be submitted and approved in accordance with Section 502.

**SECTION 308 – IN-PLACE CEMENT TREATED BASE COURSE:**

All Subsections within Section 308 – (07/07), Pages 191 – 198.

Whenever the reference to “DOTD TR-432, Method D” is used, it shall mean “DOTD TR-432”.

**PART V – ASPHALTIC PAVEMENTS**

**SECTION 502 – SUPERPAVE ASPHALTIC CONCRETE MIXTURES:**

Subsection 502.02 – Materials (08/06) (11/07), Pages 210 – 213.

Delete Table 502-2, Superpave Asphalt Cement Usage under Subheading (a) and substitute the following.

**Table 502-2**  
**Superpave Asphalt Cement Usage**

Current Traffic Load Level	Mixture Type	Grade of Asphalt Cement
Level 1	Wearing Course	PG 70-22m
	Binder Course	PG 70-22m
	Base Course	PG 64-22
Level 2	Wearing Course	PG 76-22m
	Binder Course	PG 76-22m
Level A	Incidental Paving	PG 70-22m

Note: A PG 82-22 rm, Waste Tire Rubber Modified Asphalt, may be substituted for any other grade of asphalt cement.

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Delete Table 502-3, Aggregate Friction Rating under Subheading (c)(1) and substitute the following.

**Table 502-3**  
**Aggregate Friction Rating**

Friction Rating	Allowable Usage
I	All mixtures
II	All mixtures
III	All mixtures, except travel lane wearing courses with plan ADT greater than 7000 <sup>1</sup>
IV	All mixtures, except travel lane wearing courses <sup>2</sup>

<sup>1</sup> When plan current average daily traffic (ADT) is greater than 7000, blending of Friction Rating III aggregates and Friction Rating I and/or II aggregates will be allowed for travel lane wearing courses at the following percentages. At least 30 percent by weight (mass) of the total aggregates shall have a Friction Rating of I, or at least 50 percent by weight (mass) of the total aggregate shall have a Friction Rating of II. The frictional aggregates used to obtain the required percentages shall not have more than 10 percent passing the No. 8 (2.36 mm) sieve.

<sup>2</sup> When the average daily traffic (ADT) is less than 2500, blending of Friction Rating IV aggregates with Friction Rating I and/or II aggregates will be allowed for travel lane wearing courses at the following percentages. At least 50 percent by weight (mass) of the total aggregate in the mixture shall have a Friction Rating of I or II. The frictional aggregates used to obtain the required percentages shall not have more than 10 percent passing the No. 8 (2.36 mm) sieve.

Subsection 502.14 – Lot Sizes (11/07), Pages 232 and 233.

Delete the first sentence of the first paragraph and substitute the following.

A lot is a segment of continuous production of asphaltic concrete mixture from the same job mix formula produced for the Department at a specific plant, delivered to a specific DOTD project.

**SECTION 508 – STONE MATRIX ASPHALT:**

Subsection 508.01 – Description (09/07), Page 274.

Delete this subsection and substitute the following.

508.01 DESCRIPTION. This work consists of furnishing and constructing Stone Matrix Asphalt (SMA) which is a plant mixed asphalt concrete wearing course for high traffic applications. This mixture is a rut resistant hot mix design with stone on stone contact. The mixture shall be composed of a PG 76-22m, or PG 82-22rm asphalt cement and a gap graded coarse aggregate structure. Mineral filler and/or fibers shall be used to control draindown. This work shall be in accordance with these specifications, plan details, and as directed. All requirements of Section 502 apply to Stone Matrix Asphalt, except as modified herein. All plant and paving equipment and processes must meet the requirements of Section 503.

Mixture used for shoulder may be Stone Matrix Asphalt or any mixture type shown in Table 502-5.

Subsection 508.02 – Materials (09/07), Page 274.

Delete the contents of Subheading (a), Asphalt Cement and substitute the following.

(a) Asphalt Cement: Asphalt cement shall be PG 76-22m, or PG 82-22rm as listed on QPL 41 and complying with Section 1002.

## **PART VI – RIGID PAVEMENT**

### **SECTION 602 – PORTLAND CEMENT CONCRETE PAVEMENT**

#### **REHABILITATION:**

Subsection 602.17 – Payment (09/07), Pages 341 – 344.

Delete the last paragraph of Subheadings (d), Full Depth Corner Patching of Jointed Concrete Pavement, (e) Full Depth Patching of Jointed Concrete Pavement, and (g) Patching Continuously Reinforced Concrete Pavement, and substitute the following.

Payment for deteriorated base course removed as directed by the engineer and replaced with concrete will be made as follows: The value per inch (mm) thickness will be determined by dividing the contract unit price per square yard (sq m) by the plan thickness. Thickness of patches will be measured from the surface that exists at the time of patching. Payment for the additional thickness will be made at 50 percent of the value per inch (mm) thus determined.

## **PART VII – INCIDENTAL CONSTRUCTION**

### **SECTION 701 – CULVERTS AND STORM DRAINS:**

All Subsections within Section 701 (08/07), Pages 347 – 358.

Delete Section 701, Culverts and Storm Drains and substitute the following.

#### **SECTION 701 CULVERTS AND STORM DRAINS**

**701.01 DESCRIPTION.** This work consists of furnishing, installing, and cleaning pipe, pipe arch, storm drains and sewers, also referred to as culverts or conduit, in accordance with these specifications and in conformity with lines and grades shown on the plans or established.

**701.02 MATERIALS.** Materials shall comply with the following sections and subsections:

Usable Soil	203.06(a)
Selected Soil	203.06(b)
Plastic Soil Blanket	203.10
Mortar	702.02
Flowable Fill	710
Portland Cement Concrete	901
Reclaimed Asphaltic Pavement (RAP)	1003.01 & 1003.04(d)
Stone	1003.03(b)
Recycled Portland Cement Concrete	1003.03(c)

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Granular Material	1003.07
Bedding Material	1003.08
Concrete Sewer Pipe	1006.02
Reinforced Concrete Pipe	1006.03
Reinforced Concrete Pipe Arch	1006.04
Gasket Materials	1006.06
Plastic Pipe	1006.07
Split Plastic Coupling Bands	1006.07(d)(4)
Plastic Yard Drain Pipe	1006.09
Bituminous Coated Corrugated Steel Pipe and Pipe Arch	1007.02
Structural Plate for Pipe, Pipe Arch and Arch	1007.04
Corrugated Aluminum Pipe and Pipe Arch	1007.05
Coupling Bands	1007.09
Reinforcing Steel	1009
Geotextile Fabric	1019

(a) Side Drain Pipe or Side Drain Pipe Arch: When the item for Side Drain Pipe or Side Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, corrugated metal pipe or corrugated metal pipe arch, or plastic pipe, as allowed by EDSM II.2.1.1 or unless otherwise specified.

(b) Cross Drain Pipe or Cross Drain Pipe Arch: When the item for Cross Drain Pipe or Cross Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, corrugated metal pipe or corrugated metal pipe arch, or plastic pipe, as allowed by EDSM II.2.1.1 or unless otherwise specified.

(c) Storm Drain Pipe or Storm Drain Pipe Arch: When the item for Storm Drain Pipe or Storm Drain Pipe Arch is included in the contract, the contractor has the option of furnishing reinforced concrete pipe or reinforced concrete pipe arch, or plastic pipe, as allowed by EDSM II.2.1.1 or unless otherwise specified.

(d) Yard Drain Pipe: When the item for Yard Drain Pipe is included in the contract, the contractor has the option of furnishing concrete sewer pipe, plastic yard drain pipe or plastic pipe in accordance with Section 1006 unless otherwise specified.

(e) Material Type Abbreviations:

(1) Reinforced Concrete Pipe:

RCP	Reinforced Concrete Pipe
RCPA	Reinforced Concrete Pipe Arch

(2) Corrugated Metal Pipe:

CAP	Corrugated Aluminum Pipe
CAPA	Corrugated Aluminum Pipe Arch
CMP	Corrugated Metal Pipe
CMPA	Corrugated Metal Pipe Arch
CSP	Corrugated Steel Pipe
CSPA	Corrugated Steel Pipe Arch

BCCSP	Bituminous Coated Corrugated Steel Pipe
BCCSPA	Bituminous Coated Corrugated Steel Pipe Arch
(3) Plastic Pipe:	
PP	Plastic Pipe
PVCP	Polyvinyl Chloride Pipe
RPVCP	Ribbed Polyvinyl Chloride Pipe
CPEPDW	Corrugated Polyethylene Pipe Double Wall
(f) Joint Type Abbreviations:	
T1	Type 1 Joint
T2	Type 2 Joint
T3	Type 3 Joint

(g) Quality Assurance for Pipe: Manufacturing plants will be periodically inspected for compliance with specified manufacturing methods, and material samples will be randomly obtained for laboratory testing for verification of manufacturing lots. Materials approved at the manufacturing plant will be subject to visual acceptance inspections at the jobsite or point of delivery.

701.03 EXCAVATION. For all pipe, when the sides of the trench are stable as evidenced by the sides of the trench being able to maintain a vertical cut face, the minimum trench width at the bottom of the excavation will be 18 inches (460mm) on either side of the outside diameter of the pipe. If the sides of the trench are unstable, the width of the trench at the bottom of the excavation, for plastic or metal pipe, shall be a minimum width of at least 18 inches (460mm) or one pipe diameter on each side of the outside diameter of the pipe, which ever is greater. Surplus material or excavated material that does not conform to the requirements of Subsection 203.06(a) shall be satisfactorily disposed of in accordance with Subsection 202.02. Moisture controls including backfill materials selection and dewatering using sumps, wells, well points or other approved processes may be necessary to control excess moisture during excavation, installation of bedding, over-excavated trench backfilling, pipe placement and pipe backfill.

(a) Over-excavation: When unsuitable soils as defined in Subsection 203.04 or a stable, non-yielding foundation cannot be obtained at the established pipe grade, or at the grade established for placement of the bedding, unstable or unsuitable soils below this grade shall be removed and replaced with granular material meeting the requirements of Subsection 1003.07, bedding materials meeting the requirements of Subsection 1003.08 or Type A backfill. All granular, backfill materials placed below the established pipe or bedding grade shall be placed in lifts not exceeding 8 inches (200 mm) thick and sufficiently compacted by hand or a dynamic mechanical hand compaction device over the surface of each lift to form a stable, non-yielding foundation at the surface of the established bedding or pipe grade.

When rock is encountered, it shall be removed below grade and replaced with material complying with Subsection 1003.07, bedding materials meeting the requirements of Subsection 1003.08 or Type A backfill. The compacted earth cushion shall have a thickness under the pipe of at least 1/2 inch per foot (40 mm/m) of fill height over the top of the pipe with a minimum thickness of 8 inches (200 mm). All granular, backfill materials placed below the established pipe or bedding grade shall be placed in lifts not exceeding 8 inches (200 mm) thick and

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sufficiently compacted by hand or a dynamic mechanical hand operated compaction device over the surface of each lift to form a stable, non-yielding foundation at the surface of the established bedding or pipe grade.

Materials used to backfill in an over-excavated portion of a trench do not require encasement in a Geotextile Fabric.

Density of approved materials placed in over-excavated trenches will not be measured or determined.

**701.04 FORMING PIPE BED.** Bedding material, when specified, shall be constructed in accordance with Section 726. Materials allowed for bedding shall be as specified in Subsection 1003.08 or may be Type A backfill materials. When bedding materials are specified, additional excavation shall be performed below established pipe grade and the bedding material placed in lifts not exceeding 8 inches (200 mm) thick and lightly compacted by hand or a dynamic hand compaction device over the surface of each lift.

When the bottom of the pipe is not laid in a trench but is constructed above natural soils, a uniform bed shall be constructed as specified for the bottom of a trench.

Density of approved bedding materials will not be measured or determined.

**701.05 LAYING PIPE.** Pipe laying shall begin at the downstream end of the line. The pipe shall be in contact with the foundation throughout its length. Bell or groove ends of pipe and outside circumferential laps of riveted metal pipe shall be placed facing upstream. Riveted seam metal pipe shall be placed with longitudinal laps at sides. Pipes in each continuous line shall have the same wall thickness. Metal pipes provided with lifting lugs shall be handled only by these lugs.

After pipe has been laid and before backfill is placed, the engineer will inspect the pipe for alignment, grade, integrity of joints, and coating damage.

**701.06 JOINING PIPE.**

(a) Joint Usage:

(1) Type 1 (T1) joints shall be used for side drains under drives and similar installations.

(2) Type 2 (T2) joints shall be used for cross drains under roadways, including turnouts.

(3) Type 3 (T3) joints shall be used for closed storm drain systems, flumes and siphons.

(b) Concrete Pipe: Concrete pipe may be either bell and spigot, or tongue and groove. The method of joining pipe sections shall be such that ends are fully entered and inner surfaces are flush and even.

An approved mechanical pipe puller shall be used for joining pipes over 36 inches (900 mm) in diameter. For pipe 36 inches (900 mm) or less in diameter, any approved method for joining pipe may be used which does not damage the pipe.

Joints shall comply with Subsection 1006.05, and shall be sealed with gasket material installed in accordance with the manufacturer's recommendations.

(c) Metal Pipe: Metal pipe shall be firmly joined by coupling bands. Bands shall be centered over the joint.

For Type 1 joints, approved gasket material shall be placed in one corrugation recess on each side of the joint at the coupling band and on each band connection in such manner to prevent leakage.

When Type 2 or 3 joints are specified, joining of metal pipe sections shall conform to the following provisions:

(1) General: Band joints shall be sealed with gasket material. Gasket material shall be placed in accordance with the plan details.

(2) Circular Section: Connecting bands shall be of an approved design and shall be installed in accordance with plan details.

(3) Arch Section: Connecting bands shall be a minimum of 12 inches (300 mm) wide for pipe arch less than 36 inches (900 mm) round equivalent diameter, and a minimum of 21 inches (525 mm) wide for 36 inches (900 mm) round equivalent diameter pipe arch and greater. Bands shall be connected at the ends by approved angle or strap connections. Connecting bands used for 36 inches (900 mm) round equivalent diameter pipe arch and above shall be 2-piece bands.

(d) Plastic Pipe: Joints for plastic pipe shall be either bell and spigot or split coupling bands.

(1) Bell and Spigot Type Joint System: The method of joining pipe sections shall be such that ends are fully entered and inner surfaces are flush and even.

Any approved method for joining pipe may be used which does not damage the pipe.

Joints shall be approved and shall be sealed with a gasket system utilizing gasket material complying with Subsection 1006.06(a).

(2) Split Coupling Type Joint System: Split coupling bands shall comply with all dimensional and material requirements of Subsection 1006.07. The bands shall be centered over the joint. The split coupling band shall be secured to the pipe with a minimum of five stainless steel or other approved corrosion resistant bands.

Joints shall be approved and shall be sealed with gasket material. Gasket material shall be placed in the first two corrugation recesses on each side of the pipe connections. Gasket material shall also be placed on each band connection to prevent leakage. When flexible plastic gasket material is used it shall be a minimum of 1/2 inch (13 mm) in size. The bands shall be tightened to create overlap of the band and shall adequately compress the gasket material.

(e) Connections: Approved connections shall be used when joining new pipes to existing pipes. When concrete collars are required in order to extend the ends of existing pipes that have been damaged or to join different types or sizes of pipes, the concrete collars shall be constructed in accordance with plan details, the applicable requirements of Section 901, and as directed.

(f) Geotextile Fabric, Pipe Joints: For concrete, metal and plastic pipes, Types 2 and 3 joints shall be wrapped with geotextile fabric for a minimum of 12 inches (300 mm) on each side of joint for pipe 36 inches (900 mm) or less in diameter and a minimum of 18 inches (450 mm) on each side of the joint for pipe greater than 36 inches (900 mm) in diameter. Ends of the fabric shall be lapped at least 10 inches (250 mm). The edges and ends of fabric shall be suitably secured for the entire circumference of the pipe.

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701.07 RELAYING PIPE. If specified or directed, existing pipes shall be removed and suitable sections relaid as specified for new pipes.

701.08 BACKFILLING.

(a) General: Prior to backfilling, pipes found to be damaged or out of alignment or grade shall be removed and reinstalled, or replaced.

Type A backfill material shall be stone, recycled portland cement concrete, flowable fill, or RAP.

Type B backfill materials are selected soils. Where Type B backfill materials are called for, Type A backfill materials may be substituted.

When corrugated metal pipe is used, the backfill material shall be tested and shall have a resistivity greater than 1500 ohm-cm and a pH greater than 5 when tested in accordance with DOTD TR 429 and DOTD TR 430 respectively.

When Type A backfill material is used, geotextile fabric surrounding this backfill shall be placed in accordance with Subsection 726.03 between the aggregate backfill material and all other natural or placed soils in the trench or embankment. Care shall be taken to prevent damage to geotextile fabric during placement of backfill material. For concrete pipe, the fabric shall enclose not only the initial backfill but shall be wrapped over the top of the pipe with at least 12 inches (300 mm) of overlap.

When a trench box or trench sheeting is used in unstable soils and/or for worker safety, and when moved during backfilling operations, filling and additional compaction of the disturbed zone of backfill must take place immediately and in a manner acceptable to the engineer.

