

# **BID PROPOSAL INSTRUCTIONS**

**ABOUT IDOT PROPOSALS:** All proposals are potential bidding proposals. Each proposal contains all certifications and affidavits, a proposal signature sheet and a proposal bid bond.

## **PREQUALIFICATION**

Any contractor who desires to become pre-qualified to bid on work advertised by IDOT must submit the properly completed pre-qualification forms to the Bureau of Construction no later than 4:30 p.m. prevailing time twenty-one days prior to the letting of interest. This pre-qualification requirement applies to first time contractors, contractors renewing expired ratings, contractors maintaining continuous pre-qualification or contractors requesting revised ratings. To be eligible to bid, existing pre-qualification ratings must be effective through the date of letting.

## **WHO CAN BID ?**

Bids will be accepted from only those companies that request and receive written Authorization to Bid from IDOT's Central Bureau of Construction.

## **REQUESTS FOR AUTHORIZATION TO BID**

Contractors wanting to bid on items included in a particular letting must submit the properly completed "Request for Authorization to Bid/or Not For Bid Status" (BDE 124) and the ORIGINAL "Affidavit of Availability" (BC 57) to the proper office no later than 4:30 p.m. prevailing time, three (3) days prior to the letting date.

## **WHAT CONSTITUTES WRITTEN AUTHORIZATION TO BID?**

When a prospective prime bidder submits a "Request for Authorization to Bid/or Not For Bid Status"(BDE 124) he/she must indicate at that time which items are being requested For Bidding purposes. Only those items requested For Bidding will be analyzed. After the request has been analyzed, the bidder will be issued an **Authorization to Bid or Not for Bid Report**, approved by the Central Bureau of Construction and the Chief Procurement Officer that indicates which items have been approved For Bidding. If **Authorization to Bid** cannot be approved, the **Authorization to Bid or Not for Bid Report** will indicate the reason for denial.

## **ABOUT AUTHORIZATION TO BID**

Firms that have not received an Authorization to Bid or Not For Bid Report within a reasonable time of complete and correct original document submittal should contact the Department as to the status. Firms unsure as to authorization status should call the Prequalification Section of the Bureau of Construction at the number listed at the end of these instructions.

## **ADDENDA AND REVISIONS**

It is the bidder's responsibility to determine which, if any, addenda or revisions pertain to any project they may be bidding. Failure to incorporate all relevant addenda or revisions may cause the bid to be declared unacceptable.

Each addendum or revision will be included with the Electronic Plans and Proposals. Addenda and revisions will also be placed on the Addendum/Revision Checklist and each subscription service subscriber will be notified by e-mail of each addendum and revision issued.

The Internet is the Department's primary way of doing business. The subscription service emails are an added courtesy the Department provides. It is suggested that bidders check IDOT's website at <http://www.idot.illinois.gov/doing-business/procurements/construction-services/construction-bulletins/transportation-bulletin/index#TransportationBulletin> before submitting final bid information.

***IDOT IS NOT RESPONSIBLE FOR ANY E-MAIL FAILURES.***

Addenda questions may be directed to the Contracts Office at (217)782-7806 or [DOT.D&Econtracts@illinois.gov](mailto:DOT.D&Econtracts@illinois.gov)

Technical questions about downloading these files may be directed to Tim Garman at (217)524-1642 or [Timothy.Garman@illinois.gov](mailto:Timothy.Garman@illinois.gov).

## **STANDARD GUIDELINES FOR SUBMITTING PAPER BIDS**

- All pages should be single sided.
- Use the Cover Page that is provided in the Bid Proposal (posted on the IDOT Web Site) as the first page of your submitted bid. It has the item number in large bold type in the upper left-hand corner and lines provided for your company name and address in the upper right-hand corner.
- Do not use report covers, presentation folders or special bindings and do not staple multiple times on left side like a book. Use only 1 staple in the upper left hand corner. Make sure all elements of your bid are stapled together including the bid bond or guaranty check (if required).
- **Do not include any certificates of eligibility, your authorization to bid, Addendum Letters or affidavit of availability.**
- Do not include the Subcontractor Documentation with your bid (pages i – iii and pages a – g). This documentation is required only if you are awarded the project.
- Use the envelope cover sheet (provided with the proposal) as the cover for the proposal envelope.
- Do not rely on overnight services to deliver your proposal prior to 10 AM on letting day. It will not be read if it is delivered after 10 AM.
- Do not submit your Substance Abuse Prevention Program (SAPP) with your bid. If you are awarded the contract this form is to be submitted to the district engineer at the pre-construction conference.

## **BID SUBMITTAL CHECKLIST**

- Cover page** (the sheet that has the item number on it) – This should be the first page of your bid proposal, **followed by your bid (the Schedule of Prices/Pay Items)**. If you are using special software or CBID to generate your schedule of prices, do not include the blank pages of the schedule of prices that came with the proposal package.
- Page 4 (Item 9)** – Check “YES” if you will use a subcontractor(s) with an annual value over \$50,000. Include the subcontractor(s) name, address, general type of work to be performed and the dollar amount. If you will use subcontractor(s) but are uncertain who or the dollar amount; check “YES” but leave the lines blank.
- After page 4** – Insert the following documents: Cost Adjustments for Steel, Bituminous and Fuel (if applicable) and the Contractor Letter of Assent (if applicable). The general rule should be, if you don’t know where it goes, put it after page 4.
- Page 10 (Paragraph J)** – Check “YES” or “NO” whether your company has any business in Iran.
- Page 10 (Paragraph K)** – (Not applicable to federally funded projects) List the name of the apprenticeship and training program sponsor holding the certificate of registration from the US Department of Labor. If no applicable program exists, please indicate the work/job category. **Do not include certificates with your bid.** Keep the certificates in your office in case they are requested by IDOT.
- Page 11 (Paragraph L)** – Your State Board of Elections certificate of registration is no longer required with your bid.
- Page 11 (Paragraph M)** – Indicate if your company has hired a lobbyist in connection with the job for which you are submitting the bid proposal.
- Page 12 (Paragraph C)** – This is a work sheet to determine if a completed Form A is required. It is not part of the form and you do not need to make copies for each completed Form A.
- Pages 14-17 (Form A)** – One Form A (4 pages) is required for each applicable person in your company. Copies of the forms can be used and only need to be changed when the information changes. The certification signature and date must be original for each letting. **Do not staple the forms together.** If you answered “NO” to all of the questions in Paragraph C (page 12), complete the first section (page 14) with your company information and then sign and date the Not Applicable statement on page 17.
- Page 18 (Form B)** - If you check “YES” to having other current or pending contracts it is acceptable to use the phrase, “See Affidavit of Availability on file”. **Ownership Certification** (at the bottom of the page) - Check N/A if the Form A(s) you submitted accounts for 100 percent of the company ownership. Check YES if any percentage of ownership falls outside of the parameters that require reporting on the Form A. Checking NO indicates that the Form A(s) you submitted is not correct and you will be required to submit a revised Form A.
- Page 20 (Workforce Projection)** – Be sure to include the Duration of the Project. It is acceptable to use the phrase “Per Contract Specifications”.

- Proposal Bid Bond** – (Insert after the proposal signature page) Submit your Proposal Bid Bond (if applicable) using the current Proposal Bid Bond form provided in the proposal package. The Power of Attorney page should be stapled to the Proposal Bid Bond. If you are using an electronic bond, include your bid bond number on the Proposal Bid Bond and attach the Proof of Insurance printed from the Surety’s Web Site.
- Disadvantaged Business Utilization Plan and/or Good Faith Effort – Do Not Submit with Bid** The bidder shall submit a Disadvantaged Business Utilization Plan on completed Department forms SBE 2025 and 2026. (1) The final Utilization Plan must be submitted within five calendar days after the date of the letting. (2) To meet the five day requirement, the bidder may send the Utilization Plan electronically by scanning and sending to [DOT.DBE.UP@illinois.gov](mailto:DOT.DBE.UP@illinois.gov) or faxing to (217) 785-1524. The subject line must include the bid Item Number and the Letting date. The Utilization Plan should be sent as one .pdf file, rather than multiple files and emails for the same Item Number. It is the responsibility of the bidder to obtain confirmation of email or fax delivery.