Initial backfill is a structural backfill encasing the pipe from the bottom of the pipe to the springline for concrete pipe and to a point one foot (0.3 m) above the top of the pipe for both metal and plastic pipe. Final backfill is not a structural backfill and shall extend from the top of the initial backfill to the top of the natural ground or subgrade in cut areas or to the top of existing ground in fill areas. Any fill required above the final backfill is considered and treated as embankment.

(b) Backfill Applications: For projects using A+B+C bidding method where rigid and flexible pavement alternates are considered, backfill application (2) below, "Cross Drains Under Flexible Pavements", shall apply for either rigid or flexible pavements.

(1) Under Concrete Pavements: Type B backfill may be used as initial and final backfill for all pipes, culverts or drains under concrete pavements. Placement and compaction shall be as specified in Heading (d) below.

(2) Cross Drains Under Flexible Pavements: All reaches, exclusive of those portions of the pipe which are under shoulders, of cross drains and all other culverts, pipes or drains that cross the centerlines of the new roadway or centerlines of existing roadways, such as intersections and are under flexible pavements shall receive an initial backfill of Type A material. Type B backfill materials may be used as final backfill for all pipes. Placement and compaction shall be as specified in Heading (c) and (d) below. Where the subgrade is above existing ground, embankment material as specified for the remainder of the project shall be used from the top of the final backfill to the top of the established embankment grade.



(3) Other Drains Under Flexible Pavements: All reaches of all culverts, pipes or drains under flexible pavements that do not cross the centerlines of new roadway or centerlines of existing roadways, and exclusive of those portions of the pipe which are totally under shoulders, shall receive an initial and final backfill of Type B material. Placement and compaction shall be as specified in Heading (d) below. Where the subgrade is above existing ground, embankment material as specified for the remainder of the project shall be used from the top of the final backfill to the top of the established embankment grade.

(4) Other Areas: All culverts, pipes or drains in nonpaved areas or paved areas that serve as driveways or shoulders shall receive an initial and final backfill of Type B material. Placement and compaction shall be as specified in Heading (d) below.

(5) Pipes Subject to Construction Traffic; The embankment or pipe backfill shall be constructed to a minimum of 24 inches (600 mm) over the pipe before heavy construction equipment is allowed to cross the installation. Where practical, installations with less than 24 inches (600 mm) of cover over the top of the pipe shall be constructed after heavy hauling is completed over the pipe location. After completion of hauling operations, the contractor shall remove excess cover material. Pipe damaged by hauling and backfilling operations shall be removed and reinstalled, or replaced, at no direct pay.

(c) Placement and Compaction; Type A Backfill: For all pipes, culverts and conduits under paved and nonpaved areas, where Type A backfill material is used, the Type A backfill shall be thoroughly hand compacted under the pipe haunches and then dynamically compacted in layers not exceeding 8 inches (200 mm) compacted thickness. Compaction under the haunches of the pipe shall initially be by hand tamping or other acceptable means, until a level is reached that the dynamic tamping can commence. Each lift shall be compacted by applying at least eight passes of a hand operated, dynamic mechanical compaction device over the surface of each lift. With approval of the engineer, layer thickness may be increased to 12 inches (300 mm) with verification of satisfactory installation and performance. If flowable fill is used it shall be furnished, placed and consolidated in accordance with Section 710. The contractor shall control placement operations during initial backfill operations so as not to damage protective coatings on metal pipes. The contractor shall repair damaged coatings at no additional pay.

(d) Placement and Compaction; Type B Backfill: For all pipes, culverts and conduits, where Type B backfill is allowed, the Type B material shall be placed in layers not exceeding 8 inches (200 mm) compacted thickness. Compaction shall be with suitable mechanical equipment. With approval of the engineer, layer thickness may be increased to 12 inches (300 mm) with verification of satisfactory installation and performance.

(e) Placement and Compaction; Trenchless or Partial Trench Condition: All pipes, culverts, drains and conduits placed with any portion of the pipe above existing ground must also comply with Subsections (a),(b) (c) and (d) above for the portion of the pipe within a trench and that portion of the pipe not constructed in a trench. The width of initial and final backfill of that portion above existing ground and not within a trench will be constructed to such a width that the requirements for placement, compaction and density are met.

(f) Density Requirements: The in place density of Type A backfill materials and bedding materials, will not be measured or determined. Type A backfill, exclusive of RAP and flowable

fill, shall be placed at or near optimum moisture content determined in accordance with DOTD TR 415 or 418. RAP materials shall be placed and compacted in a slightly moist condition.

The maximum dry density of initial or final Type B backfill under all paved areas which are to be under traffic will be determined in accordance with DOTD TR 415 or TR 418 and in-place density determined in accordance with DOTD TR 401. Initial and final Type B backfill under all paved areas, under traffic, shall be placed at or near optimum moisture content determined in accordance with DOTD TR 415 or TR 418. Each layer shall be compacted by approved methods prior to the placement of a subsequent layer. The engineer will approve the compaction method based upon validation that such method, including moisture control, will achieve at least 95 percent of maximum dry density as determined in accordance with DOTD TR 401. With approval of the engineer, density testing may be waived on subsequent layers with backfill installation in accordance with approved compaction methods and continued satisfactory performance.

Initial and final backfill in unpaved areas or paved areas such as shoulders or driveways, shall be placed evenly and compacted along the length of the culvert, pipe or drain from the top of the initial backfill to the top of the subgrade. Layered backfill shall be compacted at least to the density of the adjoining existing soils or the compaction required of the laterally adjoining layers of soil immediately outside the trench for embankment elevations. Initial and final backfill shall be placed and compacted at or near optimum moisture content determined in accordance with DOTD TR 415 or TR 418.

**701.09 INSPECTION OF PIPES.** After completion of embankment and prior to roadway surfacing, the engineer shall inspect pipes for proper alignment and integrity of joints. Any misaligned pipe or defective joints shall be corrected by the contractor at no direct pay.

(a) Plastic Pipe: Installed plastic pipe shall be tested to ensure that vertical deflections do not exceed 5.0 percent. Maximum allowable deflections shall be governed by the mandrel requirements stated herein.

Deflection tests shall be performed no sooner than 30 calendar days after installation and compaction of backfill. The pipe shall be cleaned and inspected for offsets and obstructions prior to testing.

For pipe 36 inches (900 mm) and less in diameter, a mandrel shall be pulled through the pipe by hand to ensure that maximum allowable deflections have not been exceeded. The mandrel shall be approved by the engineer prior to use. Use of an unapproved mandrel or a mandrel altered or modified after approval will invalidate the test. If the mandrel fails to pass, the pipe is overdeflected.

Unless otherwise permitted, overdeflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed and replaced with new pipe. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any overdeflection, shall be removed and replaced with new pipe.

The mandrel shall be a rigid, nonadjustable, odd-numbered legged (minimum 9 legs) mandrel having a length not less than its nominal diameter or 24 inches (600 mm), whichever is less. The minimum diameter at any point shall be 5.0 percent less than the base inside diameter of the pipe being tested. The mandrel shall be fabricated of steel, aluminum or other approved

material fitted with pulling rings at each end. The nominal pipe size and outside diameter of the mandrel shall be stamped or engraved on some segment other than a runner. A suitable carrying case shall be furnished.

For pipe larger than 36 inches (900 mm) in diameter, deflection shall be determined by a method approved by the engineer. If a mandrel is selected, the minimum diameter, length, and other requirements shall conform to the above requirements.

Mandrel testing shall be conducted by the contractor in the presence of the engineer. Mandrel testing shall be at no direct pay.

(b) Metal Pipe: If the inside diameter of metal pipe or rise dimension of metal pipe arch deflects more than 5.0 percent from original dimensions, they shall be removed and reinstalled, unless they do not rebound or are damaged. Pipe or pipe arch which are damaged or do not rebound shall be removed and replaced at no direct pay. Measurement of deflection will be made by the engineer away from rerolled ends.

#### 701.10 CLEANING PIPES.

(a) Existing Pipes: Pipes designated to be cleaned shall be cleaned of soil, debris and other materials to the invert of the pipe. Designated pipes shall be cleaned by approved methods that will not damage the pipes. Any damage caused by the contractor's operations shall be satisfactorily repaired at no direct pay.

Removed soil, debris and other materials shall be disposed of in accordance with Subsection 202.02 or as otherwise approved in writing.

(b) Contractor Installed Pipes: Prior to final acceptance, pipes shall be cleaned of all debris and soil to the invert of the pipe at no direct pay.

Removed soil, debris and other materials shall be disposed of in accordance with Subsection 202.02 or as otherwise approved in writing.

701.11 STUBBING AND PLUGGING PIPES. When it is required that pipes be plugged, such plugs shall be constructed of Class R concrete complying with Section 901. Thickness of plug and method of construction shall be as directed.

When new pipes are to be stubbed into new or existing pipes or other structures, the connection shall be made with approved mortar complying with Subsection 702.02.

701.12 MEASUREMENT. Pipe, both new and relaid, will be measured in linear feet (lin m) as follows unless stated otherwise.

(a) Pipe not confined by fixed structures will be measured by the number of joints at the nominal length of each joint.

(b) Pipe confined by fixed structures will be measured along the pipe between the termini of pipe in structure walls.

(c) Pipe confined by a fixed structure on one end and unconfined at the other end will be measured along the pipe from the terminus of pipe in the structure wall to the unconfined end of pipe.

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(d) Fabricating of pipe tees, elbows and other fittings will be measured per each fitting. The length of pipe in such fittings will be included in the pay length measurement of pipes of which they form a part.

(e) Excavation required for installation of pipes will not be measured for payment, except as otherwise specified in Subsection 203.14.

(f) Furnishing and placing backfill material below existing ground level for pipes will not be measured for payment. Backfill material needed to complete backfill above natural ground and around pipes that extend above natural ground will be measured and payment will be made under applicable earthwork items. When specified, flowable fill will be measured and paid for in accordance with Section 710.

(g) Plugging and stubbing of pipes will not be measured for payment.

(h) Cleaning existing pipes will be measured by the length of pipe cleaned and accepted.

(i) Concrete collars will be measured per each.

**701.13 PAYMENT.**

(a) Payment for pipe will be made at the contract unit price per linear foot (lin m) of the types and sizes specified.

When plastic pipe is specified on the plans or elected to be used by the contractor, payment will be made at the contract unit price per linear foot (lin m) of the types and sizes specified in accordance with the payment schedule of Table 701-1.

Table 701-1  
Payment Schedule for Plastic Pipe

Percent Payment	Stage of Completeness
75	After placement and backfill has been completed
25	After the pipe has met vertical deflection requirements in accordance with Subsection 701.09(a)

(b) Payment for fabricating pipe tees, elbows and other fittings will be made at the contract unit price per each fitting.

(c) When unstable conditions are encountered, the additional excavation will not be measured for payment; however, the additional materials furnished and placed for the pipe foundation will be measured and paid for as follows:

(1) Granular Materials: Payment will be made under the embankment item. The net section volume of the materials will be multiplied by 3 to determine the pay volume. When the contract does not include a pay item for embankment, payment will be made in accordance with Subsection 104.02.

(2) Bedding Material: Measurement and payment will be made in accordance with Section 726. When the contract does not include a pay item for bedding material, payment will be made in accordance with Subsection 104.02.

(d) Payment for cleaning existing pipes will be made at the contract unit price per linear foot (lin m).

(e) Payment for concrete collars will be made at the contract unit price per each.

Payment will be made under:

Item No.	Pay Item	Pay Unit
701-01	Cross Drain Pipe (Size & Type)	Linear Foot (Lin m)
701-02	Cross Drain Pipe Arch (Size & Type)	Linear Foot (Lin m)
701-03	Storm Drain Pipe (Size & Type)	Linear Foot (Lin m)
701-04	Storm Drain Pipe Arch (Size & Type)	Linear Foot (Lin m)
701-05	Side Drain Pipe (Size)	Linear Foot (Lin m)
701-06	Side Drain Pipe Arch (Size)	Linear Foot (Lin m)
701-07	Yard Drain Pipe (Size)	Linear Foot (Lin m)
701-08	Relaying Pipe	Linear Foot (Lin m)
701-09	Fabricating Pipe Fittings	Each
701-10	Reinforced Concrete Pipe (Extension)	Linear Foot (Lin m)
701-11	Reinforced Concrete Pipe Arch (Extension)	Linear Foot (Lin m)
701-12	Corrugated Metal Pipe (Extension)	Linear Foot (Lin m)
701-13	Corrugated Metal Pipe Arch (Extension)	Linear Foot (Lin m)
701-14	Cleaning Existing Pipes	Linear Foot (Lin m)
701-15	Concrete Collar	Each
701-16	Plastic Pipe (Extension)	Linear Foot (Lin m)

**SECTION 704 – GUARD RAIL:**

Subsection 704.03 – General Construction Requirements (01/05), Pages 368 and 369.

Add the following to Heading (d), Guard Rail End Treatments.

All end treatments shall bear a label indicating the manufacturer and exact product name of the end treatment along with its assigned NCHRP 350 test level. This label shall resist weathering and shall be permanently affixed to the railing in such a way as to be readily visible.

**SECTION 706 – CONCRETE WALKS, DRIVES AND INCIDENTAL PAVING:**

All Subsections within Section 706 (04/08), Pages 375 – 377.

Delete Section 706, Concrete Walks, Drives and Incidental Paving and substitute the following.

**SECTION 706**  
**CONCRETE WALKS, DRIVES AND INCIDENTAL PAVING**

706.01 DESCRIPTION. This work consists of furnishing and constructing portland cement concrete walks, handicapped curb ramps, drives and incidental paving slabs in accordance with

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these specifications and in conformity with lines, grades and dimensions shown on the plans or established.

706.02 MATERIALS. Materials shall comply with the following Section or Subsections.

Portland Cement Concrete (Class M)	901
Joint Filler	1005.01(c)
Reinforcing Steel	1009.01
Curing Materials	1011.01

**706.03 CONSTRUCTION REQUIREMENTS.**

(a) Excavation: Excavation shall be made to required depth and width. The top of the subgrade shall be shaped and compacted to a firm, even surface conforming to the section shown on the plans. Unsuitable material shall be removed and disposed of in accordance with Subsection 202.02 and replaced with approved material at no direct pay.

(b) Forms: Forms shall be of wood or metal and shall extend the full depth of concrete. Forms shall be straight, clean and of sufficient strength to resist the pressure of concrete. Bracing of forms shall be such that forms remain in horizontal and vertical alignment until their removal.

Concrete may be placed by slip-form methods. Slip-formed concrete shall be placed with an approved machine designed to spread, vibrate, consolidate and finish concrete in one pass of the machine in such manner that minimum hand finishing is necessary. Sliding forms shall be rigidly held together to prevent spreading of forms. After the passing of the side forms there shall be no noticeable slumping of concrete.

(c) Subgrade: The subgrade shall be thoroughly moistened immediately prior to placing concrete.

(d) Placing and Finishing: Concrete shall be placed on the subgrade, struck off to required thickness and tamped sufficiently to bring the mortar to the surface. The surface shall be finished with a wood float or steel trowel followed by brushing to a slightly rough finish. Joints and edges shall be rounded with an edging tool having a 1/4-inch (6 mm) radius.

**(e) Joints:**

(1) Expansion Joints: Expansion joints shall be filled with 1/2 inch (13 mm) thick preformed expansion joint filler. Expansion joints shall be installed at maximum 100-foot (30 m) intervals, and between intersecting paving and any fixed structure such as a building, bridge or curbing, and between intersecting paving and the handicapped curb ramps. Expansion joint material shall extend for the full width and depth of paving.

(2) Weakened Plane: Weakened planes shall be formed by a jointing tool or other acceptable means. Weakened planes shall extend into concrete for at least 1/4 of the depth and shall be approximately 1/8 inch (3 mm) wide.

a. Walks: Spacing of weakened planes for walks shall be equal to the width of walk.

b. Drives: A longitudinal weakened plane shall be formed along the centerline of drives more than 16 feet (5 m) wide, and transverse weakened planes shall be formed at not more than 16-foot (5 m) intervals.

c. Incidental Paving: Weakened planes for incidental paving shall be formed at intervals not exceeding 30 times the thickness of the concrete in length or width. Incidental paving poured adjacent to jointed concrete shall be jointed to match existing joints, with intermediate joints formed as necessary not to exceed the maximum joint spacing.

(3) Construction Joints: Construction joints shall be formed around manholes, utility poles, etc., extending into paving and 1/4 inch (6 mm) thick preformed expansion joint filler shall be installed in these joints.

(4) Tie-ins: Tie-ins of existing concrete shall be made by full depth sawing at no direct pay.

(f) Curing: Concrete shall be cured in accordance with Subsection 601.10.

(g) Detectable Warning Surface for Handicap Ramps and At-Grade Sidewalk Intersections: Sidewalks, when intersecting with roadways, shall be equipped with a detectable warning surface system consisting of raised truncated domes as a transition between the sidewalk and the street as required by the Americans with Disabilities Act, 28 CFR Part 36, ADA Standards for Accessible Design.

Detectable warnings (truncated domes) shall be installed on the ramp surface over the full width of the ramp throat for a distance of 24 inches (600 mm) in the direction of travel from the back of the curb. Detectable warnings (truncated domes) shall also be installed on at-grade sidewalks intersecting with roadways for a distance of 36 inches (900 mm) in the direction of travel from the end of the sidewalk. Truncated domes shall be laid out on a square grid in order to allow enough space for wheelchairs to roll between the domes.

Light reflectance of the truncated domes and the underlying surface must meet the 70 percent contrast requirement of ADAAG.

**706.04 MEASUREMENT.** Quantities of concrete walks, drives and incidental paving slabs for payment will be the design quantities as specified on the plans and adjustments thereto. Design quantities will be adjusted if the engineer makes changes to adjust to field conditions, if design errors are proven or if design changes are made. Design areas are based on the horizontal dimensions shown on the plans. Excavation, backfill, reinforcing steel and joint materials will not be measured for payment.

Handicapped curb ramps, including the detectable surface warning system, will be measured per each.

Detectable surface warning systems for at-grade sidewalk intersection will not be measured for payment.

**706.05 PAYMENT.** Payment for concrete walks, drives and incidental paving will be made on a lot basis at the contract unit price per square yard (sq m), adjusted in accordance with the following provisions. Payment for each lot will be made in accordance with Table 901-6. Size, sampling, and testing of each concrete lot shall be in accordance with the Materials Sampling Manual.

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Payment for handicapped curb ramps, including the detectable surface warning system, will be made by each and shall include, but not limited to, curb transitions, detectable warning system, gutter, landing and base.

Payment will be made under:

Item No.	Pay Item	Pay Unit
706-01	Concrete Walk (    inch (mm) Thick)	Square Yard (Sq m)
706-02	Concrete Drive (    inch (mm) Thick)	Square Yard (Sq m)
706-03	Incidental Concrete Paving (    inch (mm) Thick)	Square Yard (Sq m)
706-04	Handicapped Curb Ramps	Each

**SECTION 713 – TEMPORARY TRAFFIC CONTROL:**

Subsection 713.06 – Pavement Markings (08/06), Pages 400 – 403.

Delete Table 713-1, Temporary Pavement Markings and substitute the following.



Table 713-1  
Temporary Pavement Markings<sup>1,2</sup>

		Two-lane Highways	Undivided Multilane Highways	Divided Multilane Highways
SHORT TERM	ADT<1500; or ADT>1500 and time<3 days	Lane lines 4-foot (1.2 m) tape on 40-foot (12 m) centers; with "Do Not Pass" and "Pass With Care" signs as required		
	ADT>1500; Time>3 days and<2 weeks	Lane lines 4-foot (1.2-m) tape on 40-foot (12-m) centers with no passing zone markings		
	All ADT's with time <2 weeks		Lane lines 4-foot (1.2m) tape on 40-foot (12 m) centers; double yellow centerline	Lane lines 4-foot (1.2 m) tape on 40-foot (12 m) centers
LONG TERM	All ADT's with time >2 weeks	Standard lane lines, no-passing zone markings, legends and symbols and when pavement width is 22 feet (6.7 m) or greater, edge lines	Standard lane lines, centerlines, edge lines, and legends and symbols	Standard lane lines, centerlines, edge lines, and legends and symbols.

<sup>1</sup>No-passing zones shall be delineated as indicated whenever a project is open to traffic.

<sup>2</sup>On all Asphaltic Surface Treatments that are open to traffic and used as a final wearing course or as an interlayer, temporary pavement markings (tabs) on 20-foot (6 m) centers shall be used, in lieu of the 4-foot (1.2 m) tape, on 40-foot (12 m) centers.

**SECTION 719 – LANDSCAPING:**

Subsection 719.06 – Construction Methods (03/09), Pages 429 – 432.

Delete the first paragraph of Heading (a), Seasonal Operations and substitute the following.

Unless otherwise directed by the engineer in writing, the planting season is between November 1 and April 15.

**SECTION 729 – TRAFFIC SIGNS AND DEVICES:**

Subsection 729.02 – Materials (04/08), Pages 456 and 457.

Delete the contents of Heading (a), Sign and Marker Sheeting, and substitute the following.

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(a) Sign and Marker Sheeting: Sheeting material for sign panels, delineators, barricades and other markers shall comply with Section 1015. All permanent signs shall meet the requirements of ASTM D 4956, Type X.

Subsection 729.04, Fabrication of Sign Panels and Markers (04/08), Pages 458 – 460.

Delete the third paragraph of Heading (c), Sheeting Application and substitute the following.

ASTM D 4956 Type X reflective sheeting shall be applied with an orientation determined by the engineer to obtain the optimum entrance angle performance. Fabricated vertical splices in ASTM D 4956 Type X reflective sheeting will be allowed only when the horizontal dimension of the sign face or attached shield is in excess of the maximum manufactured width of the sheeting. Fabricated vertical splices in ASTM D 4956 Type X reflective sheeting will also be allowed when the specified orientation will create excessive sheeting waste.

**SECTION 730 – ELECTRICAL SYSTEMS:**

Subsection 730.04 – Drawings and Equipment Submittals (03/09), Pages 468 and 469.

Delete the third sentence of Heading (b), As-Built Drawings and substitute the following:

The drawings shall show the exact location of the underground wiring, light poles, junction boxes, under roadway crossings, service poles, controllers, disconnects, and conduit or cables.

Subsection 730.08 – Measurement (03/09), Pages 470 – 472.

Delete Heading (e), Jacked or Bored Casing and substitute the following:

(e) Jacked or Bored Casing: Jacked or bored casings will be measured by the linear foot (lin m) of casing furnished and installed, which will include the casing, fittings, and required excavation and backfill.

Add the following:

(t) Modular Breakaway Cable System: Modular breakaway electrical cable systems for low mast light poles shall be measured per each and shall include all materials, labor, equipment, and tools necessary to furnish and install a complete system in accordance with the plans and specifications.

(u) Disconnect: Disconnects shall be measured per each and shall include all materials, labor, equipment, and tools necessary to furnish and install this item in accordance with the plans and specifications.

(v) Duct Markers: Duct markers shall be measured per each and shall include all materials, labor, equipment, and tools necessary to furnish and install this item in accordance with the plans and specifications.

(w) Underground Marker Tape: Marker tape shall be measured per linear foot and shall include all materials, labor, equipment, tools necessary to furnish and install this item in accordance with the plans and specifications.

Subsection 730.09, Payment (03/09), Pages 472 and 473.

Add the following pay items.

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
730-19	Modular Breakaway Cable System	Each
730-20	Disconnect (Type)	Each
730-21	Duct Marker (Type)	Each
730-22	Underground Marker Tape (Size and Type)	Linear Foot (Lin m)

**SECTION 732 – PLASTIC PAVEMENT MARKINGS:**

All subsections within Section 732 (10/11), Pages 477 – 482.

Delete Section 732, Plastic Pavement Markings and substitute the following:

Section 732  
Plastic Pavement Markings

732.01 DESCRIPTION. This work consists of furnishing and placing reflective pavement markings of hot applied thermoplastic or preformed (cold or hot applied) plastic at the locations shown on the plans or as directed. This work shall be in compliance with the MUTCD, plan details and these specifications. Plastic pavement markings include stripes, gore markings, lines, legends and symbols.

732.02 MATERIALS.

(a) Thermoplastic Markings: Thermoplastic marking material shall be a plastic compound reflectorized by internal and external application of glass beads, complying with Subsections 1015.10 and 1015.13. Black thermoplastic marking material shall be used according to the standard plans on all portland cement concrete pavement. This material shall not require glass beads. Width and color of markings shall be as specified.

Thermoplastic material shall be delivered in containers of sufficient strength to permit normal handling during shipment and transportation without loss of material. Approved heat-degradable containers that can be placed in heating kettles along with the plastic material will be permitted. Each container shall be clearly marked to indicate color of material, process batch number, name of manufacturer and date of manufacture.

The material, upon heating to application temperature, shall not give off fumes that are toxic to persons or property. The maximum elapsed time after application which normal traffic will leave no impression or imprint on the new strip shall be 60 seconds when the air and road surface temperature is approximately 68°F ± 5°F (20°C ± 3°C). The material shall provide a stripe that has a uniform thickness throughout its cross-section.

(b) Preformed Plastic Markings: Preformed plastic markings shall comply with Subsection 1015.11.

(c) Surface Primer: A single component surface primer or two component epoxy primer sealer shall be provided by the contractor for the appropriate application in accordance with Subsection 732.03(e). The primer shall form a continuous film that dries rapidly and adheres to

the pavement. The primer material shall not discolor or cause any noticeable change in the appearance of the pavement outside of the finished pavement marking. A sample of the primer shall be submitted with the recommended method of application to the engineer and to the manufacturer of the thermoplastic marking material. Written approval shall be obtained from the engineer and the manufacturer before applying the primer.

(d) Glass Beads: Glass beads used for drop-on application to molten plastic shall be shipped in moisture resistant sacks (containers). The sacks shall be strong enough to permit handling without damage. Sacks shall be sufficiently water-resistant so that beads will not become wet or caked in transit.

Glass beads for standard (flat) thermoplastic markings shall be in accordance with Subsection 1015.13.

### **732.03 CONSTRUCTION REQUIREMENTS FOR PLASTIC PAVEMENT MARKING MATERIAL.**

#### **(a) Equipment for Standard (Flat) Thermoplastic Marking Material:**

The application equipment shall consist of an extrusion die or a ribbon gun that simultaneously deposits and shapes lines at a thickness of 90 mils (2.3 mm) or greater on the pavement surface. When restriping onto existing thermoplastic markings, only a ribbon gun shall be used. Finished markings shall be continuous and uniform in shape, and have clear and sharp dimensions. Applicators shall be capable of producing various widths of traffic markings. Applicators shall produce sharply defined lines and provide means for cleanly cutting off stripe ends and applying broken lines. The ribbon extrusion die or shaping die shall not be more than 2 inches (50 mm) above the roadway surface during application. A spray application will only be allowed when applying 40 mil (1.0 mm) thermoplastic.

The application equipment shall provide continuous mixing and agitation of material. Thermoplastic conveying equipment components located between the main material reservoir and discharge mechanism shall be free from material accumulation and clogging. Parts of application equipment in contact with the material shall be easily accessible for cleaning and maintaining. Mixing and conveying equipment shall maintain material at the application temperature.

Glass beads shall be applied to the molten surface of completed stripes by either a single drop or a double drop application depending on the thickness of the thermoplastic striping as shown in Table 1015-13. Glass beads for single drop applications and the first (large) bead drop for double drop applications shall be applied by a gravity bead dispenser attached to the striping machine in such a manner that beads are dispensed simultaneously with the thermoplastic material at a controlled rate of flow on installed lines. The second (small) bead drop shall be applied immediately after the first bead drop by a gravity bead dispenser attached to the striping machine.

Applicators and kettles shall be equipped and arranged to comply with requirements of the National Board of Fire Underwriters. Applicators shall be maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc. Applicator equipment shall consist of a motorized mobile unit capable of installing traffic stripes either left or right of the applying unit so that only one lane of traffic will be occupied during installation.

(b) Weather Limitations: Application of markings will not be permitted when there is excessive pavement moisture. The pavement shall be considered excessively moist when it is visibly wet or when a 1 square foot (0.1 sq m) piece of polyethylene film condenses moisture after being placed on the pavement surface for 15 minutes. The surface temperature and the ambient temperature must be 50°F (10°C) and rising to begin striping operations. Striping operations shall cease when either temperature reaches 50°F (10°C).

(c) Cleaning of Surfaces: Surfaces on which markings are to be applied shall be cleaned of materials that may reduce adhesion of the thermoplastic marking materials to the pavement. Cleaning shall be done by blast cleaning or grinding. Surfaces shall be kept clean until placement of markings.

(d) Removal of Existing Markings:

(1) 40 Mil (1.0mm): Existing thermoplastic markings that are not flaking or peeling will not require removal prior to placement of thermoplastic. Flaking or peeling material shall be removed by mechanical sweeper or wire brush to the satisfaction of the engineer prior to thermoplastic application.

(2) 90 Mil (2.3mm): Existing thermoplastic markings and painted markings, regardless of condition, shall be removed prior to placement of 90 mil (2.3 mm) thick or greater thermoplastic except on asphalt pavements, unless otherwise directed.

(3) Intersection Markings, Legends and Symbols: Existing markings shall be removed from the pavement surface so that 125 mils of new markings can be applied.

(4) Preformed Plastic Markings (Tape): Existing markings shall be removed from the pavement surface before applying the preformed plastic markings (tape).

Removal of markings shall be accomplished by methods that will not damage the pavement or bridge deck. After the markings are removed, the debris and residue shall be picked up and disposed of by the contractor so that the primer and thermoplastic can adhere to the pavement. At the end of each day's operations the engineer may direct that temporary pavement markings complying with Section 713 be used in areas where existing markings have been removed and new markings not placed. Temporary pavement markings shall be satisfactorily removed prior to resuming thermoplastic marking operations.

All markings made in error or not conforming to the traffic operation in use shall be removed by either an abrasion or burning process to the satisfaction of the engineer. Markings shall not be obliterated by painting with asphalt binder or other material.

(e) Application of Surface Primer: A single component surface primer will be required prior to placement of thermoplastic markings over oxidized asphalt, when striping over existing thermoplastic on portland cement concrete surfaces, or when 40 mil (1.0 mm) thick thermoplastic is allowed to be placed over existing markings on concrete surfaces, unless otherwise directed by the engineer. A two component epoxy primer sealer will be required prior to placement of thermoplastic materials on portland cement concrete surfaces, unless otherwise directed by the engineer.

(f) Application of Markings: Material shall be installed in specified widths from 4 inches to 8 inches (100 mm to 200 mm) for 40 mil (1.0 mm) applications and from 4 inches to 24 inches (100 mm to 600 mm) for 90 mil (2.3 mm) applications. Finished lines shall have well defined edges and be free of waviness. Measurements shall be taken as an average through any 36-inch

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(900 mm) section of line. Longitudinal lines shall be offset approximately 2 inches (50 mm) from longitudinal joints. A tolerance of +1/2 inch and -1/8 inch (+13 mm and -3 mm) from the specified width will be allowed, provided the variation is gradual. Segments shall square off at each end without mist or drip. Transverse variations from the control device up to 1 inch (25 mm) will be allowed provided the variation does not increase or decrease at the rate of more than 1/2 inch in 25 feet (15 mm in 10.0 m). Lines not meeting these tolerances shall be removed and replaced at no direct pay.

(1) Thermoplastic Markings: For extruded or ribbon gun applied markings, the thickness of material, not including drop-on beads, shall be not less than 90 mils (2.3 mm) for lane lines, edge lines, black contrast, and gore markings and not less than 125 mils (3.2 mm) for crosswalks, stop lines, and word and symbol markings.

For spray applications the thickness of material, not including drop-on beads, shall not be less than 40 mils (1.0 mm).

Thermoplastic material at 90 mil (2.3 mm) thickness or greater shall be applied by extrusion at 390°F to 450°F (200°C to 230°C), unless otherwise recommended by the manufacturer. Thermoplastic material at 40 mil (1.0 mm) thickness shall be applied by spray at 410°F to 450°F (210°C to 230°C). Immediately after application of the markings, glass beads for a single drop application shall be applied at a minimum rate of 141 pounds per mile (40 kg/km) for a 4-inch (100 mm) solid line stripe. Glass beads for a double drop application shall be applied at a minimum rate of 211 pounds per mile (60 kg/km) for each drop on a 4-inch (100 mm) solid line. Black thermoplastic pavement marking material shall not require glass beads. Material shall not scorch or discolor when kept at this temperature range for 4 hours.

(2) Preformed Plastic Markings: Plastic tape shall be applied with adequate pressure to ensure proper adhesion. Preformed heat-applied thermoplastic material shall be applied in accordance with the manufacturers' recommendation. Material not adhering properly shall be satisfactorily corrected at no direct pay.

(g) Field Testing of Roadway Markings: The contractor will field test the pavement markings in accordance with Subsections 1015.10 and 1015.11 and Table 732-1. Failure to meet these requirements will require the contractor to replace the portion of the material shown to be out of specifications as directed.

(h) Initial Requirements Corrective Work: Any line found to be defective shall be restriped as directed by the engineer. The corrective work shall also be subject to these requirements and as noted in Table 732-2, "Payment Adjustments for Initial Retroreflectivity." The contractor shall provide the materials and install the pavement marking at no direct pay.

(i) Subsequent (Warranty) Requirements Corrective Work: The Department will take subsequent readings not later than one year after installation. The retroreflective requirements for warranty readings are in accordance with Subsection 1015.10(c)(3), "Retroreflectivity". If a project fails to meet retroreflective requirements the contractor shall, at no cost to the Department, replace the materials and install the pavement markings. The Department will determine if the failure is due to poor workmanship or due to no fault of the contractor. Disputes will be resolved by the Chief Engineer.

(j) Guarantee: Work performed in accordance with this Section shall be guaranteed as specified in Subsection 104.05, "Guarantees".

**732.04 MEASUREMENT.**

(a) Plastic Pavement Striping: Plastic striping will be measured by the linear foot (lin m) or mile (km), as specified. When a bid item is not included for gore markings, the Department will measure the quantity by converting the actual length and width of line installed to an equivalent length of the normal width line on that section of roadway.

(1) Linear Foot (Lin m): Measurement will be made by the linear foot (lin m) of striping, exclusive of gaps.