Alternatively, the Utilization Plan may be sent by certified mail or delivery service within the five calendar day period. If a question arises concerning the mailing date of a Utilization Plan, the mailing date will be established by the U.S. Postal Service postmark on the certified mail receipt from the U.S. Postal Service or the receipt issued by a delivery service. It is the responsibility of the bidder to ensure the postmark or receipt date is affixed within the five days if the bidder intends to rely upon mailing or delivery to satisfy the submission day requirement. The Utilization Plan is to be submitted to:

Illinois Department of Transportation  
 Bureau of Small Business Enterprises  
 Contract Compliance Section  
 2300 South Dirksen Parkway, Room 319  
 Springfield, Illinois 62764

**The Bid Letting is now available in streaming Audio/Video from the IDOT Web Site.** A link to the stream will be placed on the main page of the current letting on the day of the Letting. The stream will not begin until 10 AM. The actual reading of the bids does not begin until approximately 10:30 AM.

Following the Letting, the As-Read Tabulation of Bids will be posted by the end of the day. You will find the link on the main Web page for the current letting.

**QUESTIONS: pre-letting up to execution of the contract**

Contractor pre-qualification .....	217-782-3413
Small Business, Disadvantaged Business Enterprise (DBE) .....	217-785-4611
Contracts, Bids, Letting process or Internet downloads .....	217-782-7806
Estimates Unit.....	217-785-3483
Aeronautics.....	217-785-8515
IDNR (Land Reclamation, Water Resources, Natural Resources).....	217-782-6302

**QUESTIONS: following contract execution**

Subcontractor documentation, payments .....	217-782-3413
Railroad Insurance .....	217-785-0275

# 86

RETURN WITH BID

Proposal Submitted By
Name
Address
City

## Letting July 29, 2016

### NOTICE TO PROSPECTIVE BIDDERS

This proposal can be used for bidding purposes by only those companies that request and receive written AUTHORIZATION TO BID from IDOT's Central Bureau of Construction.

**BIDDERS NEED NOT RETURN THE ENTIRE PROPOSAL**

# Notice to Bidders, Specifications, Proposal, Contract and Contract Bond



**Illinois Department  
of Transportation**

Springfield, Illinois 62764

Contract No. 61C74  
COOK County  
Section 13-00136-00-RR (Maywood)  
Route MAIN STREET (Maywood Commuter Station)  
Project CMM-4003(277)  
District 1 Construction Funds

PLEASE MARK THE APPROPRIATE BOX BELOW:

- A Bid Bond is included.
- A Cashier's Check or a Certified Check is included
- An Annual Bid Bond is included or is on file with IDOT.

Prepared by

Checked by

F

(Printed by authority of the State of Illinois)



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RETURN WITH BID



PROPOSAL

TO THE DEPARTMENT OF TRANSPORTATION

1. Proposal of \_\_\_\_\_

Taxpayer Identification Number (Mandatory) \_\_\_\_\_

For the improvement identified and advertised for bids in the Invitation for Bids as:

**Contract No. 61C74  
COOK County  
Section 13-00136-00-RR (Maywood)  
Project CMM-4003(277)  
Route MAIN STREET (Maywood Commuter Station)  
District 1 Construction Funds**

**This project consists of the construction of a warming shelter at the METRA Maywood Station, located on the north side of the Union Pacific-Milwaukee West Line adjacent to Main Street and between 3rd and 5th Avenue in the Village of Maywood. Project also includes retaining walls, parking facility reconstruction and lighting improvements.**

2. The undersigned bidder will furnish all labor, material and equipment to complete the above described project in a good and workmanlike manner as provided in the contract documents provided by the Department of Transportation. This proposal will become part of the contract and the terms and conditions contained in the contract documents will govern performance and payments.



**RETURN WITH BID**

6. **COMBINATION BIDS.** The undersigned bidder further agrees that if awarded the contract for the sections contained in the following combination, he/she will perform the work in accordance with the requirements of each individual contract comprising the combination bid specified in the schedule below, and that the combination bid shall be prorated against each section in proportion to the bid submitted for the same. If an error is found to exist in the gross sum bid for one or more of the individual sections included in a combination, the combination bid shall be corrected as provided in the specifications.

**When a combination bid is submitted, the schedule below must be completed in each proposal comprising the combination.**

**If alternate bids are submitted for one or more of the sections comprising the combination, a combination bid must be submitted for each alternate.**

**Schedule of Combination Bids**

Combination No.	Sections Included in Combination	Combination Bid	
		Dollars	Cents

7. **SCHEDULE OF PRICES.** The undersigned bidder submits herewith, in accordance with the rules and instructions, a schedule of prices for the items of work for which bids are sought. The unit prices bid are in U.S. dollars and cents, and all extensions and summations have been made. The bidder understands that the quantities appearing in the bid schedule are approximate and are provided for the purpose of obtaining a gross sum for the comparison of bids. If there is an error in the extension of the unit prices, the unit prices will govern. Payment to the contractor awarded the contract will be made only for actual quantities of work performed and accepted or materials furnished according to the contract. The scheduled quantities of work to be done and materials to be furnished may be increased, decreased or omitted as provided elsewhere in the contract.
8. **AUTHORITY TO DO BUSINESS IN ILLINOIS.** Section 20-43 of the Illinois Procurement Code (the Code) (30 ILCS 500/20-43) provides that a person (other than an individual acting as a sole proprietor) must be a legal entity authorized to transact business or conduct affairs in the State of Illinois prior to submitting the bid.
9. **EXECUTION OF CONTRACT:** The Department of Transportation will, in accordance with the rules governing Department procurements, execute the contract and shall be the sole entity having the authority to accept performance and make payments under the contract. Execution of the contract by the Chief Procurement Officer (CPO) or the State Purchasing Officer (SPO) is for approval of the procurement process and execution of the contract by the Department. Neither the CPO nor the SPO shall be responsible for administration of the contract or determinations respecting performance or payment there under except as otherwise permitted in the Code.
10. **The services of a subcontractor will be used.**

Check box Yes   
 Check box No

For known subcontractors with subcontracts with an annual value of more than \$50,000, the contract shall include their name, address, general type of work to be performed, and the dollar allocation for each subcontractor.  
 (30 ILCS 500/20-120)

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ILLINOIS DEPARTMENT OF TRANSPORTATION ECMS002 DTGECM03 ECMR003 PAGE  
 SCHEDULE OF PRICES RUN DATE - 06/14/16  
 CONTRACT NUMBER - 61C74 RUN TIME - 183024

STATE JOB #- C-91-211-14  
 PPS NBR -

COUNTY NAME	CODE	DIST	SECTION NUMBER	PROJECT NUMBER	ROUTE
COOK	031	01	13-00136-00-RR (MAYWOOD)	CMM-4003/277/000	MAIN STREET

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
XX007056	BUILDING	L SUM	1.000 X	=	=	=	=
XX008868	ELECTRIC SYSTEM COMP	L SUM	1.000 X	=	=	=	=
X0322080	BUS SHELTER REM RELOC	EACH	1.000 X	=	=	=	=
X0322869	REM TIMBER RET WALL	L SUM	1.000 X	=	=	=	=
X0323444	DECORATIVE STL RAIL	FOOT	365.000 X	=	=	=	=
X0323553	ORN FENCE WRT IRON	FOOT	353.000 X	=	=	=	=
X0324582	PLUMB EQ, ACCESS & RS	L SUM	1.000 X	=	=	=	=
X0325789	INTERPRET SIGN COMPL	EACH	21.000 X	=	=	=	=
X0326696	SIGN AND POST	EACH	4.000 X	=	=	=	=
X0327494	MECH WORK COMPLETE	L SUM	1.000 X	=	=	=	=
X1400094	LUM LED HM LOW WATT	EACH	4.000 X	=	=	=	=
X5610651	ABAN EX WM FILL CLSM	FOOT	295.000 X	=	=	=	=
X5610750	WM LINE STOP 10	EACH	2.000 X	=	=	=	=
X5630010	CUT & CAP EX 10 WM	EACH	2.000 X	=	=	=	=
X5860110	GRANULAR BACKFILL STR	CU YD	300.000 X	=	=	=	=