(2) Mile (km): Measurement will be made by the mile (km) of single stripe. No deduction will be made for standard 30-foot (9 m) design gaps in broken-line striping; however, deductions will be made for the length of other gaps or omitted sections.

(b) Plastic Pavement Legends and Symbols: Plastic legends and symbols will be measured per each legend or symbol. Symbols shall include all letters, lines, bars or markings necessary to convey the message at each location.

(c) Removal of Existing Markings: Removal of existing pavement markings for undivided highways will be measured by the linear mile (km) of full roadway width including shoulders. For divided highways, the full roadway width including shoulders and ramps will be measured separately for each direction of travel. Removal of pavement markings will include removal of lane lines, edgelines, gore markings, legends, symbols, and raised pavement markers.

**732.05 PAYMENT.** Payment for the completed and accepted quantities of plastic pavement markings and removal of existing markings will be made at the contract unit prices, or in accordance with Table 732-2, "Payment Adjustments for Initial Retroreflectivity."

Payment will be made under:

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
732-01	Plastic Pavement Striping (    inch ( __mm) Width)	Linear Foot (Lin m)
732-02	Plastic Pavement Striping (Solid Line) (    inch ( __mm) Width)	Mile (km)
732-03	Plastic Pavement Striping (Broken Line) (    inch ( __mm) Width)	Mile (km)
732-04	Plastic Pavement Legends and Symbols (Type)	Each
732-05	Removal of Existing Markings	Mile (km)

Table 732-1  
Field Testing of Plastic Pavement Markings

Length of Roadway	Minimum Required Readings
Less than 1 mile (1.6 km)	10 evenly spaced readings per line type/color <sup>1</sup>
1 mile (1.6 km) to 6 miles (9.6 km)	10 evenly spaced readings per line type/color for each 1 mile (1.6 km) section <sup>1</sup>
Greater than 6 miles (9.6 km)	5 evenly spaced readings per line type/color for each 1 mile (1.6 km) section <sup>2</sup>
Legends and Symbols	Visual night time inspection only
8", 16" and 24" Lines	5 readings per line/color <sup>2</sup>
<sup>1</sup> Average of 10 readings per set <sup>2</sup> Average of 5 readings per set	
<p>Measurements</p> <ol style="list-style-type: none"> <li>Each line type/color will be measured separately.</li> <li>Measurements will be taken on dry, clean roadways.</li> <li>Data will be collected in direction of traffic flow.</li> <li>On broken lines (skip striping), no more than two readings will be taken per stripe, with readings 20 inches (0.5 m) from ends of marking.</li> <li>The Department may take additional readings.</li> <li>Acceptance will be based on the average of each set of readings for each line type/color.</li> <li>Failure of the average reading for any segment to meet the specified minimum values will require replacement, corrective action or subject to payment adjustments specified in Table 732-2, "Payment Adjustment for Initial Retroreflectivity".</li> <li>Limits of replacement will be determined by the engineer.</li> <li>Line widths 8"; 16"; and 24" will be tested per each location or as directed by the engineer. Retroreflectivity shall match 40 mil (1.0 mm) requirements.</li> <li>Aggregate Surface Course projects will not be tested for retroreflectivity, but will be visual inspected at night for acceptance by the engineer.</li> <li>Multiple lane roadways will require testing of each lane line per mile.</li> <li>No reflectance readings are required for black thermoplastic pavement markings.</li> </ol>	



Table 732-2  
Payment Adjustment for Initial Retroreflectivity

Contract Unit Price <sup>1</sup> , %	White (mcd\lux\m <sup>2</sup> )		Yellow (mcd\lux\m <sup>2</sup> )	
	40 mil (1.0 mm)	90 mil (2.3 mm)	40 mil (1.0 mm)	90 mil (2.3 mm)
103 <sup>2</sup>	350	450	225	300
100	250	375	175	250
90	230	360	165	230
80	220	340	155	220
50 or Restripe	200	325	150	200

<sup>1</sup>The payment requirements are based on the project total average of all test segments for initial reading in accordance with Table 732-1.

<sup>2</sup>There cannot be any test segments meeting less than 100 percent pay within the project limits to qualify for the bonus payment.

All subsections within Section 737 (09/11), Pages 503 – 507.

Delete Section 737, Painted Traffic Striping and substitute the following:

Section 737  
Painted Traffic Striping

737.01 DESCRIPTION. This work consists of furnishing and applying reflective white or yellow paint for pavement striping, curbs and traffic islands in accordance with plan details, the MUTCD and these specifications.

737.02 MATERIALS. Traffic paint shall be a water-based traffic paint complying with Subsection 1015.12. Glass beads for drop-on application shall comply with Subsection 1015.13.

737.03 EQUIPMENT. Selection of proper equipment to produce satisfactory results within the following requirements shall be the responsibility of the contractor.

(a) Equipment shall permit traffic to pass safely within the limits of the roadway surface and shoulder while operating.

(b) Equipment shall be designed for placement of both solid and broken line stripes of the spacing shown on the plans with square, neat stripe ends. Hand spraying may be used for curbs and traffic islands.

(c) Equipment shall provide a method for cleaning the surface of dust immediately prior to placement of any striping or painting materials.

(d) Equipment shall provide a gravity bead dispenser for drop-on application of glass beads.

(e) The equipment shall provide accurate regulation of the application rate and shall have a tachometer or other approved device to ensure uniform paint application at the designated rate. The equipment shall be adjustable for applying one, two or three adjacent lines simultaneously at the specified spacing and be equipped with a device capable of following a control line. Operation of the unit shall be such that paint will not be spattered or blown on another stripe or outside the prescribed limits during application. The unit shall be designed to properly agitate the paint while in operation.

(f) The equipment may be equipped with a heat exchanger to heat the paint to reduce drying time.

(g) The operation shall include a trailing vehicle equipped with a flashing arrow board.

737.04 CONSTRUCTION. Yellow centerline striping shall be used to delineate traffic moving in opposite directions. White lane line striping shall be used to delineate traffic moving in the same direction. These stripings shall be broken lines and solid lines as required by Part 3 of the MUTCD. Edge lines shall be solid lines, the color of which shall be determined from Part 3 of the MUTCD.

Pavement striping shall be 4 inches (100 mm) in width on all routes. Striping widths for gore markings and turning lanes shall be 8 inches (200 mm) unless noted otherwise in the plans. All lines shall have clean edges with a width tolerance in accordance with Subsection 737.08. The engineer may waive the tolerance when deviations are caused by undulation in the pavement surface.

Broken lines shall be constructed with a stripe-to-gap ratio of a 10-foot (3 m) paint stripe to a 30-foot (9m) gap. The length of the stripe shall be 10 feet (3 m) minimum and 10 1/2 feet (3.2 m) maximum. The stripe-gap cycle shall be 40 feet (12 m) minimum and 40 1/2 feet (12.3 m) maximum.

Curbs and islands shall be painted (yellow or white) as determined in the plans. Paint for curbs and islands may be applied by machine or hand methods as approved by the engineer.

The contractor shall apply all paint on new pavement prior to opening to traffic. When rain or other unavoidable occurrences prevent the marking of pavement, the contractor shall mark the pavement as soon as conditions permit before the roadway is allowed to be open. The requirements of Subsection 713.06 shall govern over the above mentioned application requirements.

**737.05 SURFACE PREPARATION.** Surfaces to be painted shall be cleaned of materials that may reduce adhesion of paint. Any flaking or peeling material shall be removed by mechanical sweeper or wire brush to the satisfaction of the engineer. Surfaces shall be kept clean and dry at the time of application of paint.

**737.06 WEATHER LIMITATIONS.** No painting shall be done when:

1. the pavement surface is not thoroughly dried; or,
2. the air is foggy or misty; or,
3. the air or surface temperature is below 50°F (10°C); or,
4. wind or other conditions cause a film of dust to be deposited on the surface after cleaning; or,
5. wind causes displacement of striping material.

**737.07 APPLICATION.** The longitudinal joint or existing centerline stripe shall be used in determining the location of the centerline of new striping. In the absence of a longitudinal joint or existing stripe, the location of the centerline of new striping shall be located by the contractor with the approval of the engineer. Broken line individual intervals will not be marked. No striping material shall be applied over a guide stringline.

(a) **Paint Preparation:** Immediately before application, paints shall be agitated and mixed thoroughly to a uniform consistency, free from lumps or agglomerates. Paints shall be kept covered to retain volatiles. Paints shall not be thinned without approval. Paint shall be kept thoroughly mixed throughout the application process.

Paint may be heated in heat exchangers to accelerate drying, to a temperature between 110°F and 130°F (43°C and 54°C) for water-based paint.

(b) **Application Rate:** Paint shall be applied at the rate of 25 gallons per mile (59 L/km) at a thickness of 22 wet mils (560 wet µm) and 15 dry mils (380 dry µm) to produce a 4-inch (100 mm) wide solid line. Temporary paint shall be applied at a thickness of 15 wet mils (380 wet µm). Curb and island painting shall be applied at the rate of 12.5 gallons per 100 square yards (57 liters /100 sq m) at a thickness of 15 wet mils (380 wet µm).

Glass beads, complying with Subsection 1015.13, shall be applied at the same time as the paint but in a separate operation at the rate of 90 pounds of beads per 100 square

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yards (49 kg/ 100 sq m). The application of glass beads by the drop-on-method for hand painting shall be at the rate of 72 pounds per 100 square yards (39 kg/100 sq m) of markings or as specified in the plans.

737.08 TOLERANCES. A tolerance of +1/2 inch and -1/8 inch (+13 mm and -3 mm) from the specified width will be allowed, provided the variation is gradual. Segments of broken line may vary  $\pm 6$  inches (150 mm) from the specified length provided it is not consistently short. Segments shall be squared off at each end without mist or drip. Longitudinal painted lines shall not deviate from established alignment by more than 1 inch (25 mm) provided the variation does not increase or decrease at the rate of more than 1/2 inch in 25 feet (15 mm in 10 m). Lines not meeting these tolerances shall be removed by abrasive blasting or grinding and replaced at no direct pay.

737.09 PROTECTION OF MARKINGS. Traffic shall be prevented from crossing a wet stripe. The contractor shall use flaggers or other methods to prevent traffic from crossing the wet paint or adjust the operation. Paint that has been marred or picked up by traffic before it has dried shall be repaired by the contractor at no direct pay. The pavement shall be cleaned outside the painted area at no direct pay.

The contractor is not required to maintain striping which has been accepted and opened to traffic.

737.10 PROTECTION OF TRAFFIC. The contractor shall furnish and place all necessary temporary warning and directional signs to direct and protect the traveling public during striping or painting operations.

The pavement striping equipment shall move in the direction of normal traffic flow. The trailing vehicle shall be equipped with an approved flashing arrowboard for directing traffic to the appropriate side during striping operation, when required. Temporary signs, cones and equipment shall be removed from the roadway when striping equipment is not in operation.

Protective and traffic marking devices shall comply with Section 713.

The contractor shall be responsible for resolving all issues related to paint on private vehicles at no direct pay.

737.11 FIELD TESTING OF PAINTED TRAFFIC STRIPING: The Department will field test the pavement markings in accordance with Subsection 1015.12 and Table 737-1. Failure to meet these requirements will require the contractor to provide material and install the portion of the material shown to be out of specifications as directed by the engineer at no cost to the Department.

737.12 CORRECTIVE WORK: Any line or painted area found to be defective shall be restriped or repainted as directed by the engineer. The corrective work shall also be subject to these requirements and as noted in Table 737-2, "Payment Adjustments for Initial Retroreflectivity". The contractor shall restripe or repaint any defective area at no cost to the Department.

737.13 GUARANTEE: All work performed in accordance with this section shall be guaranteed in accordance with Subsection 104.05.

737.14 MEASUREMENT. Painted Traffic Striping will be measured by the mile (km) or linear foot (lin m) as specified. Painted curbs and islands will be measured by the square yard or linear foot. The quantities of traffic paint for payment will be the design quantities specified in the plans and adjustments thereto. The design quantities will be adjusted if the engineer makes changes to adjust to field conditions, if design errors are proven, or if design changes are necessary.

(a) Mile (km): Measurement will be by the mile (km) of single stripe per roadway. No deduction will be made for the standard 30-foot (9 m) design gaps in broken-line striping; however, deductions will be made for the length of other omitted sections.

(b) Linear Foot (Lin m): Measurement will be by the linear foot (lin m), exclusive of gaps.

(c) Square Yard (sq m): Measurement will be by the square yard (sq m) based on horizontal dimensions of the painted area. Quantities will not be adjusted for the vertical faces.

737.15 PAYMENT. Payment for painted traffic striping paint will be made at the contract unit prices and as noted in Table 737-2, "Payment Adjustments for Initial Retroreflectivity".

Payment will be made under:

<u>Item No.</u>	<u>Pay Item</u>	<u>Pay Unit</u>
737-01	Painted Traffic Striping (Solid Line)	Mile (km)
737-02	Painted Traffic Striping (Broken Line)	Mile (km)
737-03	Painted Traffic Striping (Solid Line)	Linear Foot (Lin m)
737-04	Painted Curbs and Islands	Square Yard (Sq m)
737-05	Painted Curbs and Islands	Linear Foot (Lin m)

Table 737-1  
Field Testing of Painted Pavement Markings

Length of Roadway	Minimum Required Readings
Less than 1 mile (1.6 km)	10 evenly spaced readings per line type/color <sup>1</sup>
1 mile (1.6 km) to 6 miles (9.6 km)	10 evenly spaced readings per line type/color for each 1 mile (1.6 km) section <sup>1</sup>
Greater than 6 miles (9.6 km)	5 evenly spaced readings per line type/color for each 1 mile (1.6 km) section <sup>2</sup>
Legends and Symbols	Visual night time inspection only
8", 16" and 24" Lines	5 readings per line/color <sup>2</sup>
<sup>1</sup> Average of 10 readings per set <sup>2</sup> Average of 5 readings per set	
<p>Measurements</p> <ol style="list-style-type: none"> <li>Each line type/color will be measured separately.</li> <li>Measurements will be taken on dry, clean roadways.</li> <li>Data will be collected in direction of traffic flow.</li> <li>On broken lines (skip striping), no more than two readings will be taken per stripe, with readings 20 inches (0.5 m) from ends of marking.</li> <li>The Department may take additional readings.</li> <li>Acceptance will be based on the average of each set of readings for each line type/color.</li> <li>Failure of the average reading for any segment to meet the specified minimum values will require replacement, corrective action, or subject to payment adjustments specified in Table 732-2, "Payment Adjustment for Initial Retroreflectivity".</li> <li>Limits of replacement will be determined by the engineer.</li> <li>Line widths 8"; 16"; and 24" will be tested per each location or as directed by the engineer. Retroreflectivity shall match 40 mil (1.0 mm) requirements.</li> <li>Aggregate Surface Course projects will not be tested for retroreflectivity, but will be visual inspected at night for acceptance by the engineer.</li> <li>Multiple lane roadways will require testing of each lane line per mile.</li> </ol>	

Table 737-2  
Payment Adjustment for Initial Retroreflectivity

Contract Unit Price <sup>1</sup> , %	Retroreflectivity Number (Painted Markings)	
	White (mcd\lux\m <sup>2</sup> )	Yellow (mcd\lux\m <sup>2</sup> )
100	250	175
90	230	165
80	220	155
50 or Restripe	200	150

<sup>1</sup> The payment requirements are based on the project total average of all test segments for initial reading in accordance with Table 737-1.

**SECTION 804 – DRIVEN PILES:**

Subsection 804.08 – Construction Requirements (04/07), Pages 548 – 554.

Delete the first sentence of Heading (a), Preboring and substitute the following.

Preboring by augering, wet-rotary drilling, or other methods used to facilitate pile driving will not be permitted unless specified in the plans or allowed by the engineer.

Delete the first sentence of Heading (b), Jetting and substitute the following.

Jetting will not be permitted unless allowed in the plans or allowed by the engineer.

**SECTION 813 – CONCRETE APPROACH SLABS:**

Subsection 813.03 – Embankment (06/08), Pages 688 – 690.

Delete the third paragraph and substitute the following:

When specified, the approach slab shall be placed on a layer of bedding material in accordance with plan details. Bedding material shall be placed and compacted as directed and covered with approved polyethylene film of at least 6-mil (150 µm) nominal thickness.

**SECTION 901 – PORTLAND CEMENT CONCRETE:**

Subsection 901.06 – Quality Control of Concrete (08/06), Pages 726 – 731.

Add the following to the contents of Heading (b), Quality Control Tests.

The contractor shall be responsible for monitoring the components (cement, mineral and chemical admixtures, aggregates) in their mix to protect against any changes due to component variations. As component shipments arrive, the contractor shall verify slump, air content and set time by testing at ambient temperatures. The contractor shall make adjustments to the mix design to rectify any changes which would adversely affect constructability, concrete placement or the specifications. The contractor shall submit test results to the Department for review each day of paving. Testing to validate component consistency will be documented on the control logs. Conformance or variation in mix parameters (workability, set times, air content, etc.) shall

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be noted on the control logs. The contractor shall provide a copy of the proposed testing plan to the engineer for record. Acceptance of the plan does not relieve the contractor's responsibility for consistency.

Subsection 901.08 – Composition of Concrete (12/05), Pages 732 – 734.

Add the following to Heading (a).

The blended cement containing up to 50 percent of grade 100 or grade 120 ground granulated blast-furnace slag must be in compliance with Subsection 1001.04 for portland blast-furnace slag cement.

**SECTION 1001 – HYDRAULIC CEMENT:**

Subsection 1001.01 – Portland Cement (09/07), Page 749.

Delete the contents of this subsection and substitute the following.

1001.01 PORTLAND CEMENT. Portland cement shall be from an approved source listed in QPL 7 and shall comply with AASHTO M 85.

Alkali content calculated as sodium oxide equivalent shall not exceed 0.60 percent by weight for all types of cement.

**SECTION 1002 – ASPHALT MATERIALS AND ADDITIVES:**

Subsection 1002.02 – Asphalt Material Additives (04/08), Pages 750 – 760.

Delete Table 1002-1, Performance Graded Asphalt Cements and substitute the following.



**Table 1002-1**  
**Performance Graded Asphalt Cements**

Property	AASHTO Test Method	PG82-22rm <sup>6</sup>	PG76-22m	PG70-22m	PG64-22	PG58-28
		Spec.	Spec.	Spec.	Spec.	Spec.
<b>Tests on Original Binder:</b>						
Rotational Viscosity @ 135°C, Pa·s <sup>1</sup>	T 316	3.0	3.0	3.0	3.0	3.0
Dynamic Shear, 10 rad/s, G*/Sin Delta, kPa	T 315	1.00+ @ 82°C	1.00+ @ 76°C	1.00+ @ 70°C	1.30+ @ 64°C	1.00+ @ 58°C
Flash Point, °C	T 48	232+	232+	232+	232+	232+
Solubility, % <sup>2</sup>	T 44	N/A	99.0+	99.0+	99.0+	99.0+
Separation of Polymer, 163°C, 48 hours, degree C difference in R & B from top to bottom <sup>5</sup>	ASTM D 7173 AASHTO T 53	---	2-	2-	---	---
Force Ductility Ratio (f <sub>2</sub> /f <sub>1</sub> , 4°C, 5 cm/min., f <sub>2</sub> @ 30 cm elongation) <sup>3</sup>	T 300	---	0.30+	---	---	---
Force Ductility, (4°C, 5 cm/min, 30 cm elongation, kg) <sup>3</sup>	T 300	---	---	0.23+	---	---
<b>Tests on Rolling Thin Film Oven Residue:</b>	T 240					
Mass loss, %	T 240	1.00-	1.00-	1.00-	1.00-	1.00-
Dynamic Shear, 10 rad/s, G*/Sin Delta, kPa	T 315	2.20+ @ 82°C	2.20+ @76°C	2.20+ @ 70°C	2.20+ @ 64°C	2.20+ @ 58°C
Elastic Recovery, 25°C, 10 cm elongation, % <sup>4</sup>	T 301	60+	60+	40+	---	---
Ductility, 25°C, 5 cm/min, cm	T 51	---	---	---	90+	---
<b>Tests on Pressure Aging Vessel Residue:</b>	R 28					
Dynamic Shear, @ 25°C, 10 rad/s, G* Sin Delta, kPa	T 315	5000-	5000-	5000-	5000-	5000- @ 19°C
Bending Beam Creep Stiffness, S, MPa @ -12°C.	T 313	300-	300-	300-	300-	300- @ -18°C
Bending Beam Creep Slope, m value,@ -12°C	T 313	0.300+	0.300+	0.300+	0.300+	0.300+ @ -18°C

<sup>1</sup>The rotational viscosity will be measured to determine product uniformity. The rotational viscosity measured by the supplier shall be noted on the Certificate of Delivery. A binder having a rotational viscosity of 3.0 Pa·s or less will typically have adequate mixing and pumping capabilities. Binders with rotational viscosity values higher than 3.0 Pa·s should be used with caution and only after consulting with the supplier as to any special handling procedures and guarantees of mixing and pumping capabilities.

<sup>2</sup>Not all polymers are soluble in the specified solvents. If the polymer modified asphalt digested in the solvent will not pass the filter media, a sample of the base asphalt used in making the polymer modified asphalt should be tested for solubility. If the solubility of the base asphalt is at least 99.0%, the material will be considered as passing.

<sup>3</sup>AASHTO T 300 except the second peak (f<sub>2</sub>) is defined as the stress at 30 cm elongation.

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<sup>4</sup> AASHTO T 301 except elongation shall be 10 cm.

<sup>5</sup> Prepare samples per ASTM D 7173. Determine softening point of top and bottom per AASHTO T 53.

<sup>6</sup> The quality assurance plan for this product will require the contractors who use this material to submit written documentation of tank cleaning annually. Contractors must have tank mixers. Written certificates of analysis from the asphalt binder supplier confirming rubber source and size distribution of rubber used shall be furnished to the Materials Laboratory.

Add the following Table 1002-12, Anionic Trackless Tack Coat Grade NTSS-1HM.

Table 1002-12  
Anionic Trackless Tack Coat Grade NTSS-1HM

Property	AASHTO Test Method	Specification Deviation	
		100% Pay	50% Pay or Remove <sup>1</sup>
Viscosity, Saybolt Furol @ 25°C, s	T 59	15 - 100	---
Storage Stability, 24 Hour, %	T 59	1.0-	---
Settlement, 5 Days, %	T 59	5.0-	---
Residue by Distillation, %	T 59	50+	49-
Oil Distillate, %	T 59	1.0-	---
Sieve Test <sup>2</sup> , (Retained on the 850 µm), %	T 59	0.3-	---
Tests on Residue			
Penetration @ 25°C, 100g, 5s, dmm	T 49	20-	---
Softening Point, Ring and Ball, °C	T 53	65+	64-
Solubility, %	T 44	97.5+	---
DSR @ 82°C; G*/Sin δ, 10 rad / s, kPa	T 315	1.0+	---

<sup>1</sup> At the option of Engineer.

<sup>2</sup> Sieve tests may be waived if no application problems are present in the field.

**SECTION 1003 – AGGREGATES:**

**Subsection 1003.02 – Aggregates for Portland Cement Concrete and Mortar (07/07).**

Pages 763 – 766.

Delete the contents of Heading (c), Aggregates for Types B and D Pavements, and substitute the following.

(c) Aggregates for Types B and D Pavements: For the combined aggregates for the proposed portland cement concrete pavement mix, the percent retained based on the dry weight (mass) of the total aggregates shall meet the requirements of Table 1003-1A for the type of pavement specified in the plans. Additionally, the sum of the percents retained on any two adjacent sieves so designated in the table shall be at least 12 percent of the total combined aggregates. The maximum amounts by weight (mass) of deleterious materials for the total aggregate shall be the same as shown in Subsection 1003.02(b).

Table 1003-1A  
Aggregates for Types B and D Pavements

U.S. Sieve	Metric Sieve	Percent Retained of Total Combined Aggregates	
		Pavement Type	
		Type B	Type D
2 1/2 inch	63 mm	0	0
2 inch	50 mm	0	0-20
1 1/2 inch	37.5 mm	0-20	0-20
1 inch	25.0 mm	0-20	5-20
3/4 inch	19.0 mm	5-20	5-20
1/2 inch	12.5 mm	5-20	5-20
3/8 inch	9.5 mm	5-20	5-20
No. 4	4.75 mm	5-20	5-20
No. 8	2.36 mm	5-20	5-20
No. 16	1.18 mm	5-20	5-20
No. 30	600 µm	5-20	5-20
No. 50	300 µm	0-20	0-20
No. 100	150 µm	0-20	0-20
No. 200	75 µm	0-5	0-5
Note: For the sieves in the shaded areas, the sum of any two adjacent sieves shall be a minimum of 12 percent of the total combined aggregates.			

Each type of aggregate to be used in the proposed mixture shall be sampled and tested individually. The percent of total combined aggregates retained shall be determined mathematically based on the proportions of the combined aggregate blend. All gradation calculations shall be based on percent of dry weight (mass).

Subsection 1003.03 – Base Course Aggregates (07/08), Page 767 – 768.

Add the following:

(e) Blended Calcium Sulfate: When blended calcium sulfate base course material is allowed on the plans, it shall consist of calcium sulfate from a source approved by the Materials and Testing Section and be blended with an approved aggregate or lime. The source shall have a quality control program approved by the Materials and Testing Section. The source shall have been given environmental clearance by the Department of Environmental Quality for the intended use, and written evidence of such environmental clearance shall be on file at the Materials and Testing Section. DOTD monitoring for compliance with environmental regulations will be limited to the pH testing stated herein below. The blended material shall be non-plastic and reasonably free from organic and foreign matter. The pH shall be a minimum of 5.0 when tested in accordance with DOTD TR 430. Re-evaluation will be required if the source of the aggregate or lime that is blended with the calcium sulfate changes.

Blended calcium sulfate material used as base course shall comply with the following gradation requirements when tested in accordance with DOTD TR 113, modified to include a

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maximum drying temperature of 140°F (60°C). Sampling shall be taken from an approved stockpile at the point of origin.

<u>U.S. Sieve</u>	<u>Metric Sieve</u>	<u>Percent Passing</u>
1-1/2 inch	37.5 mm	60 - 100
1 inch	25.0 mm	40 - 80
3/4 inch	19.0 mm	30 - 70
No. 4	4.75 mm	20 - 65
No. 200	75 µm	0 - 25

Blended calcium sulfate shall be sampled in accordance with the requirements for stone in Section 302 of the Materials Sampling Manual.

Subsection 1003.09 – Nonplastic Embankment (03/09), Pages 775 and 776.

Delete Heading (b) and substitute the following.

(b) Stone: Stone shall be coarse stone from a source listed on QPL 2. For applications requiring lightweight embankment, the stone shall have a dry rodded unit weight (mass) of no greater than 95 pounds per cubic foot (1520 kg/cu m) when tested in accordance with AASHTO T19. Stone shall comply with the following gradation:

<u>U.S. Sieve</u>	<u>Metric Sieve</u>	<u>Percent Passing</u>
2 inch	50 mm	100
1 1/2 inch	37.5 mm	85 - 100
3/4 inch	19.0 mm	35 - 88
No. 4	4.75 mm	0 - 10

**SECTION 1005 – JOINT MATERIALS FOR PAVEMENTS AND STRUCTURES:**

Subsection 1005.04 – Combination Joint Former/Sealer (11/05), Pages 782 and 783.

Delete Heading (a) and substitute the following.

(a) Description: This joint former/sealer is intended for use in simultaneously forming and sealing a weakened plane in portland cement concrete pavements.

The material shall consist of an elastomeric strip permanently bonded either mechanically or chemically at the top of each of two rigid plastic side frames and covered with a removable plastic top cap. Side frames shall be of such configuration that when the sealer is inserted into plastic concrete and vibrated, a permanent bond forms between side frames and concrete.

Delete Heading (b)(1) and substitute the following.

(1) Elastomer: The elastomer strip portion of the material shall be manufactured from vulcanized elastomeric compound using polymerized chloroprene or thermoplastic vulcanizate as the base polymer, and shall comply with the following requirements:

<u>Property</u>	<u>ASTM Test Method</u>	<u>Requirements</u>	
		<u>Polymerized Chloroprene</u>	<u>Thermoplastic Vulcanizate</u>
Tensile Strength, kPa, Min.	D 412	12,400	7,400
Elongation at Break, % Min.	D 412	200	400
Hardness, Shore A	D 2240	65 ± 10	65 ± 10
Properties after Aging, 70 h @ 100°C	D 573		
Tensile Strength, % Loss, Max.		20	20
Elongation, % loss, Max.		25	25
Hardness, pts. increase, Max.		10	10
Ozone Resistance, 20% strain or bentloop,			
300 pphm in air, 70 h @ 40°C	D 1149	no cracks	no cracks
Oil Swell, IRM 903, 70 h			
@ 100°C, wt change, % Max.	D 471	45	75

Delete Headings (b)(2) and (b)(3) and substitute the following:

(2) Bond of Elastomer to Plastic: The force required to shear the elastomer from the plastic shall be a minimum of 5.0 pounds per linear inch (90 g/mm) of sealer when tested in accordance with DOTD TR 636.

(3) Bond of Plastic to Cement Mortar: This bond will be evaluated and shall meet the following requirements:

The force required to separate the cement mortar from the plastic shall be a minimum of 5.0 pounds per linear inch (90 g/mm) of sealer when tested in accordance with DOTD TR 636.

## **SECTION 1006 – CONCRETE AND PLASTIC PIPE:**

### Subsection 1006.09 – Plastic Yard Drain Pipe (06/07), Page 789.

Delete the contents of Subheading (a)(3), Ribbed Polyvinyl Chloride Pipe (RPVCP) and substitute the following.

Ribbed Polyvinyl Chloride Pipe (RPVCP): Ribbed Polyvinyl Chloride Pipe shall comply with ASTM F 794, Series 46 or ASTM F 949 (46 psi).

## **SECTION 1013 – METALS:**

### Subsection 1013.09 – Steel Piles (08/06) Page 822.

Delete the title and references to “Steel Piles” in this subsection and substitute “Steel H Piles”.

**SECTION 1015 – SIGNS AND PAVEMENT MARKINGS:**

All subsections within Section 1015 (10/11), Pages 831 – 849.

Delete Section 1015, Signs and Pavement Markings and substitute the following:

Section 1015  
Signs and Pavement Markings

1015.01 GENERAL REQUIREMENTS. The materials shall comply with these specifications, the plans and the MUTCD. When directed, the contractor shall furnish and prepare samples for testing in accordance with Department instructions.

1015.02 METALS.

(a) Ferrous Metals:

(1) Structural Steel: Structural steel for posts, stringers, framing and miscellaneous steel shall comply with AASHTO M 270, Grade 36 (M 270M, Grade 250). Steel shall be galvanized in accordance with Subsection 811.12.

(2) Steel Pipe: Steel pipe or tubing for structures shall be Schedule 40 (STD) complying with ASTM A 53, Type E or Type S Grade B, or hot formed tubing complying with ASTM A 36 (ASTM A 36M) and ASTM A 501.

(3) Steel Posts for Small Signs, Markers and Delineators: Posts shall be steel of the flanged channel type shown on the plans, galvanized after fabrication in accordance with Subsection 811.12. Before fabrication, posts shall be within 3.5 percent of the specified weight (mass).

Posts shall be fabricated from steel complying with either ASTM A 499, Grade 60 with chemical properties conforming to ASTM A 1 for 91 -lb/yd (45 kg/m) or heavier rail steel, or ASTM A 576, Grade 1080 with 0.10 percent -0.20 percent silicon. Holes 3/8 inch (10 mm) in diameter shall be drilled or punched through the middle of each post on one inch (25-mm) centers for at least 36 inches (900 mm) from the top of each post.

(b) Aluminum Alloy: Structural members shall be aluminum complying with ASTM B 221 (ASTM B 221M) or ASTM B 429, Alloy 6061-T6. Miscellaneous aluminum shall comply with ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

(c) Fittings:

(1) Structural Bolts, Nuts and Washers: High strength bolts shall be ASTM A 325 (ASTM A 325M), and other bolts shall be ASTM A 307, Grade A or Grade B. Bolts shall have hexagonal heads and be supplied with two flat and one lock washer and hexagonal-head nut. Bevel washers, where required, shall be wrought steel. Bolts, nuts and washers shall be galvanized in accordance with ASTM A 153 or by an approved mechanical galvanizing process complying with ASTM B 695 that provides the same coating thickness.

Anchor bolts shall be AASHTO M 270, Grade 36 (M 270M, Grade 250) steel except the maximum tensile strength shall be 88,000 psi (605 MPa) and galvanized in accordance with Subsection 811.12 unless otherwise specified.

Stainless steel bolts shall comply with ASTM A 320 (ASTM A 320M), Grade B 8, annealed or approved equal.

(2) Fasteners: Fasteners used in fabricating sign faces, including splice plates for joining two panels, sills and border angles, and attaching route marker shields shall be 1/4 inch (6 mm) aluminum blind rivets that provide positive mandrel retention. These rivets shall have a minimum tensile strength of 875 pounds (397 kg) and a minimum sheer strength of 850 pounds (386 kg).

Fasteners, used in attaching Interstate, Louisiana, and U.S. shields to the sign panel, shall be manufactured from aluminum alloy with brasier heads, complying with ASTM B 316 (ASTM B 316M), Alloy 2024-T4.

Fasteners used in attaching demountable legend to sign faces (except for shields) shall be 1/8 inch (3 mm) diameter blind rivets manufactured from aluminum alloy complying with ASTM B 316 (ASTM B 316M), Alloy 1100-H14.

Fasteners for delineator, object marker and milepost assemblies shall be vandal resistant and will be subject to approval prior to use.

**1015.03 FLEXIBLE POSTS.** Flexible posts for small signs, markers and delineators shall be approved products listed in QPL 39.

**1015.04 SIGN PANELS.**

(a) Permanent Sign Panels: Flat panels shall be aluminum sheets or plates complying with ASTM B 209, Alloy 6061-T6 or Alloy 5052-H38. Extruded aluminum panels shall comply with ASTM B 221 (ASTM B 221M), Alloy 6063-T6 and after fabrication, have a flatness equal to or less than 0.031 inch per foot of length and 0.004 inch per inch of width.