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
X7010216	TRAF CONT & PROT SPL	L SUM	1.000 X	=	=	=	=
X8360215	LIGHT POLE FDN 24D OS	FOOT	16.000 X	=	=	=	=
Z0013798	CONSTRUCTION LAYOUT	L SUM	1.000 X	=	=	=	=
Z0022800	FENCE REMOVAL	FOOT	322.000 X	=	=	=	=
Z0026408	TEMP SHT PILING SPL	SQ FT	1,660.000 X	=	=	=	=
Z0044298	PRESS CONN EX WTR MN	EACH	1.000 X	=	=	=	=
Z0048665	RR PROT LIABILITY INS	L SUM	1.000 X	=	=	=	=
Z0056900	SAN SEW 8	FOOT	17.000 X	=	=	=	=
Z0076600	TRAINEES	HOURL	500.000 X	0.80	=	400.00	=
Z0076604	TRAINEES TPG	HOURL	500.000 X	15.00	=	7,500.00	=
20200100	EARTH EXCAVATION	CU YD	405.000 X	=	=	=	=
20201200	REM & DISP UNS MATL	CU YD	200.000 X	=	=	=	=
20400800	FURNISHED EXCAVATION	CU YD	550.000 X	=	=	=	=
20700220	POROUS GRAN EMBANK	CU YD	440.000 X	=	=	=	=
20800150	TRENCH BACKFILL	CU YD	125.000 X	=	=	=	=

13-00136-00-RR (MAYWOOD) SCHEDULE OF PRICES  
 COOK CONTRACT NUMBER - 61C74

MAIN RUN DATE - 06/14/16  
 RUN TIME - 183024

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
25000300	SEEDING CL 3	ACRE	0.250 X	=	=	=	=
25000400	NITROGEN FERT NUTR	POUND	5.500 X	=	=	=	=
25000500	PHOSPHORUS FERT NUTR	POUND	5.500 X	=	=	=	=
25000600	POTASSIUM FERT NUTR	POUND	5.500 X	=	=	=	=
25200110	SODDING SALT TOLERANT	SQ YD	275.000 X	=	=	=	=
25200200	SUPPLE WATERING	UNIT	5.000 X	=	=	=	=
28000510	INLET FILTERS	EACH	3.000 X	=	=	=	=
35101582	AGG BASE CSE B 2	SQ YD	445.000 X	=	=	=	=
35102100	AGG BASE CSE B 9	SQ YD	585.000 X	=	=	=	=
40600290	BIT MATLS TACK CT	POUND	6,315.000 X	=	=	=	=
40603080	HMA BC IL-19.0 N50	TON	235.000 X	=	=	=	=
40603335	HMA SC "D" N50	TON	410.000 X	=	=	=	=
42000100	PCC PVT 6	SQ YD	260.000 X	=	=	=	=
42400200	PC CONC SIDEWALK 5	SQ FT	3,995.000 X	=	=	=	=
42400800	DETECTABLE WARNINGS	SQ FT	9.000 X	=	=	=	=

ILLINOIS DEPARTMENT OF TRANSPORTATION

MAIN

13-00136-00-RR (MAYWOOD)

RUN DATE - 06/14/16

SCHEDULE OF PRICES

CONTRACT NUMBER - 61C74

RUN TIME - 183024

COOK

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
44000160	HMA SURF REM 2 3/4	SQ YD	1,140.000 X	=	=	=	=
44000173	HMA SURF REM 6	SQ YD	1,465.000 X	=	=	=	=
44000400	GUTTER REM	FOOT	330.000 X	=	=	=	=
44000500	COMB CURB GUTTER REM	FOOT	925.000 X	=	=	=	=
44000600	SIDEWALK REM	SQ FT	2,096.000 X	=	=	=	=
44201717	CL D PATCH T2 6	SQ YD	170.000 X	=	=	=	=
50200100	STRUCTURE EXCAVATION	CU YD	1,250.000 X	=	=	=	=
50300100	FLOOR DRAINS	EACH	3.000 X	=	=	=	=
50300225	CONC STRUCT	CU YD	392.000 X	=	=	=	=
50300285	FORM LINER TEX SURF	SQ FT	1,310.000 X	=	=	=	=
50800205	REINF BARS, EPOXY CTD	POUND	58,800.000 X	=	=	=	=
550B0040	STORM SEW CL B 1 10	FOOT	2.000 X	=	=	=	=
55100400	STORM SEWER REM 10	FOOT	13.000 X	=	=	=	=
56100035	DI WAT MN TEE, 10X 8	EACH	1.000 X	=	=	=	=
56100700	WATER MAIN 8	FOOT	10.000 X	=	=	=	=



ILLINOIS DEPARTMENT OF TRANSPORTATION  
 SCHEDULE OF PRICES  
 CONTRACT NUMBER - 61C74

MAIN  
 13-00136-00-RR (MAYWOOD)  
 COOK

RUN DATE - 06/14/16  
 RUN TIME - 183024

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
56100800	WATER MAIN 10	FOOT	300.000 X	=	=	=	=
56109410	DI WT MNF 10 22.50 DB	EACH	4.000 X	=	=	=	=
59100100	GEOCOMPOSITE WALL DR	SQ YD	85.000 X	=	=	=	=
60100925	PIPE DRAINS 8	FOOT	100.000 X	=	=	=	=
60201105	CB TA 4 DIA T11F&G	EACH	3.000 X	=	=	=	=
60218400	MAN TA 4 DIA T1F CL	EACH	2.000 X	=	=	=	=
60500050	REMOV CATCH BAS	EACH	3.000 X	=	=	=	=
60600605	CONC CURB TB	FOOT	445.000 X	=	=	=	=
60603800	COMB CC&G TB6.12	FOOT	825.000 X	=	=	=	=
60618300	CONC MEDIAN SURF 4	SQ FT	40.000 X	=	=	=	=
67100100	MOBILIZATION	L SUM	1.000 X	=	=	=	=
70300100	SHORT TERM PAVT MKING	FOOT	810.000 X	=	=	=	=
70300150	SHRT TRM PAVT MK REM	SQ FT	405.000 X	=	=	=	=
72900100	METAL POST TY A	FOOT	135.000 X	=	=	=	=
78000100	THPL PVT MK LTR & SYM	SQ FT	18.400 X	=	=	=	=

ILLINOIS DEPARTMENT OF TRANSPORTATION  
 SCHEDULE OF PRICES  
 CONTRACT NUMBER - 61C74

MAIN  
 13-00136-00-RR (MAYWOOD)  
 COOK

RUN DATE - 06/14/16  
 RUN TIME - 183024

ITEM NUMBER	PAY ITEM DESCRIPTION	UNIT OF MEASURE	QUANTITY	UNIT PRICE		TOTAL PRICE	
				DOLLARS	CENTS	DOLLARS	CTS
78000400	THPL PVT MK LINE 6	FOOT	740.000 X	=	=	=	=
78000600	THPL PVT MK LINE 12	FOOT	270.000 X	=	=	=	=
81028200	UNDRGRD C GALVS 2	FOOT	500.000 X	=	=	=	=
81028230	UNDRGRD C GALVS 3 1/2	FOOT	400.000 X	=	=	=	=
81028720	UNDRGRD C CNC 1	FOOT	500.000 X	=	=	=	=
81028730	UNDRGRD C CNC 1 1/4	FOOT	200.000 X	=	=	=	=
81028740	UNDRGRD C CNC 1 1/2	FOOT	200.000 X	=	=	=	=
81028750	UNDRGRD C CNC 2	FOOT	100.000 X	=	=	=	=
81400730	HANDHOLE C CONC	EACH	4,000 X	=	=	=	=
81702120	EC C XLP USE 1C 8	FOOT	1,500.000 X	=	=	=	=
83000198	LT P A 25MH 10MA	EACH	4,000 X	=	=	=	=
83600200	LIGHT POLE FDN 24D	FOOT	40.000 X	=	=	=	=
				TOTAL \$			

NOTE:  
 \*\*\* PLEASE TURN PAGE FOR IMPORTANT NOTES \*\*\*

MAIN  
13-00136-00-RR (MAYWOOD)  
COOK

ILLINOIS DEPARTMENT OF TRANSPORTATION  
SCHEDULE OF PRICES  
CONTRACT NUMBER - 61C74

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NOTE:

1. EACH PAY ITEM SHOULD HAVE A UNIT PRICE AND A TOTAL PRICE.
2. THE UNIT PRICE SHALL GOVERN IF NO TOTAL PRICE IS SHOWN OR IF THERE IS A DISCREPANCY BETWEEN THE PRODUCT OF THE UNIT PRICE MULTIPLIED BY THE QUANTITY.
3. IF A UNIT PRICE IS OMITTED, THE TOTAL PRICE WILL BE DIVIDED BY THE QUANTITY IN ORDER TO ESTABLISH A UNIT PRICE.
4. A BID MAY BE DECLARED UNACCEPTABLE IF NEITHER A UNIT PRICE NOR A TOTAL PRICE IS SHOWN.

## RETURN WITH BID

### **STATE REQUIRED ETHICAL STANDARDS GOVERNING CONTRACT PROCUREMENT: ASSURANCES, CERTIFICATIONS AND DISCLOSURES**

#### **I. GENERAL**

**A.** Article 50 of the Code establishes the duty of all State CPOs, SPOs, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

**B.** In order to comply with the provisions of Article 50 and to carry out the duty established therein, all bidders are to adhere to ethical standards established for the procurement process, and to make such assurances, disclosures and certifications required by law. Except as otherwise required in subsection III, paragraphs J-M, by execution of the Proposal Signature Sheet, the bidder indicates that each of the mandated assurances have been read and understood, that each certification is made and understood, and that each disclosure requirement has been understood and completed.

**C.** In addition to all other remedies provided by law, failure to comply with any assurance, failure to make any disclosure or the making of a false certification shall be grounds for the CPO to void the contract, and may result in the suspension or debarment of the bidder or subcontractor. If a false certification is made by a subcontractor the contractor's submitted bid and the executed contract may not be declared void unless the contractor refuses to terminate the subcontract upon the State's request after a finding that the subcontractor's certification was false.

I acknowledge, understand and accept these terms and conditions.

#### **II. ASSURANCES**

The assurances hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder.

##### **A. Conflicts of Interest**

Section 50-13. Conflicts of Interest.

(a) Prohibition. It is unlawful for any person holding an elective office in this State, holding a seat in the General Assembly, or appointed to or employed in any of the offices or agencies of state government and who receives compensation for such employment in excess of 60% of the salary of the Governor of the State of Illinois, or who is an officer or employee of the Capital Development Board or the Illinois State Toll Highway Authority, or who is the spouse or minor child of any such person to have or acquire any contract, or any direct pecuniary interest in any contract therein, whether for stationery, printing, paper, or any services, materials, or supplies, that will be wholly or partially satisfied by the payment of funds appropriated by the General Assembly of the State of Illinois or in any contract of the Capital Development Board or the Illinois State Toll Highway Authority.

(b) Interests. It is unlawful for any firm, partnership, association or corporation, in which any person listed in subsection (a) is entitled to receive (i) more than 7 1/2% of the total distributable income or (ii) an amount in excess of the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(c) Combined interests. It is unlawful for any firm, partnership, association, or corporation, in which any person listed in subsection (a) together with his or her spouse or minor children is entitled to receive (i) more than 15%, in the aggregate, of the total distributable income or (ii) an amount in excess of 2 times the salary of the Governor, to have or acquire any such contract or direct pecuniary interest therein.

(d) Securities. Nothing in this Section invalidates the provisions of any bond or other security previously offered or to be offered for sale or sold by or for the State of Illinois.

(e) Prior interests. This Section does not affect the validity of any contract made between the State and an officer or employee of the State or member of the General Assembly, his or her spouse, minor child or any combination of those persons if that contract was in existence before his or her election or employment as an officer, member, or employee. The contract is voidable, however, if it cannot be completed within 365 calendar days after the officer, member, or employee takes office or is employed. The current salary of the Governor is \$177,412.00. Sixty percent of the salary is \$106,447.20.

## RETURN WITH BID

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-13, or that an effective exemption has been issued by the Board of Ethics to any individual subject to the Section 50-13 prohibitions pursuant to the provisions of Section 50-20 of the Code. Information concerning the exemption process is available from the Department upon request.

### **B. Negotiations**

Section 50-15. Negotiations.

It is unlawful for any person employed in or on a continual contractual relationship with any of the offices or agencies of State government to participate in contract negotiations on behalf of that office or agency with any firm, partnership, association, or corporation with whom that person has a contract for future employment or is negotiating concerning possible future employment.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-15, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

### **C. Inducements**

Section 50-25. Inducement.

Any person who offers or pays any money or other valuable thing to any person to induce him or her not to provide a submission to a vendor portal or to bid for a State contract or as recompense for not having bid on a State contract is guilty of a Class 4 felony. Any person who accepts any money or other valuable thing for not bidding for a State contract, not making a submission to a vendor portal, or who withholds a bid or submission to a vendor portal in consideration of the promise for the payment of money or other valuable thing is guilty of a Class 4 felony.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-25, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

### **D. Revolving Door Prohibition**

Section 50-30. Revolving door prohibition.

CPOs, SPOs, procurement compliance monitors, their designees whose principal duties are directly related to State procurement, and executive officers confirmed by the Senate are expressly prohibited for a period of 2 years after terminating an affected position from engaging in any procurement activity relating to the State agency most recently employing them in an affected position for a period of at least 6 months. The prohibition includes, but is not limited to: lobbying the procurement process; specifying; bidding; proposing bid, proposal, or contract documents; on their own behalf or on behalf of any firm, partnership, association, or corporation. This Section applies only to persons who terminate an affected position on or after January 15, 1999.

The bidder assures the Department that the award and execution of the contract would not cause a violation of Section 50-30, and that the bidder has no knowledge of any facts relevant to the kinds of acts prohibited therein.

### **E. Reporting Anticompetitive Practices**

Section 50-40. Reporting anticompetitive practices.

When, for any reason, any vendor, bidder, contractor, CPO, SPO, designee, elected official, or State employee suspects collusion or other anticompetitive practice among any bidders, offerors, contractors, proposers, or employees of the State, a notice of the relevant facts shall be transmitted to the Attorney General and the CPO.

The bidder assures the Department that it has not failed to report any relevant facts concerning the practices addressed in Section 50-40 which may involve the contract for which the bid or submission to a vendor portal is submitted.

### **F. Confidentiality**

Section 50-45. Confidentiality.

Any CPO, SPO, designee, or executive officer who willfully uses or allows the use of specifications, competitive bid documents, proprietary competitive information, proposals, contracts, or selection information to compromise the fairness or integrity of the procurement, bidding, or contract process shall be subject to immediate dismissal, regardless of the Personnel code, any contract, or any collective bargaining agreement, and may in addition be subject to criminal prosecution.