(b) Temporary Sign Panels: Substrate for barricade panels shall be either wood or rigid thermoplastic. Substrate for portable signs shall be aluminum, wood or plastic. Substrate for post mounted signs shall be aluminum, wood, rigid thermoplastic or aluminum clad low density polyethylene plastic.

(1) Aluminum: Aluminum sheeting shall be 0.080 inch (2 mm) thickness complying with ASTM B 209 (ASTM B 209M), Alloy 6061-T6 or Alloy 5052-H38.

(2) Wood: Plywood sheeting of exterior type Grades either High Density Overlay or Medium Density Overlay, are acceptable for use provided the following requirements are met.

Panels shall be a minimum of 5/8 inch (15 mm) thick and shall comply with the latest American Plywood Association specifications and be identified with the APA edge mark or back stamp to verify inspection and testing. Prior to application of reflective sheeting, the surface shall be abraded with steel wool or fine sandpaper, and wiped thoroughly clean. The surface shall be allowed to dry a minimum of 8 hours prior to application of sheeting. Cut edges of plywood panels shall be sealed with an approved aluminum pigmented polyurethane sealer.

(3) Plastic: Plastic substrate for barricade panels and signs shall be as follows.

a. Fiber Reinforced Vinyl (PVC): The substrate shall have a nominal composite thickness of 0.04 inches (1 mm) and be bonded to an approved retroreflective material by the manufacturer.

b. Rigid Thermoplastic: Rigid thermoplastic substrate shall consist of either High Density Polyethylene (HDPE) or High Density Polycarbonate (HDPC). The rigid thermoplastic for barricade panels shall be hollow core HDPE or HDPC with a minimum

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thickness of 0.625 inch (16 mm). The thermoplastic for sign panels shall be either 0.40 inch (10 mm) thick thin wall, fluted substrate or 0.625 inch (16 mm) thick blow molded substrate. Substrates shall be sufficiently rigid to maintain a flat face and shall be capable of attachment to the sign mounting in such a manner as not to crush or otherwise deform the substrate. Reflectorized sheeting applied to rigid thermoplastic shall have its manufacturer's approval for use on the substrate.

c. Aluminum Clad Low Density Polyethylene (AL/LDPE) Plastic: The aluminum clad low density polyethylene plastic substrate shall be 0.080 inch (2 mm) thick. The substrates shall be sufficiently rigid to maintain a flat face and shall be capable of attachment to the sign mounting in such a manner as not to crush or otherwise deform the substrate. Reflectorized sheeting applied to aluminum clad low density polyethylene shall have its manufacturer's approval for use on this substrate.

**1015.05 REFLECTIVE SHEETING.**

(a) Permanent and Temporary Standard Sheeting: Reflective sheeting shall be one of the following standard types as specified on the plans and complying with ASTM D 4956 except as modified herein. Permanent warning, regulatory, guide and supplemental guide sign sheeting shall meet the requirements of DOTD Type X as detailed below. Reflective sheeting for temporary signs and devices shall meet the requirements of ASTM D 4956 Type III except as noted in Subsection 1015.05(f). Reflective sheeting shall be an approved product listed in QPL 13.

Type III - A high-intensity retroreflective sheeting that is typically encapsulated glass-bead retroreflective material.

Type VI - An elastomeric, high-intensity retroreflective sheeting without adhesive. This sheeting is typically a vinyl microprismatic retroreflective material.

Type X - A super high-intensity retroreflective sheeting having highest retroreflectivity characteristics at medium distances. This sheeting is typically an unmetalized microprismatic retroreflective element material.

(b) Fluorescent Pink Retroreflective Sheeting: Signs for temporary control of traffic through incident management areas shall be Type VI fluorescent pink retroreflective sheeting and shall comply with the MUTCD. Temporary traffic control signs for incident management shall be placed to notify motorists of upcoming incidents on the roadway, and shall be removed from public view once the incident has been managed. Physical properties shall comply with ASTM D 4956. Photometric properties shall be as follows.

(1) Retroreflectivity: Minimum Coefficients of Retroreflection shall be as specified in Table 1015-1.



Table 1015-1  
Coefficients of Retroreflection for Fluorescent Pink Sheeting<sup>1</sup>

Observation Angle, degrees	Entrance Angle, degrees	Fluorescent Pink
0.2	-4	100
0.2	+30	40
0.5	-4	40
0.5	+30	15

<sup>1</sup>Minimum Coefficient of Retroreflection ( $R_A$ ) ( $\text{cd lx}^{-1}\text{m}^{-2}$ )

(2) Color and Daytime Luminance: Color Chromaticity Coordinates and Daytime Luminance Factors shall be as specified in Table 1015-2.

Table 1015-2  
Fluorescent Pink Color Specifications Limits (Daytime)

Chromaticity Coordinates (corner points) <sup>1</sup>								Luminance Factor, min.
1		2		3		4		Y%
x	y	x	y	x	Y	x	y	25
0.450	0.270	0.590	0.350	0.644	0.290	0.536	0.230	

<sup>1</sup>The four pairs of chromaticity coordinates measured with CIE 2° Standard Observer and 45/0 (0/45) geometry and CIE D65 Standard Illuminant.

(c) DOTD Type X Retroreflective Sheeting: Physical properties shall comply with ASTM D 4956. Color shall conform to ASTM D 4956, Table 11. Luminance shall conform to ASTM D 4956, Table 2. Retroreflectivity properties shall be as follows:

(1) Retroreflectivity: Minimum Coefficients of Retroreflection shall be as specified in Table 1015-1A.

Table 1015-1A  
Coefficients of Retroreflection for DOTD Type X Sheeting<sup>1</sup>

Observation Angle, (degrees)	0.2	0.2	0.5	0.5
Entrance Angle, (degrees)	-4	+30	-4	+30
White	560	280	200	100
Yellow	420	210	150	75
Orange	210	105	75	37
Green	56	28	20	10
Red	84	42	30	15
Blue	28	14	10	5.0
Brown	17	8.4	6.0	3.0
Fluorescent Yellow-Green	450	220	160	80
Fluorescent Yellow	340	170	120	60
Fluorescent Orange	170	84	60	30

<sup>1</sup>Minimum Coefficient of Retroreflection ( $R_A$ ) ( $\text{cd lx}^{-1}\text{m}^{-2}$ )

(d) Adhesive Classes: The adhesive required for retroreflective sheeting shall be Class 1 (pressure sensitive) as specified in ASTM D 4956.

(e) Accelerated Weathering: Reflective sheeting, when processed, applied and cleaned in accordance with the manufacturer's recommendations shall perform in accordance with the accelerated weathering standards in Table 1015-3.

Table 1015-3  
Accelerated Weathering Standards<sup>1</sup>

Type	Retroreflectivity <sup>2</sup>				Colorfastness <sup>3</sup>	
	Orange/ Fluorescent Orange		All colors, except Orange/ Fluorescent Orange		Orange/ Fluorescent Orange	All colors, except Orange/ Fluorescent Orange
III	1 year	80 <sup>4</sup>	3 years	80 <sup>4</sup>	1 year	3 years
III (for drums)	1 year	80 <sup>4</sup>	1 year	80 <sup>4</sup>	1 year	1 year
VI	1/2 year	50 <sup>5</sup>	1/2 year	50 <sup>5</sup>	1/2 year	1/2 year
DOTD X	1 year	80 <sup>6</sup>	3 years	80 <sup>6</sup>	1 year	3 years

<sup>1</sup> At an angle of 45° from the horizontal and facing south in accordance with ASTM G 7 at an approved test facility in Louisiana or South Florida.

<sup>2</sup> Percent retained retroreflectivity of referenced table after the outdoor test exposure time specified.

<sup>3</sup> Colors shall conform to the color specification limits of ASTM D 4956 after the outdoor test exposure time specified.

<sup>4</sup> ASTM D 4956, Table 4.

<sup>5</sup> ASTM D 4956, Table 7.

<sup>6</sup> Table 1015-1A.

(f) Expected Sign Life Data and Performance: The sheeting manufacturer shall supply expected retroreflectivity service life curves for each of the following sign sheeting colors: white, green, blue, brown, red, and yellow. The service life curves shall be plots of the 95 percent expected life plotted on an 'x-y' graph with life years on the 'x-axis' and retroreflectivity on the 'y-axis'. The expected life shall account for worst-case installations, equivalent to an installation in South Louisiana with the sign facing to the South. The sheeting manufacturer shall also supply a table of expected life values taken from the service life curves for Revision Number 2 to the 2003 Edition of the MUTCD minimum reflectivity requirements published in the Federal Register on December 21, 2007.

Reflective sheeting for signs, when processed, applied and cleaned in accordance with the manufacturer's recommendations shall perform outdoors in accordance with the performance standards in Table 1015-4.

Table 1015-4  
Reflective Sheeting Performance Standards

Type	Retroreflectivity <sup>1</sup> -- Durability <sup>2</sup>				Colorfastness <sup>3</sup>
	Orange/ Fluorescent Orange		All colors, except orange/Fluorescent Orange		
III	3 years	80 <sup>4</sup>	10 years	80 <sup>4</sup>	3 years
DOTD X	3 years	80 <sup>5</sup>	7 years	80 <sup>5</sup>	3 years

<sup>1</sup>Percent retained retroreflectivity of referenced table after installation and the field exposure time specified.

<sup>2</sup>All sheeting shall maintain its structural integrity, adhesion and functionality after installation and the field exposure time specified.

<sup>3</sup>All colors shall conform to the color specification limits of ASTM D 4956 after installation and the field exposure time specified.

<sup>4</sup>ASTM D 4956, Table 4.

<sup>5</sup>Table 1015-1A.

(g) Temporary Signs, Barricades, Channelizing Devices, Drums and Cones: Reflective sheeting for temporary signs, barricades and channelizing devices, shall meet the requirements of ASTM D 4956, Type III except that temporary warning construction signs used on the mainline of freeways and expressways shall be fluorescent orange and meet the requirements of DOTD Type X.

Reflective sheeting for vertical panels shall meet the requirements of ASTM D 4956, Type III.

Reflective sheeting for drums shall be a minimum of 6 inches (150 mm) wide and shall meet the requirements of ASTM D 4956, Type III, and the Supplementary Requirement S2 for Reboundable Sheeting as specified in ASTM D 4956. Reflective sheeting for traffic cone collars shall meet the requirements of ASTM D 4956, Type III or Type VI.

(h) Sheeting Guaranty. The contractor shall provide the Department with a guaranty from the sheeting manufacturer stating that if the retroreflective sheeting fails to comply with the performance requirements of this subsection, the sheeting manufacturer shall do the following:

Table 1015-5  
Manufacturer's Guaranty-Reflective Sheeting

Type	Manufacturer shall restore the sign face in its field location to its original effectiveness at no cost to the Department if failure occurs during the time period <sup>1</sup> as specified below		Manufacturer shall replace the sheeting required to restore the sign face to its original effectiveness at no cost to the Department if failure occurs during the time period <sup>1</sup> as specified below
	Orange/Fluorescent Orange	All colors, except orange/Fluorescent Orange	All colors, except orange/Fluorescent Orange
III	<3 years	<7 years	7-10 years
DOTD X	<3 years	<5 years	5-7 years

<sup>1</sup> From the date of sign installation.

Replacement sheeting for sign faces, material, and labor shall carry the unexpired guaranty of the sheeting for which it replaces.

The sign fabricator shall be responsible for dating all signs with the month and year of fabrication at the time of sign fabrication. This date shall constitute the start of the guaranty obligation period.

#### 1015.06 NONREFLECTIVE SHEETING.

(a) General Requirements: Nonreflective sheeting film shall consist of an extensible, pigmented, weather-resistant plastic film. Face side of film shall be supported and protected by a paper liner which is readily removable after application without the necessity of soaking in water or other solvents. Colors shall be matched visually and be within the limits shown in Table 17 of ASTM D 4956.

(b) Adhesive Requirements: Sheeting shall have a pre-coated pressure sensitive adhesive backing or a tack-free heat-activated adhesive backing, either of which may be applied without additional coats on either sheeting or application surface. Adhesive shall comply with ASTM D 4956, Class 1 (pressure sensitive).

(c) Physical Characteristics: The film shall be readily cut by normal fabricating methods without cracking, checking or flaking. Applied film shall be free from ragged edges, cracks and blisters. The material shall have demonstrated its ability to withstand normal weathering without checking, cracking or excessive color loss.

#### 1015.07 SIGN ENAMELS, PAINTS, SILK SCREEN PASTE AND OVERLAY FILM.

(a) Sign Enamels and Paints: These shall be applied in accordance with the sheeting manufacturer's recommendations. Final appearance as well as materials used shall be subject to approval.

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(b) Silk Screen Paste: Constituents used in manufacture of silk screen paste shall meet approval of the engineer. Silk screen paste shall be mixed at the factory, well ground to a uniform consistency and smooth texture, and shall be free from water and other foreign matter. It shall dry within 18 hours to a film that does not run, streak, or sag. Paste which has livered, hardened or thickened in the container, or in which pigment has settled out so that it cannot be readily broken up with a paddle to a uniform usable consistency, will be rejected. Paste and thinner shall be used in accordance with the sheeting manufacturer's recommendations.

Paste shall have proper pigmentation and consistency for use in silk screen equipment. The material shall produce the desired color and the same retroreflectivity values as required for reflective sheeting of the same type and color when applied on reflective sheeting background. Paste shall meet the quality and test requirements for appearance, coarse particles, and moisture and water resistance as specified for sign paints.

(c) Overlay Film: Transparent electronic cuttable overlay film shall produce the desired color and the same reflectivity values as required for reflective sheeting of the same type and color when applied on reflective sheeting background.

**1015.08 TEMPORARY PAVEMENT MARKINGS.**

(a) Temporary Tape: Temporary tape shall comply with ASTM D 4592, Type I (removable) or Type II (non-removable) and shall be an approved product listed in QPL-60.

(b) Painted Stripe: Paint shall be an approved traffic paint complying with Subsection 1015.12. Glass beads for drop-on application shall comply with Subsection 1015.13.

(c) Temporary Raised Pavement Markings for Asphaltic Surface Treatment: Temporary raised pavement markers for asphaltic surface treatment shall be flexible reflective tabs having a nominal width of 4 inches (10 cm). The markers shall be yellow with amber reflective area on both sides. The body of the marker shall consist of a base and vertical wall made of polyurethane or other approved material and shall be capable of maintaining a reasonable vertical position after installation. The initial minimum Coefficient of Luminous Intensity at an entrance angle of -4 degrees and an observation angle of 0.2 degrees shall be 230 mcd/lx when measured in accordance with ASTM E 810.

The reflective material shall be protected with an easily removable cover of heat resistant material capable of withstanding and protecting the reflective material from the application of asphalt at temperatures exceeding 325°F (160°C).

**1015.09 RAISED PAVEMENT MARKERS.** Markers shall be either nonreflectorized or reflectorized, as specified. Markers shall be approved products listed in QPL 9. Infrared curves of materials used in markers shall match approved curves on file at the Department's Materials and Testing Section.

(a) Nonreflectorized Markers:

(1) Description: Nonreflectorized markers shall consist of an acrylonitrile butadiene styrene polymer or other approved material, and shall be 4-by-6-inches (100-by-150-mm).

(2) Physical Requirements: Markers shall comply with the compressive strength requirements of ASTM D 4280. The color shall be in accordance with the plans and the MUTCD.

(b) Reflectorized Markers: Reflectorized markers shall comply with ASTM D 4280, Designation H and Designation F. The type and color shall be in accordance with the plans and the MUTCD. The markers shall be either standard having approximate base dimensions of 4-by-4-inches (100-by-100-mm) and a maximum height of 0.80 inches (20 mm) or low profile having approximate base dimensions of 4-by-2-inches (100-by-50-mm) and a maximum height of 0.60 inches (15 mm).

(c) Adhesive:

(1) Epoxy Adhesive: Epoxy adhesive shall be Type V epoxy resin system complying with Subsection 1017.02.

(2) Bituminous Adhesive: The adhesive shall conform to ASTM D 4280 for asphaltic surfaces and D 4280 Type II or Type III for concrete surfaces and shall be an approved product listed in QPL 59.

#### 1015.10 THERMOPLASTIC PAVEMENT MARKINGS.

(a) Description: This specification covers hot-sprayed, hot-extruded, and preformed thermoplastic reflective compound for pavement markings on asphaltic or portland cement concrete pavement. Thermoplastic marking material applied to asphaltic surfaces shall consist of an alkyd based formulation. Thermoplastic marking material applied to portland cement concrete surfaces shall consist of either an alkyd based or hydrocarbon based formulation. Material shall be so manufactured as to be applied by spray (40 mil (1.0 mm)) or extrusion (90 mil (2.3 mm)) to pavement in molten form, with internal and surface application of glass spheres, and upon cooling to normal pavement temperature, shall produce an adherent, reflectorized pavement marking of specified thickness and width, capable of resisting deformation. Black thermoplastic marking material shall be used according the standard plans on all Portland cement concrete pavement. This material shall not require glass beads. Material shall not scorch, break down, or deteriorate when held at the plastic temperature specified in Subsection 732.03(f) (1) for 4 hours or when reheated four times to the plastic temperature. Temperature-vs.-viscosity characteristics of plastic material shall remain constant when reheated four times, and shall be the same from batch to batch. There shall be no obvious change in color of material as the result of reheating four times or from batch to batch.