The bidder assures the Department that it has no knowledge of any fact relevant to the practices addressed in Section 50-45 which may involve the contract for which the bid is submitted.

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### G. Insider Information

Section 50-50. Insider information.

It is unlawful for any current or former elected or appointed State official or State employee to knowingly use confidential information available only by virtue of that office or employment for actual or anticipated gain for themselves or another person.

The bidder assures the Department that it has no knowledge of any facts relevant to the practices addressed in Section 50-50 which may involve the contract for which the bid is submitted.

I acknowledge, understand and accept these terms and conditions for the above assurances.

### III. CERTIFICATIONS

The certifications hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. Section 50-2 of the Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible CPO whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

#### A. Bribery

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 2012.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50-5.

#### B. Felons

Section 50-10. Felons.

(a) Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

(b) Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code and every vendor's submission to a vendor portal shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any of the certifications required by this Section are false.

## RETURN WITH BID

### **C. Debt Delinquency**

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the CPO may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

### **D. Prohibited Bidders, Contractors and Subcontractors**

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.

The bidder or contractor or subcontractor, respectively, certifies in accordance with Section 50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

### **E. Section 42 of the Environmental Protection Act**

Section 50-14 Environmental Protection Act violations.

The bidder or contractor or subcontractor, respectively, certifies in accordance with Section 50-14 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the CPO may declare the contract void if this certification is false.

### **F. Educational Loan**

Section 3 of the Educational Loan Default Act, 5 ILCS 385/3.

Pursuant to the Educational Loan Default Act no State agency shall contract with an individual for goods or services if that individual is in default on an educational loan.

The bidder, if an individual as opposed to a corporation, partnership or other form of business organization, certifies that the bidder is not in default on an educational loan as provided in Section 3 of the Act.

### **G. Bid-Rigging/Bid Rotating**

Section 33E-11 of the Criminal Code of 2012, 720 ILCS 5/3BE-11.

(a) Every bid submitted to and public contract executed pursuant to such bid by the State or a unit of local government shall contain a certification by the prime contractor that the prime contractor is not barred from contracting with any unit of State or local government as a result of a violation of either Section 33E-3 or 33E-4 of this Article.

(b) A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

A violation of Section 33E-3 would be represented by a conviction of the crime of bid-rigging which, in addition to Class 3 felony sentencing, provides that any person convicted of this offense or any similar offense of any state or the United States which contains the same elements as this offense shall be barred for 5 years from the date of conviction from contracting with any unit of State or local government. No corporation shall be barred from contracting with any unit of State or local government as a result of a conviction under this Section of any employee or agent of such corporation if the employee so convicted is no longer employed by the corporation and: (1) it has been finally adjudicated not guilty or (2) if it demonstrates to the governmental entity with which it seeks to contract and that entity finds that the commission of the offense was neither authorized, requested, commanded, nor performed by a director, officer or a high managerial agent in behalf of the corporation.

The bidder certifies that it is not barred from contracting with the Department by reason of a violation of either Section 33E-3 or Section 33E-4.

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### **H. International Anti-Boycott**

Section 5 of the International Anti-Boycott Certification Act provides every contract entered into by the State of Illinois for the manufacture, furnishing, or purchasing of supplies, material, or equipment or for the furnishing of work, labor, or services, in an amount exceeding the threshold for small purchases according to the purchasing laws of this State or \$10,000.00, whichever is less, shall contain certification, as a material condition of the contract, by which the contractor agrees that neither the contractor nor any substantially-owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the U.S. Export Administration Act of 1979 or the regulations of the U.S. Department of Commerce promulgated under that Act.

The bidder makes the certification set forth in Section 5 of the Act.

### **I. Drug Free Workplace**

The Illinois "Drug Free Workplace Act" applies to this contract and it is necessary to comply with the provisions of the "Act" if the contractor is a corporation, partnership, or other entity (including a sole proprietorship) which has 25 or more employees.

The bidder certifies that if awarded a contract in excess of \$5,000 it will provide a drug free workplace in compliance with the provisions of the Act.

### **J. Disclosure of Business Operations in Iran**

Section 50-36 of the Code provides that each bid, offer, or proposal submitted for a State contract shall include a disclosure of whether or not the Company acting as the bidder, offeror, or proposing entity, or any of its corporate parents or subsidiaries, within the 24 months before submission of the bid, offer, or proposal had business operations that involved contracts with or provision of supplies or services to the Government of Iran, companies in which the Government of Iran has any direct or indirect equity share, consortiums or projects commissioned by the Government of Iran, or companies involved in consortiums or projects commissioned by the Government of Iran and either of the following conditions apply:

- (1) More than 10% of the Company's revenues produced in or assets located in Iran involve oil-related activities or mineral-extraction activities; less than 75% of the Company's revenues produced in or assets located in Iran involve contracts with or provision of oil-related or mineral-extraction products or services to the Government of Iran or a project or consortium created exclusively by that government; and the Company has failed to take substantial action.
- (2) The Company has, on or after August 5, 1996, made an investment of \$20 million or more, or any combination of investments of at least \$10 million each that in the aggregate equals or exceeds \$20 million in any 12-month period, which directly or significantly contributes to the enhancement of Iran's ability to develop petroleum resources of Iran.

The terms "Business operations", "Company", "Mineral-extraction activities", "Oil-related activities", "Petroleum resources", and "Substantial action" are all defined in the Code.

Failure to make the disclosure required by the Code may cause the bid, offer or proposal to be considered not responsive. The disclosure will be considered when evaluating the bid or awarding the contract. The name of each Company disclosed as doing business or having done business in Iran will be provided to the State Comptroller.

Check the appropriate statement:

Company has no business operations in Iran to disclose.

Company has business operations in Iran as disclosed on the attached document.



## RETURN WITH BID

### **K. Apprenticeship and Training Certification (Does not apply to federal aid projects)**

In accordance with the provisions of Section 30-22 (6) of the Code, the bidder certifies that it is a participant, either as an individual or as part of a group program, in the approved apprenticeship and training programs applicable to each type of work or craft that the bidder will perform with its own forces. The bidder further certifies for work that will be performed by subcontract that each of its subcontractors submitted for approval either (a) is, at the time of such bid, participating in an approved, applicable apprenticeship and training program; or (b) will, prior to commencement of performance of work pursuant to this contract, begin participation in an approved apprenticeship and training program applicable to the work of the subcontract. The Department, at any time before or after award, may require the production of a copy of each applicable Certificate of Registration issued by the United States Department of Labor evidencing such participation by the contractor and any or all of its subcontractors. Applicable apprenticeship and training programs are those that have been approved and registered with the United States Department of Labor. The bidder shall list in the space below, the official name of the program sponsor holding the Certificate of Registration for all of the types of work or crafts in which the bidder is a participant and that will be performed with the bidder's forces. Types of work or craft work that will be subcontracted shall be included and listed as subcontract work. The list shall also indicate any type of work or craft job category that does not have an applicable apprenticeship or training program. **The bidder is responsible for making a complete report and shall make certain that each type of work or craft job category that will be utilized on the project as reported on the Construction Employee Workforce Projection (Form BC-1256) and returned with the bid is accounted for and listed.**

Additionally, Section 30-22 of the Code requires that the bidder certify that an Illinois office be maintained as the primary place of employment for persons employed for this contract.

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The requirements of these certifications and disclosures are a material part of the contract, and the contractor shall require these certification provisions to be included in all approved subcontracts. In order to fulfill this requirement, it shall not be necessary that an applicable program sponsor be currently taking, or that it will take applications for apprenticeship, training or employment during the performance of the work of this contract.