For yellow thermoplastic material, the type and amount of yellow pigment shall be at the option of the manufacturer, providing all other requirements of this specification are met. However, the pigment for yellow thermoplastic shall be lead free and shall meet the regulatory level of non-hazardous waste as defined by 40 CFR 261.24 when tested in accordance with EPA Method 1311, toxicity Characteristics Leaching Procedures. The manufacturer shall provide certification that the material provided meets these requirements.

(b) Suitability for Application: Thermoplastic material shall be a product especially compounded for pavement markings. Markings shall maintain their original dimension and placement and shall not smear or spread under normal traffic at temperatures below 140°F (60°C). Markings shall have a uniform cross section. Pigment shall be evenly dispersed

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throughout the material thickness. The exposed surface shall be free from tack and shall not be slippery when wet. Material shall not lift from pavement in freezing weather. Cold ductility of material shall be such as to permit normal movement with the pavement surfaced without chipping or cracking.

(c) Standard (Flat) 90 mil (2.3 mm) or Greater Thermoplastic Pavement Markings: White and yellow thermoplastic shall be approved products listed in QPL 63 and shall comply with AASHTO M 249 as modified herein. All other colors are not required to be on the QPL.

(1) Color:

a. Laboratory Performance: The yellow thermoplastic shall comply with the requirements of Table 1015-6 when tested in accordance with ASTM E 1349.

Table 1015-6  
Color Specification Limits (Daytime)

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
Yellow	0.4756	0.4517	0.4985	0.4779	0.5222	0.4542	0.4919	0.4354

(The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System measured with Standard 2° Observer and Standard Illuminant D65.)

b. Field Performance: The initial daytime color and luminance factor (Cap Y) readings may be taken by the Department, as required by the engineer, within 7 to 30 days after installation to verify compliance with ASTM D 6628.

(2) Whiteness Index: The white thermoplastic shall have a minimum whiteness index of 40 when tested according to ASTM E 313.

(3) Filler: For black thermoplastic, the filler to be incorporated with the resins shall be a white calcium carbonate, silica, or any approved equivalent.

(4) Retroreflectivity: Within 30 days of application, the initial retroreflectivity readings shall be taken by the contractor with a DOTD inspector present during testing. Upon completion of the testing the DOTD inspector shall immediately take possession of a copy of the retroreflectivity readings in either hard copy (8-1/2 inch by 11 inch) or electronic format as noted below. Additionally, documentation shall be provided to the Department that the instrument has been calibrated per manufacturer's requirements.

For each material type, a different set of readings shall be taken in accordance with Table 732-1, "Field Testing of Plastic Pavement Markings" in Section 732. If the data was provided in hard copy as noted above, the data shall be given to the Department in electronic Microsoft Excel® (xls) format downloaded from the reflectometer data within 30 days. Each spreadsheet shall have a header that states all of the following:

1. Project number;
2. Date material installed;
3. Type of material installed; and
4. The beginning mile-point to ending mile-point of material installed.



The format for the excel spreadsheet shall be (description, date, and reading). In the description cell the format shall be Route (i.e. LA, US, or I), Direction (i.e. N, S, E, or W), Mile Point and Color (W or Y).

*Examples:*

LA 115W; 23; Y.

I-10; S; 4; W.

For 90 mil thermoplastic, the initial retroreflectance for the in-place marking shall have a minimum retroreflectance value of 375 mcd/lux/sq m for white and 250 mcd/lux/sq m for yellow. Readings taken by the Department before the expiration of the Guarantee Period of Subsection 104.05 shall be at least 325 mcd/lux/sq m or greater for white and 200 mcd/lux/sq m or greater for yellow when measured with a geometry of 1.05 degrees observation angle and 88.76 degrees entrance angle.

Black thermoplastic pavement markings shall not require any reflectivity testing.

For pavement legends and symbols and non-lane delineation striping, the initial retroreflectance for the in-place markings shall be in accordance with Section 732, Table 732-2.

(d) Standard (Flat) 40 mil (1.0 mm) Thermoplastic Pavement Markings: Materials shall comply with AASHTO M 429 as modified herein:

(1) Composition: The material shall meet the following composition requirements:

	White	Yellow
Binder	25 percent minimum	25 percent minimum
Glass Spheres	30 percent minimum	30 percent minimum

% by weight (mass)

The intermix glass spheres contained in the thermoplastic material shall conform to AASHTO M 247 Type I.

(2) Color:

a. Laboratory Performance: The yellow thermoplastic shall comply with the requirements of Table 1015-6, "Color Specification Limits (Daytime)" when tested in accordance with ASTM E 1349.

b. Field Performance: The initial daytime color and luminance factor (Cap Y) reading may be taken by the Department, as required by the engineer, within 7 to 30 days after installation to verify compliance with ASTM D 6628.

(3) Softening Point: After heating the marking compound for 4 hours  $\pm$  5 min. at 375°F  $\pm$  3°F (190°C  $\pm$  2°C) and testing in accordance with ASTM E 28, the material shall have a minimum softening point of 190°F (88°C) as measured by the ring and ball method.

(4) Indentation Resistance: The material, when tested in accordance with ASTM D 2240, Shore Durometer, A2, shall not exceed 40 when tested at 115°F  $\pm$  3°F (46.1°C  $\pm$  2°C).

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(5) Retroreflectivity: Within 30 days of application, the initial retroreflectivity readings shall be taken by the contractor with a DOTD inspector present during testing. Upon the completion of the testing the DOTD inspector will immediately take possession of a copy of the retroreflectivity readings in either hard copy (8-1/2 inch by 11 inch) or electronic format as noted below. Additionally, documentation shall be provided to the Department that the instrument has been calibrated per manufacturer's requirements.

For each material type, a different set of readings shall be taken in accordance with Table 732-1, "Field Testing of Plastic Pavement Markings" in Section 732. If the data was provided in hard copy as noted above, the data shall be given to the Department in electronic Microsoft Excel® (xls) format downloaded from the reflectometer data within 30 days. Each spreadsheet shall have a header that states all of the following:

1. Project number;
2. Date material installed;
3. Type of material installed; and,
4. The beginning mile-point to ending mile-point of material installed.

The format for the excel spreadsheet shall be (description, date, and reading). In the description cell the format shall be Route (i.e. LA, US, or I), Direction (i.e. N, S, E, or W), Mile Point and Color (W or Y).

*Examples:*

LA 115W; 23; Y  
I-10; S; 4; W.

For 40 mil thermoplastic, initial retroreflectance for the in-place marking shall have a minimum retroreflectance of 250 mcd/lux/sq m for white and 175 mcd/lux/sq m for yellow when measured at a geometry of 1.05 degrees observation angle and 88.76 degrees entrance angle (30 m geometry), as detailed in ASTM E 1710. Readings taken by the Department before the expiration of the Guarantee Period of Subsection 104.05 shall be at least 200 mcd/lux/sq m or greater for white and 125 mcd/lux/sq m or greater for yellow when measured with a geometry of 1.05 degrees observation angle and 88.76 degrees entrance angle.

(e) 125 mil (3.2 mm) Thermoplastic Pavement Markings: Materials shall comply with AASHTO M 429 as modified herein:

Thickness of material not including drop on beads shall not be less than 125 mils (3.2mm) for gore markings, crosswalks, stop lines, word and symbol markings. This material can be applied either by standard thermoplastic or preformed thermoplastic material.

Extruded or Ribbon Thermoplastic Materials shall comply with the same requirements in 1015.10(c).

Preformed Thermoplastic Material shall be approved products listed on QPL 76.

**1015.11 PREFORMED PLASTIC PAVEMENT MARKING TAPE.**

(a) General: Preformed plastic pavement marking tape shall be approved products listed on QPL 64 and shall comply with ASTM D4505 Retroreflectivity Level I or Level II, or DOTD Intersection Grade (as specified below), except as modified herein. The marking tape shall be Class 2 or 3. The type and color shall be in accordance with the plans and the MUTCD.

(b) Thickness: All preformed plastic pavement marking tape shall have a minimum overall thickness of 0.060 inches (1.5 mm) when tested without the adhesive.

(c) Friction Resistance: The surface of the Retroreflectivity Level II preformed plastic pavement marking tape shall provide a minimum frictional resistance value of 35 British Polish Number (BPN) when tested according to ASTM E303. The surface of the Retroreflectivity Level I and DOTD Intersection Grade preformed plastic pavement marking tape shall provide a minimum frictional resistance value of 45 BPN when tested according to ASTM E 303. Values for the Retroreflectivity Level I material with a raised surface pattern as defined in ASTM D 4505 are calculated by averaging values taken at downweb and at a 45 degrees angle from downweb.

(d) Retroreflective Requirements: The preformed plastic pavement marking tape shall have the minimum initial specific luminance values shown in Table 1015-7 when measured in accordance with ASTM D 4061.

Table 1015-7  
Specific Luminance of Preformed Plastic Tape

Type	Observation Angle, degrees	Entrance Angle, degrees	Specific Luminance (mcd/sq m/lx)	
			White	Yellow
Retroreflectivity Level I	1.05	88.76	500	300
DOTD Intersection Grade	1.05	88.76	375	250
Retroreflectivity Level II	1.05	88.76	250	175

(e) Durability Requirements: The DOTD Intersection Grade preformed plastic pavement marking tape shall show no appreciable fading, lifting or shrinkage for at least 12 months after placement when placed in accordance with the manufacturer's recommended procedures on pavement surfaces having a daily traffic count not to exceed 15,000 ADT per lane.

The Retroreflectivity Level I preformed plastic pavement marking tape shall show no appreciable fading, lifting or shrinkage for at least 4 years after placement for longitudinal lines and at least 2 years after placement for symbols and legends.

The Retroreflectivity Level I preformed plastic pavement marking tape shall also retain the following reflectance values for the time period detailed in Table 1015-8.

Table 1015-8  
Retained Specific Luminance for Retroreflectivity Level I  
Preformed Plastic Pavement Marking Tape

Time	Observation Angle, degrees	Entrance Angle, degrees	Specific Luminance (mcd/sq m/lx)	
			White	Yellow
1 year	1.05	88.76	400	240
4 years (2 years for symbols and legend)	1.05	88.76	100	100

(f) Plastic Pavement Marking Tape Guaranty (DOTD Intersection Grade and Retroreflectivity Level I): If the plastic pavement marking tape fails to comply with the performance and durability requirements of this subsection within 12 months for DOTD Intersection Grade and 4 years for Retroreflectivity Level I, the manufacturer shall replace the plastic pavement marking material at no cost to the Department.

1015.12 TRAFFIC PAINT. The contractor shall use water-borne traffic paint. The same type paint shall be used throughout the project. Each paint container shall bear a label with the name and address of manufacturer, trade name or trademark, type of paint, number of gallons, batch number and date of manufacture.

Paints shall be approved products listed in QPL 36, shall show no excessive settling, caking or increase in viscosity during 6 months of storage, and shall be readily stirred to a suitable consistency for standard spray gun application.

An infrared curve shall be generated in accordance with DOTD TR 610 and compared with the standard curve made during the initial qualification process.

For yellow paint material, the type and the amount of yellow pigment shall be at the option of the manufacturer, providing all of the requirements of this specification are met. However, the pigment for yellow paint shall be lead free and shall meet the regulatory level of non-hazardous waste as defined by 40 CFR 261.24 when tested in accordance with EPA Method 1311, Toxicity Characteristics Leaching Procedures. The manufacturer shall provide certification that the material provided meets these requirements.

(a) Vacant

(b) Water Borne Traffic Paint: This material shall be a rapid setting waterborne compound suitable for use with hot application equipment. The paint shall contain Rohm & Hass Rhoplex Fastrack HD-21, an emulsion with 48.5 percent solids content, Dow DT 400NA acrylic emulsion with 49.5 – 51.5 percent solids content, or approved equal. The material shall meet the requirements of Table 1015-10.

Table 1015-10  
Water Borne Traffic Paint Physical Properties

<u>Property</u>	<u>Test Method</u>	<u>Requirements</u>	
		<u>Min.</u>	<u>Max.</u>
pH	ASTM E 70	9.9	---
Viscosity, at 25°C Krebs Unit	ASTM D 562	78	95
Drying Time, minutes <sup>1</sup>	ASTM D 711	---	10
Total Solids, % by mass	ASTM D 2369	73	79
Percent Pigment <sup>2</sup>	ASTM D 3723	55	62
Nonvolatiles in Vehicle, % by weight	ASTM D 215	43	---
Weight per Gallon, lb/gal	ASTM D 1475	---	---
White		13.7	---
Yellow		13.1	---
Daylight Reflectance, %	ASTM E 1349		
White		80	---
Yellow		50	---
Fineness of Grind	ASTM D 1210	3	---
Color	<sup>3</sup>	Pass	
Shelf Life, months		12	---
Pigment Composition	<sup>4</sup>	Pass	
Infrared Spectroscopy (IR)	DOTD TR 610	Pass	

<sup>1</sup>Drying time to no track - Paint applied at 15 mils (375 µm) wet on the road surface with paint heated to 120-150°F (50-65°C) shall not show tracking when a standard size automobile crosses in a passing maneuver at 3 minutes.

<sup>2</sup>No theoretical empirical factor shall be applied in determining the percent of the paint. Percent pigment shall not be calculated by adding back the burned-off organic constituents of the pigment.

<sup>3</sup>Color (without glass beads) - Yellow paint shall comply with the requirements of Table 1015-11 when tested in accordance with ASTM E 1349. White shall be a clean, bright, untinted binder.

<sup>4</sup>The white paint shall contain a minimum of 1.0 pound per gallon (120 g/L) of rutile titanium dioxide (TiO<sub>2</sub>) as determined using DOTD TR 523. The rutile titanium dioxide shall comply with ASTM D 476.

Table 1015-11  
Water Borne Traffic Paint Color Specification Limits (Daytime)

Color	1		2		3		4	
	x	y	x	y	x	y	x	y
Yellow	0.493	0.473	0.518	0.464	0.486	0.428	0.469	0.452

(The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 Standard Colorimetric System measured with Standard 2° Observer and Standard Illuminant D65.)

(c) Initial Retroreflectivity: Within 30 days of application, the initial retroreflectivity readings shall be taken by the contractor with a DOTD inspector present during testing. Upon completion of the testing, the DOTD inspector shall immediately take possession of a copy of the retroreflectivity readings in either hard copy (8-1/2 inch by 11 inch) or electronic format as noted below. Additionally, documentation shall be provided to the Department that the instrument has been calibrated per manufacturer's requirements.

For each material type a different set of readings shall be taken in accordance with Table 737-1, "Field Testing of Painted Pavement Markings" in Section 737. If the data was provided in hard copy as noted above, the data shall be given to the Department in electronic Microsoft Excel® (xls) format downloaded from the reflectometer data within 30 days. Each spreadsheet shall have a header that states all of the following:

1. Project number;
2. Date material installed;
3. Type of material installed; and,
4. The beginning mile-point to ending mile-point of material installed.

The format for the excel spreadsheet shall be (description, date, and reading). In the description cell the format shall be Route (i.e. LA, US, or I), Direction (i.e. N, S, E, or W), Mile Point and Color (W or Y).

*Examples:*

LA 115W; 23; Y  
I-10; S; 4; W.

For traffic paint, initial retroreflectance shall have a minimum retroreflectance of 250 mcd/lux/sq m for white and 175 mcd/lux/sq m for yellow when measured with geometry of 1.05 degrees observation angle and 88.76 degrees entrance angle (30 m geometry).

(d) Initial Daytime Color and Luminance Factor: For traffic paint, the initial daytime color and luminance factor (Cap Y) will be tested according to and in compliance with the requirements of ASTM D6628. Readings may be taken by the Department from 7 to 30 days after installation to verify compliance with ASTM 6628.

1015.13 GLASS BEADS FOR PAVEMENT MARKINGS. Glass beads for use with painted traffic striping and flat thermoplastic striping shall be transparent, clean, colorless glass, smooth and spherically shaped, free from milkiness, pits, or excessive air bubbles and conform to the specific requirements for the class designated. The beads shall conform to the specification requirements of AASHTO M 247 as modified herein.

(a) Moisture Resistance - Flow Characteristics: The beads shall not absorb moisture in storage. They shall remain free of clusters and lumps and shall flow freely from the dispensing equipment.

(b) Gradation: The testing for gradation of the beads shall be in accordance with ASTM D 1214 and shall meet the gradation requirements of AASHTO M 247, Section 4.1., for the specified type of beads.

(1) Painted Traffic Striping: Glass beads for painted traffic striping shall meet the gradation requirements of AASHTO M 247 Type 3. Table 1015-12A, "Gradation of Refractive Index Glass Beads" may be used as an alternate on chip seal.

Table 1015-12A  
Gradation of 1.9 Refractive Index Glass Beads

U.S. SIEVE (METRIC SIEVE)	PERCENT RETAINED
No. 18 (1.00 mm)	0-5
No. 20 (850 µm)	5-15
No. 30 (600 µm)	10-30
No. 40 (425 µm)	20-40
No. 50 (300 µm)	20-40
PAN	0-5

(2) Flat Profile Thermoplastic Striping: Drop-on beads for flat profile thermoplastic striping shall meet the gradation requirements of Table 1015-13; AASHTO M 247, Type 1, 2, or 4; or Table 1015-12A as determined by the thickness of the striping specified in Table 1015-13.

Table 1015-13  
Types of AASHTO M 247 Glass Beads used for  
Flat Profile Thermoplastic Striping

THICKNESS	NUMBER OF BEAD DROPS	APPLICATION #1	APPLICATION #2
40 mil spray	Single Drop	AASHTO M247 Type 2 or Table 1015-12A	N/A
90 mils or greater	Double Drop	AASHTO M247 Type 4	AASHTO M 247 Type 1 or Table 1015-12A

(3) 40 mil Spray Thermoplastic Striping: Drop-on beads for 40 mil spray thermoplastic striping shall meet the gradation requirements of Table 1015-13. Table 1015-12A may be used as an alternative.

(c) Roundness: Beads shall have a minimum of 80 percent rounds per screen for the two (2) highest sieve sizes. The remaining sieve sizes shall have no less than 75 percent rounds. AASHTO M 247 Type 1 and Type 2 beads shall be tested according to ASTM D 1155. Other types shall be tested by microscopic examination.

(d) Angular Particles: The beads shall have no more than three (3) percent angular particles per screen.

(e) Refractive Index: The beads shall have a refractive index of 1.50 to 1.52 when tested by the liquid immersion method. Beads conforming to Table 1015-12A shall have a minimum refractive index of 1.90.

(f) Embedment Coating: The large beads for thermoplastic striping shall be coated with an adhesion assuring coating. The smaller AASHTO M 247 Type 1 beads shall be coated to provide free flowing characteristics when tested in accordance with AASHTO M 247 Section 5.3., and assure adhesion. Glass beads shall be properly coated and conform to the requirements when tested as described in DOTD TR 530 Determination of Embedment Coating on Large Embedment Coated Glass Beads for Pavement Markings.

(g) Packaging and Marking: The beads shall be packaged in moisture proofed containers. Each container shall be stamped with the following information: Name and address of manufacturer, shipping point, trademark or name, the wording "Large Embedment Coated Glass Beads", class, weight, lot number and the month and year of manufacture. The container for the AASHTO M 247 Type 1 beads shall be similarly stamped except that the wording shall be "Glass Beads".

(h) Heavy Metal Limits: All glass beads shall not contain more than 75 parts per million of inorganic arsenic, when tested using EPA Method 6010B in conjunction with EPA Method 3052 for sample preparation.



**SECTION 1020 – TRAFFIC SIGNALS:**

Subsection 1020.01 – Traffic Signal Heads (06/07), Pages 873 – 884.

Delete the contents of Heading (a), General Requirements and substitute the following:

(a) General Requirements: Traffic signal sections, beacon sections and pedestrian signal sections shall be of the adjustable type. Materials and construction of each section shall be the same.

Signals shall be constructed for either 8 or 12-inch (200 mm or 300 mm) lens in accordance with the plans. Signal sections shall have three to five sections per face and beacon sections have only one section per face. Signal sections and associated brackets shall be finished inside and out with two coats of high grade dark olive green enamel, color number 14056 according to Federal Standard No. 595b with each coat independently baked. Visors shall be coated green on the outside and black on the inside. Edges shall be deburred and smooth with no sharp edges.

Subsection 1020.04 – Poles for Traffic Signal Systems (06/07), Pages 890 – 894.

Delete the sixth paragraph of Heading (a), Pedestal Support Signal Poles, and substitute the following.

Pedestals shall be finished with at least one coat of rustproofing primer, applied to a clean surface and one coat of dark olive green enamel, color number 14056 according to Federal Standard No. 595.

**STATE OF LOUISIANA  
DEPARTMENT OF TRANSPORTATION AND  
DEVELOPMENT**



**CONSTRUCTION PROPOSAL  
INFORMATION  
FOR**

**STATE PROJECT NO. H.972020  
CONTROL SECTION 600-90  
DOTD HEADQUARTERS BUILDING CHILLER REPLACEMENT**

**EAST BATON ROUGE PARISH**

## BID BOND

A Bid Bond is required when the bidder's total bid amount as calculated by the Department in accordance with Subsection 103.01 is greater than \$50,000. *(See Section 102 of the Project Specifications.)*

\_\_\_\_\_, as Principal (Bidder)  
and \_\_\_\_\_, as Surety,  
are bound unto the State of Louisiana, Department of Transportation and Development, (hereinafter called the Department) in the sum of five percent (5%) of the bidder's total bid amount as calculated by the Department for payment, of which the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, as solidary obligors.

Signed and sealed this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

The condition of this obligation is such that, whereas the Principal has submitted a bid to the Department on a contract for the construction of **STATE PROJECT NO. H.972020, CONTROL SECTION NO. 600-90, DOTD HEADQUARTERS BUILDING CHILLER REPLACEMENT LOCATED IN THE PARISH OF E. BATON ROUGE**, if the bid is accepted and the Principal, within the specified time, enters into the contract in writing and gives bond with Surety acceptable to the Department for payment and performance of said contract, this obligation shall be void; otherwise to remain in effect.

_____ Principal (Bidder or First Partner to Joint Venture)	_____ If a Joint Venture, Second Partner
By _____	By _____
Authorized Officer-Owner-Partner	Authorized Officer-Owner-Partner
_____ Typed or Printed Name	_____ Typed or Printed Name
_____ Surety	
By _____ (Seal)	
Agent or Attorney-in-Fact	
_____ Typed or Printed Name	

To receive a copy of the contract and subsequent correspondence / communication from LA DOTD, with respect to the bid bonds, the following information must be provided:

_____ Bonding Agency or Company Name	_____ Address
_____ Agent or Representative	_____ Phone Number / Fax Number



9/10/2013

Louisiana Department of Transportation and Development

Proposal Schedule of Items

Page: 1

Contract ID: H.972020

Project(s): H.972020

SECTION: 1

General Items

Proposal Line Number	Item ID	Description  Unit Price (In Words, Ink or Typed)	Approximate Quantity	Unit of Measure
0001	NS-MNT-07020	Building Repairs -DOTD Headquarters Chiller Replacement, CSN 600-90.		LUMP SUM

\_\_\_\_\_ Dollars

\_\_\_\_\_ Cents

Section: 1

Total: \_\_\_\_\_

Total Bid: \_\_\_\_\_

# CONSTRUCTION PROPOSAL SIGNATURE AND EXECUTION FORM

THIS FORM, THE SCHEDULE OF ITEMS, AND THE PROPOSAL GUARANTY MUST BE COMPLETED AS INDICATED AND SUBMITTED TO THE LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT (DOTD) TO CONSTITUTE A VALID BID

STATE PROJECT NO.

H.972020

FEDERAL AID PROJECT NO.

N/A

NAME OF PROJECT

DOTD HEADQUARTERS BUILDING CHILLER REPLACEMENT

I (WE) HEREBY CERTIFY THAT I (WE) HAVE CAREFULLY EXAMINED THE PROPOSAL, PLANS AND SPECIFICATIONS, INCLUDING ANY AND ALL ADDENDA, AND THE SITE OF THE ABOVE PROJECT AND AM (ARE) FULLY COGNIZANT OF ALL PROPOSAL DOCUMENTS, THE MASTER COPY OF WHICH IS ON FILE AT DOTD HEADQUARTERS IN BATON ROUGE, LA., AND ALL WORK, MATERIALS AND LABOR REQUIRED THEREIN, AND AGREE TO PERFORM ALL WORK, AND SUPPLY ALL NECESSARY MATERIALS AND LABOR REQUIRED FOR SUCCESSFUL AND TIMELY COMPLETION OF THE ABOVE PROJECT AND TO ACCEPT THE SUMMATION OF THE PRODUCTS OF THE UNIT PRICES BID ON THE SCHEDULE OF ITEMS ATTACHED HERETO AND MADE A PART HEREOF MULTIPLIED BY THE ACTUAL QUANTITY OF UNIT OF MEASURE PERFORMED FOR EACH ITEM, AS AUDITED BY DOTD, AS FULL AND FINAL PAYMENT FOR ALL WORK, LABOR AND MATERIALS NECESSARY TO COMPLETE THE ABOVE PROJECT, SUBJECT TO INCREASE ONLY FOR PLAN CHANGES (CHANGE ORDERS) APPROVED BY THE DOTD CHIEF ENGINEER OR HIS DESIGNEE. THIS BID IS SUBMITTED IN ACCORDANCE WITH THE GENERAL BIDDING REQUIREMENTS IN THE CONSTRUCTION PROPOSAL AND ALL SPECIAL PROVISIONS, PLANS, SUPPLEMENTAL SPECIFICATIONS, AND THE LOUISIANA STANDARD SPECIFICATIONS FOR ROADS AND BRIDGES (2006 EDITION). I (WE) UNDERSTAND THAT THE SUMMATION OF THE PRODUCTS OF THE UNIT PRICES BID ON THE SCHEDULE OF ITEMS MULTIPLIED BY THE ESTIMATED QUANTITY OF UNIT OF MEASURE FOR EACH ITEM, ALONG WITH ANY OTHER FACTORS SPECIFIED TO BE APPLICABLE SUCH AS CONSTRUCTION TIME AND/OR LANE RENTAL, SHALL BE THE BASIS FOR THE COMPARISON OF BIDS. I (WE) UNDERSTAND THAT THE SCHEDULE OF ITEMS MUST CONTAIN UNIT PRICES WRITTEN OUT IN WORDS AND THAT THE SCHEDULE OF ITEMS SUBMITTED AS PART OF THIS BID IS ON THE FORM SUPPLIED BY DOTD IN THE BID PROPOSAL. MY (OUR) PROPOSAL GUARANTY IN THE AMOUNT SPECIFIED FOR THE PROJECT IS ATTACHED HERETO AS EVIDENCE OF MY (OUR) GOOD FAITH TO BE FORFEITED IF THIS BID IS ACCEPTED BY DOTD AND I (WE) FAIL TO COMPLY WITH ANY REQUIREMENT NECESSARY FOR AWARD AND EXECUTION OF THE CONTRACT, AS WELL AS, SIGN AND DELIVER THE CONTRACT AND PAYMENT/PERFORMANCE/RETAINAGE BOND AS REQUIRED IN THE SPECIFICATIONS.

## NONCOLLUSION DECLARATION (APPLICABLE TO FEDERAL-AID PROJECTS)

I (WE) DECLARE UNDER PENALTY OF PERJURY UNDER THE LAWS OF THE UNITED STATES AND THE STATE OF LOUISIANA THAT I (WE) HAVE NOT DIRECTLY OR INDIRECTLY, ENTERED INTO ANY AGREEMENT, PARTICIPATED IN ANY COLLUSION, OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THE CONTRACT FOR THIS PROJECT NOR VIOLATED LA. R.S. 48:254.

## BIDDER'S DBE GOAL STATEMENT (APPLICABLE TO DBE GOAL PROJECTS)

IF THIS PROJECT IS DESIGNATED BY SPECIAL PROVISION AS A DISADVANTAGED BUSINESS ENTERPRISE (DBE) GOAL PROJECT IN ACCORDANCE WITH THE DBE PROVISIONS OF THIS CONTRACT, THE BIDDER ASSURES DOTD THAT HE/SHE WILL MEET OR EXCEED THE DBE CONTRACT GOAL, OR IF THE BIDDER CANNOT MEET THE REQUIRED DBE GOAL, THE BIDDER ASSURES DOTD THAT HE/SHE HAS MADE AND CAN DOCUMENT GOOD FAITH EFFORTS MADE TOWARDS MEETING THE GOAL REQUIREMENT IN ACCORDANCE WITH THE CONTRACT AND DBE PROGRAM MANUAL INCORPORATED HEREIN BY REFERENCE.

THE APPARENT LOW BIDDER SHALL COMPLETE AND SUBMIT TO THE DOTD COMPLIANCE PROGRAMS OFFICE, FORM CS-6AAA AND ATTACHMENT(S) AND, IF NECESSARY, DOCUMENTATION OF GOOD FAITH EFFORTS MADE BY THE BIDDER TOWARD MEETING THE GOAL, WITHIN TEN BUSINESS DAYS AFTER THE OPENING OF BIDS FOR THIS PROJECT. RESPONSIVENESS OF INFORMATION SUPPLIED IN THIS SECTION OF THIS CONSTRUCTION PROPOSAL SIGNATURE AND EXECUTION FORM IS GOVERNED BY THE DBE REQUIREMENTS INCLUDED WITHIN THE SPECIFICATIONS AND DBE PROGRAM MANUAL.

## CERTIFICATION OF EMPLOYMENT OF LOUISIANA RESIDENTS TRANSPORTATION INFRASTRUCTURE MODEL FOR ECONOMIC DEVELOPMENT (TIME) PROJECTS (APPLICABLE TO TIME PROJECTS)

IF THIS PROJECT IS DESIGNATED BY SPECIAL PROVISION AS A TRANSPORTATION INFRASTRUCTURE MODEL FOR ECONOMIC DEVELOPMENT (TIME) PROJECT AS DEFINED IN ACT NO. 16 OF THE 1989 FIRST EXTRAORDINARY SESSION OF THE LEGISLATURE WHICH ENACTED PART V OF CHAPTER 7 OF SUBTITLE II OF TITLE 47 OF THE LOUISIANA REVISED STATUTES OF 1950, COMPRISED OF R.S. 47:820.1 THROUGH 820.6.

THE BIDDER CERTIFIES THAT AT LEAST 80 PERCENT OF THE EMPLOYEES EMPLOYED ON THIS TIME PROJECT WILL BE LOUISIANA RESIDENTS IN ACCORDANCE WITH LOUISIANA R.S. 47:820.3.

## NON PARTICIPATION IN PAYMENT ADJUSTMENT (ASPHALT CEMENT AND FUELS) STATEMENT

IF THIS PROJECT IS DESIGNATED BY SPECIAL PROVISION AS BEING SUBJECT TO PAYMENT ADJUSTMENT FOR ASPHALT CEMENT AND/OR FUELS, THE BIDDER HAS THE OPTION OF REQUESTING EXCLUSION FROM SAID PAYMENT ADJUSTMENT PROVISIONS THAT ARE ESTABLISHED BY SPECIAL PROVISION ELSEWHERE HEREIN.

IF THE BIDDER DESIRES TO BE EXCLUDED FROM THESE PAYMENT ADJUSTMENT PROVISIONS,

THE BIDDER IS REQUIRED TO MARK HERE ☐

FAILURE TO MARK THIS BOX PRIOR TO BID OPENING WILL CONSTITUTE FORFEITURE OF THE BIDDER'S OPTION TO REQUEST EXCLUSION.

CS-14A  
08/06

STATE PROJECT NO. **H.972020**

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## **BIDDER SIGNATURE REQUIREMENTS** (APPLICABLE TO ALL PROJECTS)

THIS BID FOR THE CAPTIONED PROJECT IS SUBMITTED BY:

\_\_\_\_\_  
(Name of Principal (Individual, Firm, Corporation, or Joint Venture))

\_\_\_\_\_  
(If Joint Venture, Name of First Partner)

\_\_\_\_\_  
(Louisiana Contractor's License Number of Bidder or First Partner to Joint Venture)

\_\_\_\_\_  
(Business Street Address)

\_\_\_\_\_  
(Business Mailing Address, if different)

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Area Code and Telephone Number of Business)

\_\_\_\_\_  
(Telephone Number and Name of Contact Person)

\_\_\_\_\_  
(Telecopier Number, if any)

\_\_\_\_\_  
(If Joint Venture, Name of Second Partner)

\_\_\_\_\_  
(Louisiana Contractor's License Number of Second Partner to Joint Venture)

\_\_\_\_\_  
(Business Street Address)

\_\_\_\_\_  
(Business Mailing Address, if different)

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
(Area Code and Telephone Number of Business)

\_\_\_\_\_  
(Telephone Number and Name of Contact Person)

\_\_\_\_\_  
(Telecopier Number, if any)

ACTING ON BEHALF OF THE BIDDER, THIS IS TO ATTEST THAT THE UNDERSIGNED DULY AUTHORIZED REPRESENTATIVE OF THE ABOVE CAPTIONED FIRM, CORPORATION OR BUSINESS, BY SUBMISSION OF THIS BID, AGREES AND CERTIFIES THE TRUTH AND ACCURACY OF ALL PROVISIONS OF THIS PROPOSAL, INCLUSIVE OF THE REQUIREMENTS, STATEMENTS, DECLARATIONS AND CERTIFICATIONS ABOVE AND IN THE SCHEDULE OF ITEMS AND PROPOSAL GUARANTY. EXECUTION AND SIGNATURE OF THIS FORM AND SUBMISSION OF THE SCHEDULE OF ITEMS AND PROPOSAL GUARANTY SHALL CONSTITUTE AN IRREVOCABLE AND LEGALLY BINDING OFFER BY THE BIDDER.

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Printed Name)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date of Signature)

\_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Printed Name)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Date of Signature)

CONTRACTOR'S TOTAL BASE BID \$ \_\_\_\_\_

IT IS AGREED THAT THIS TOTAL, DETERMINED BY THE BIDDER, IS FOR PURPOSES OF OPENING AND READING BIDS ONLY, AND THAT THE LOW BID FOR THIS PROJECT WILL BE DETERMINED FROM THE EXTENSION AND TOTAL OF THE BID ITEMS BY DOTD.

CS-14AA  
08/06