**RETURN WITH BID**

**L. Political Contributions and Registration with the State Board of Elections**

Sections 20-160 and 50-37 of the Code regulate political contributions from business entities and any affiliated entities or affiliated persons bidding on or contracting with the state. Generally under Section 50-37, any business entity, and any affiliated entity or affiliated person of the business entity, whose current year contracts with all state agencies exceed an awarded value of \$50,000, are prohibited from making any contributions to any political committees established to promote the candidacy of the officeholder responsible for the awarding of the contracts or any other declared candidate for that office for the duration of the term of office of the incumbent officeholder or a period 2 years after the termination of the contract, whichever is longer. Any business entity and affiliated entities or affiliated persons whose state contracts in the current year do not exceed an awarded value of \$50,000, but whose aggregate pending bids and proposals on state contracts exceed \$50,000, either alone or in combination with contracts not exceeding \$50,000, are prohibited from making any political contributions to any political committee established to promote the candidacy of the officeholder responsible for awarding the pending contract during the period beginning on the date the invitation for bids or request for proposals or any other procurement opportunity is issued and ending on the day after the date of award or selection if the entity was not awarded or selected. Section 20-160 requires certification of registration of affected business entities in accordance with procedures found in Section 9-35 of The Election Code.

By submission of a bid, the contractor business entity acknowledges and agrees that it has read and understands Sections 20-160 and 50-37 of the Code, and that it makes the following certification:

**The undersigned bidder certifies that it has registered as a business with the State Board of Elections and acknowledges a continuing duty to update the registration in accordance with the above referenced statutes. If the business entity is required to register, the CPO shall verify that it is in compliance on the date the bid or proposal is due. The CPO shall not accept a bid or proposal if the business entity is not in compliance with the registration requirements.**

These requirements and compliance with the above referenced statutory sections are a material part of the contract, and any breach thereof shall be cause to void the contract under Section 50-60 of the Code. This provision does not apply to Federal-aid contracts.

**M. Lobbyist Disclosure**

Section 50-38 of the Code requires that any bidder or offeror on a State contract that hires a person required to register under the Lobbyist Registration Act to assist in obtaining a contract shall:

- (i) Disclose all costs, fees, compensation, reimbursements, and other remunerations paid or to be paid to the lobbyist related to the contract,
- (ii) Not bill or otherwise cause the State of Illinois to pay for any of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration, and
- (iii) Sign a verification certifying that none of the lobbyist's costs, fees, compensation, reimbursements, or other remuneration were billed to the State.

This information, along with all supporting documents, shall be filed with the agency awarding the contract and with the Secretary of State. The CPO shall post this information, together with the contract award notice, in the online Procurement Bulletin.

Pursuant to Subsection (c) of this Section, no person or entity shall retain a person or entity to attempt to influence the outcome of a procurement decision made under the Code for compensation contingent in whole or in part upon the decision or procurement. Any person who violates this subsection is guilty of a business offense and shall be fined not more than \$10,000.

Bidder acknowledges that it is required to disclose the hiring of any person required to register pursuant to the Illinois Lobbyist Registration Act (25 ILCS 170) in connection with this contract.

Bidder has not hired any person required to register pursuant to the Illinois Lobbyist Registration Act in connection with this contract.

Or

Bidder has hired the following persons required to register pursuant to the Illinois Lobbyist Registration Act in connection with the contract:

Name and address of person: \_\_\_\_\_  
All costs, fees, compensation, reimbursements and other remuneration paid to said person: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I acknowledge, understand and accept these terms and conditions for the above certifications.

## RETURN WITH BID

### IV. DISCLOSURES

- A. The disclosures hereinafter made by the bidder are each a material representation of fact upon which reliance is placed should the Department enter into the contract with the bidder. The bidder further certifies that the Department has received the disclosure forms for each bid.

The CPO may void the bid, or contract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be suspended or debarred for violations of the Code. Furthermore, the CPO may void the contract and the surety providing the performance bond shall be responsible for completion of the contract.

### B. Financial Interests and Conflicts of Interest

1. Section 50-35 of the Code provides that all bids of more than \$50,000 and all submissions to a vendor portal shall be accompanied by disclosure of the financial interests of the bidder. This disclosed information for the successful bidder, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the contract. Furthermore, pursuant to Section 5-5, the Procurement Policy Board may review a proposal, bid, or contract and issue a recommendation to void a contract or reject a proposal or bid based on any violation of the Code or the existence of a conflict of interest as provided in subsections (b) and (d) of Section 50-35.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the bidding entity or its parent entity, whichever is less, unless the contractor or bidder is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each individual making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each individual making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.

**The current annual salary of the Governor is \$177,412.00.**

In addition, all disclosures shall indicate any other current or pending contracts, proposals, leases, or other ongoing procurement relationships the bidding entity has with any other unit of state government and shall clearly identify the unit and the contract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. A separate Disclosure Form A must be submitted with the bid for each individual meeting the above requirements. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies and a total ownership certification. **The forms must be included with each bid.**

### C. Disclosure Form Instructions

#### Form A Instructions for Financial Information & Potential Conflicts of Interest

If the bidder is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a bidder is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. If a bidder is not subject to Federal 10K reporting, the bidder must determine if any individuals are required by law to complete a financial disclosure form. To do this, the bidder should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the NOT APPLICABLE STATEMENT on Form A must be signed and dated by an individual that is authorized to execute contracts for the bidding company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES \_\_\_ NO \_\_\_
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the bidding entity's or parent entity's distributive income? YES \_\_\_ NO \_\_\_
4. Does anyone in your organization receive greater than 5% of the bidding entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_

(Note: Only one set of forms needs to be completed per individual per bid even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The bidder must determine each individual in the bidding entity or the bidding entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by an individual that is authorized to execute contracts for your organization. The individual signing can be, but does not have to be, the individual for which the form is being completed. The bidder is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the NOT APPLICABLE STATEMENT of Form A must be signed and dated by an individual that is authorized to execute contracts for your company.

## RETURN WITH BID

### **Form B: Instructions for Identifying Other Contracts & Procurement Related Information**

Disclosure Form B must be completed for each bid submitted by the bidding entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the bidder to ignore Form B. Form B must be completed, checked, and dated or the bidder may be considered nonresponsive and the bid will not be accepted.*

The Bidder shall identify, by checking Yes or No on Form B, whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the bidder only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the bidder must do one of the following:

Option I: If the bidder did not submit an Affidavit of Availability to obtain authorization to bid, the bidder must list all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Do not include IDOT contracts. Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included. Bidders who submit Affidavits of Availability are suggested to use Option II.

Option II: If the bidder is required and has submitted an Affidavit of Availability in order to obtain authorization to bid, the bidder may write or type "See Affidavit of Availability" which indicates that the Affidavit of Availability is incorporated by reference and includes all non-IDOT State of Illinois agency pending contracts, leases, bids, proposals, and other ongoing procurement relationships. For any contracts that are not covered by the Affidavit of Availability, the bidder must identify them on Form B or on an attached sheet(s). These might be such things as leases.

RETURN WITH BID

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form A Financial Information & Potential Conflicts of Interest Disclosure

Contractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). Vendors desiring to enter into a contract with the State of Illinois must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form. This information shall become part of the publicly available contract file. This Form A must be completed for bids in excess of \$50,000, and for all open-ended contracts. A publicly traded company may submit a 10K disclosure (or equivalent if applicable) in satisfaction of the requirements set forth in Form A. See Disclosure Form Instructions.

The current annual salary of the Governor is \$177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

- 1. Disclosure of Financial Information. The individual named below has an interest in the BIDDER (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor. (Make copies of this form as necessary and attach a separate Disclosure Form A for each individual meeting these requirements)

FOR INDIVIDUAL (type or print information) NAME: ADDRESS Type of ownership/distributable income share: stock sole proprietorship Partnership other: (explain on separate sheet): % or \$ value of ownership/distributable income share:

- 2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services. Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

- 1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes \_\_\_ No \_\_\_
2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor provide the name the State agency for which you are employed and your annual salary.

**RETURN WITH BID**

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor? Yes \_\_\_ No \_\_\_
4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15% in aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes \_\_\_ No \_\_\_

---

(b) State employment of spouse, father, mother, son, or daughter, including contractual employment for services in the previous 2 years.

Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority? Yes \_\_\_ No \_\_\_
2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of the spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. \_\_\_\_\_
- 
3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess 100% of the annual salary of the Governor? Yes \_\_\_ No \_\_\_
4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or any minor children entitled to receive (i) more than 15% in the aggregate of the total distributable income from your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor? Yes \_\_\_ No \_\_\_

---

(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years. Yes \_\_\_ No \_\_\_

---

(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

---

(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United State of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years. Yes \_\_\_ No \_\_\_

---

(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

---

(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government. Yes \_\_\_ No \_\_\_

---

**RETURN WITH BID**

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

---

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

---

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

---

**3. Communication Disclosure.**

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**RETURN WITH BID**

**4. Suspension or Debarment Disclosure.** For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: suspension or debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): \_\_\_\_\_

Nature of disclosure: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**APPLICABLE STATEMENT**

**This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.**

Completed by:  \_\_\_\_\_ Date \_\_\_\_\_  
Signature of Individual or Authorized Representative

**NOT APPLICABLE STATEMENT**

**Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.**

**This Disclosure Form A is submitted on behalf of the CONTRACTOR listed on the previous page.**

\_\_\_\_\_ Date \_\_\_\_\_  
Signature of Authorized Representative

The bidder has a continuing obligation to supplement these disclosures under Sec. 50-35 of the Code.



RETURN WITH BID

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B Other Contracts & Financial Related Information Disclosure

Contractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). This information shall become part of the publicly available contract file. This Form B must be completed for all bids.

DISCLOSURE OF OTHER CONTRACTS AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The BIDDER shall identify whether it has any pending contracts (including leases), bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes \_\_\_ No \_\_\_

If "No" is checked, the bidder only needs to complete the signature box on this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

Signature of Authorized Representative, Date

OWNERSHIP CERTIFICATION

Please certify that the following statement is true if the individuals for all submitted Form A disclosures do not total 100% of ownership.

Any remaining ownership interest is held by individuals receiving less than \$106,447.20 of the bidding entity's or parent entity's distributive income or holding less than a 5% ownership interest.

Yes No N/A (Form A disclosure(s) established 100% ownership)

## **RETURN WITH BID**

### **SPECIAL NOTICE TO CONTRACTORS**

The following requirements of the Illinois Department of Human Rights Act are applicable to bidders on all construction contracts advertised by the Illinois Department of Transportation:

#### **CONSTRUCTION EMPLOYEE UTILIZATION PROJECTION**

- (a) All bidders on construction contracts shall complete and submit, along with and as part of their bids, a Bidder's Employee Utilization Form (Form BC-1256) setting forth a projection and breakdown of the total workforce intended to be hired and/or allocated to such contract work by the bidder including a projection of minority and female employee utilization in all job classifications on the contract project.
- (b) The Department of Transportation shall review the Employee Utilization Form, and workforce projections contained therein, of the contract awardee to determine if such projections reflect an underutilization of minority persons and/or women in any job classification in accordance with the Equal Employment Opportunity Clause and Title 44, Illinois Administrative Code, Section 750.120. If it is determined that the contract awardee's projections reflect an underutilization of minority persons and/or women in any job classification, it shall be advised in writing of the manner in which it is underutilizing and such awardee shall be considered to be in breach of the contract unless, prior to commencement of work on the contract project, it submits revised satisfactory projections or an acceptable written affirmative action plan to correct such underutilization including a specific timetable geared to the completion stages of the contract.
- (c) The Department of Transportation shall provide to the Department of Human Rights a copy of the contract awardee's Employee Utilization Form, a copy of any required written affirmative action plan, and any written correspondence related thereto. The Department of Human Rights may review and revise any action taken by the Department of Transportation with respect to these requirements.



**RETURN WITH BID**

**Contract No. 61C74  
COOK County  
Section 13-00136-00-RR (Maywood)  
Project CMM-4003(277)  
Route MAIN STREET (Maywood Commuter Station)  
District 1 Construction Funds**

**PART II. WORKFORCE PROJECTION - continued**

- B. Included in "Total Employees" under Table A is the total number of **new hires** that would be employed in the event the undersigned bidder is awarded this contract.

The undersigned bidder projects that: (number) \_\_\_\_\_ new hires would be recruited from the area in which the contract project is located; and/or (number) \_\_\_\_\_ new hires would be recruited from the area in which the bidder's principal office or base of operation is located.

- C. Included in "Total Employees" under Table A is a projection of numbers of persons to be employed directly by the undersigned bidder as well as a projection of numbers of persons to be employed by subcontractors.

The undersigned bidder estimates that (number) \_\_\_\_\_ persons will be directly employed by the prime contractor and that (number) \_\_\_\_\_ persons will be employed by subcontractors.

**PART III. AFFIRMATIVE ACTION PLAN**

- A. The undersigned bidder understands and agrees that in the event the foregoing minority and female employee utilization projection included under **PART II** is determined to be an underutilization of minority persons or women in any job category, and in the event that the undersigned bidder is awarded this contract, he/she will, prior to commencement of work, develop and submit a written Affirmative Action Plan including a specific timetable (geared to the completion stages of the contract) whereby deficiencies in minority and/or female employee utilization are corrected. Such Affirmative Action Plan will be subject to approval by the contracting agency and the **Illinois Department of Human Rights**.
- B. The undersigned bidder understands and agrees that the minority and female employee utilization projection submitted herein, and the goals and timetable included under an Affirmative Action Plan if required, are deemed to be part of the contract specifications.

Company \_\_\_\_\_ Telephone Number \_\_\_\_\_

Address \_\_\_\_\_

**NOTICE REGARDING SIGNATURE**

The Bidder's signature on the Proposal Signature Sheet will constitute the signing of this form. The following signature block needs to be completed only if revisions are required.

Signature:  \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

- Instructions: All tables must include subcontractor personnel in addition to prime contractor personnel.
- Table A - Include both the number of employees that would be hired to perform the contract work and the total number currently employed (Table B) that will be allocated to contract work, and include all apprentices and on-the-job trainees. The "Total Employees" column should include all employees including all minorities, apprentices and on-the-job trainees to be employed on the contract work.
- Table B - Include all employees currently employed that will be allocated to the contract work including any apprentices and on-the-job trainees currently employed.
- Table C - Indicate the racial breakdown of the total apprentices and on-the-job trainees shown in Table A.

**RETURN WITH BID**

**ADDITIONAL FEDERAL REQUIREMENTS**

In addition to the Required Contract Provisions for Federal-Aid Construction Contracts (FHWA 1273), all bidders make the following certifications.

- A. By the execution of this proposal, the signing bidder certifies that the bidding entity has not, either 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 submitted bid. This statement made by the undersigned bidder is true and correct under penalty of perjury under the laws of the United States.
- B. CERTIFICATION, EQUAL EMPLOYMENT OPPORTUNITY:
1. Have you participated in any previous contracts or subcontracts subject to the equal opportunity clause. YES \_\_\_\_\_ NO \_\_\_\_\_
  2. If answer to #1 is yes, have you filed with the Joint Reporting Committee, the Director of OFCC, any Federal agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements of those organizations?  
YES \_\_\_\_\_ NO \_\_\_\_\_

**RETURN WITH BID**

**Contract No. 61C74  
COOK County  
Section 13-00136-00-RR (Maywood)  
Project CMM-4003(277)  
Route MAIN STREET (Maywood Commuter Station)  
District 1 Construction Funds**

PROPOSAL SIGNATURE SHEET

The undersigned bidder hereby makes and submits this bid on the subject Proposal, thereby assuring the Department that all requirements of the Invitation for Bids and rules of the Department have been met, that there is no misunderstanding of the requirements of paragraph 3 of this Proposal, and that the contract will be executed in accordance with the rules of the Department if an award is made on this bid.

(IF AN INDIVIDUAL)

Firm Name \_\_\_\_\_  
Signature of Owner \_\_\_\_\_  
Business Address \_\_\_\_\_  
\_\_\_\_\_

(IF A CO-PARTNERSHIP)

Firm Name \_\_\_\_\_  
By \_\_\_\_\_  
Business Address \_\_\_\_\_  
Name and Address of All Members of the Firm:  
\_\_\_\_\_  
\_\_\_\_\_

(IF A CORPORATION)

Corporate Name \_\_\_\_\_  
By \_\_\_\_\_  
Signature of Authorized Representative \_\_\_\_\_  
Typed or printed name and title of Authorized Representative \_\_\_\_\_

(IF A JOINT VENTURE, USE THIS SECTION FOR THE MANAGING PARTY AND THE SECOND PARTY SHOULD SIGN BELOW)

Attest \_\_\_\_\_  
Signature \_\_\_\_\_  
Business Address \_\_\_\_\_

(IF A JOINT VENTURE)

Corporate Name \_\_\_\_\_  
By \_\_\_\_\_  
Signature of Authorized Representative \_\_\_\_\_  
Typed or printed name and title of Authorized Representative \_\_\_\_\_

Attest \_\_\_\_\_  
Signature \_\_\_\_\_  
Business Address \_\_\_\_\_

If more than two parties are in the joint venture, please attach an additional signature sheet.



This Annual Proposal Bid Bond shall become effective at 12:01 AM (CDST) on \_\_\_\_\_ and shall be valid until \_\_\_\_\_ 11:59 PM (CDST).

KNOW ALL PERSONS BY THESE PRESENTS, That We \_\_\_\_\_

as PRINCIPAL, and \_\_\_\_\_

as SURETY, and held jointly, severally and firmly bound unto the STATE OF ILLINOIS in the penal sum of 5 percent of the total bid price, or for the amount specified in the bid proposal under "Proposal Guaranty" in effect on the date of the Invitation for Bids, whichever is the lesser sum, well and truly to be paid unto said STATE OF ILLINOIS, for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that whereas, the PRINCIPAL may submit bid proposal(s) to the STATE OF ILLINOIS, acting through the Department of Transportation, for various improvements published in the Transportation Bulletin during the effective term indicated above.

NOW, THEREFORE, if the Department shall accept the bid proposal(s) of the PRINCIPAL; and if the PRINCIPAL shall, within the time and as specified in the bidding and contract documents; and if, after award by the Department, the PRINCIPAL shall enter into a contract in accordance with the terms of the bidding and contract documents including evidence of the required insurance coverages and providing such bond as specified with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof; or if, in the event of the failure of the PRINCIPAL to enter into such contract and to give the specified bond, the PRINCIPAL pays to the Department the difference not to exceed the penalty hereof between the amount specified in the bid proposal and such larger amount for which the Department may contract with another party to perform the work covered by said bid proposal, then this obligation shall be null and void, otherwise, it shall remain in full force and effect.

IN THE EVENT the Department determines the PRINCIPAL has failed to comply with any requirement as set forth in the preceding paragraph, then Surety shall pay the penal sum to the Department within fifteen (15) days of written demand therefor. If Surety does not make full payment within such period of time, the Department may bring an action to collect the amount owed. Surety is liable to the Department for all its expenses, including attorney's fees, incurred in any litigation in which it prevails either in whole or in part.

In TESTIMONY WHEREOF, the said PRINCIPAL has caused this instrument to be signed by its officer \_\_\_\_\_ day of \_\_\_\_\_ A.D., \_\_\_\_\_

In TESTIMONY WHEREOF, the said SURETY has caused this instrument to be signed by its officer \_\_\_\_\_ day of \_\_\_\_\_ A.D., \_\_\_\_\_

\_\_\_\_\_  
(Company Name)

\_\_\_\_\_  
(Company Name)

By \_\_\_\_\_  
(Signature and Title)

By \_\_\_\_\_  
(Signature of Attorney-in-Fact)

**Notary for PRINCIPAL**

**Notary for SURETY**

STATE OF \_\_\_\_\_  
COUNTY OF \_\_\_\_\_

STATE OF \_\_\_\_\_  
COUNTY OF \_\_\_\_\_

Signed and attested before me on \_\_\_\_\_ (date)

Signed and attested before me on \_\_\_\_\_ (date)

by \_\_\_\_\_  
(Name of Notary Public)

by \_\_\_\_\_  
(Name of Notary Public)

(Seal) \_\_\_\_\_  
(Signature of Notary Public)

(Seal) \_\_\_\_\_  
(Signature of Notary Public)

\_\_\_\_\_  
(Date Commission Expires)

\_\_\_\_\_  
(Date Commission Expires)

In lieu of completing the above section of the Annual Proposal Bid Bond form, the Principal may file an Electronic Bid Bond. By signing the proposal(s) the Principal is ensuring the identified electronic bid bond has been executed and the Principal and Surety are firmly bound unto the State of Illinois under the conditions of the bid bond as shown above.

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Electronic Bid Bond ID #	Company/Bidder Name	Signature and Title
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This bond may be terminated, at Surety's request, upon giving not less than thirty (30) days prior written notice of the cancellation/termination of the bond. Said written notice shall be issued to the Illinois Department of Transportation, Chief Contracts Official, 2300 South Dirksen Parkway, Springfield, Illinois, 62764, and shall be served in person, by receipted courier delivery or certified or registered mail, return receipt requested. Said notice period shall commence on the first calendar day following the Department's receipt of written cancellation/termination notice. Surety shall remain firmly bound to all obligations herein for proposals submitted prior to the cancellation/termination. Surety shall be released and discharged from any obligation(s) for proposals submitted for any letting or date after the effective date of cancellation/termination.





Return with Bid

Division of Highways
Proposal Bid Bond

Item No. \_\_\_\_\_

Letting Date \_\_\_\_\_

KNOW ALL PERSONS BY THESE PRESENTS, That We \_\_\_\_\_

as PRINCIPAL, and \_\_\_\_\_

as SURETY, and held jointly, severally and firmly bound unto the STATE OF ILLINOIS in the penal sum of 5 percent of the total bid price, or for the amount specified in the bid proposal under "Proposal Guaranty" in effect on the date of the Invitation for Bids, whichever is the lesser sum, well and truly to be paid unto said STATE OF ILLINOIS, for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns.

THE CONDITION OF THE FOREGOING OBLIGATION IS SUCH that whereas, the PRINCIPAL has submitted a bid proposal to the STATE OF ILLINOIS, acting through the Department of Transportation, for the improvement designated by the Transportation Bulletin Item Number and Letting Date indicated above.

NOW, THEREFORE, if the Department shall accept the bid proposal of the PRINCIPAL; and if the PRINCIPAL shall, within the time and as specified in the bidding and contract documents; and if, after award by the Department, the PRINCIPAL shall enter into a contract in accordance with the terms of the bidding and contract documents including evidence of the required insurance coverages and providing such bond as specified with good and sufficient surety for the faithful performance of such contract and for the prompt payment of labor and material furnished in the prosecution thereof; or if, in the event of the failure of the PRINCIPAL to enter into such contract and to give the specified bond, the PRINCIPAL pays to the Department the difference not to exceed the penalty hereof between the amount specified in the bid proposal and such larger amount for which the Department may contract with another party to perform the work covered by said bid proposal, then this obligation shall be null and void, otherwise, it shall remain in full force and effect.

IN THE EVENT the Department determines the PRINCIPAL has failed to comply with any requirement as set forth in the preceding paragraph, then Surety shall pay the penal sum to the Department within fifteen (15) days of written demand therefor. If Surety does not make full payment within such period of time, the Department may bring an action to collect the amount owed. Surety is liable to the Department for all its expenses, including attorney's fees, incurred in any litigation in which it prevails either in whole or in part.

In TESTIMONY WHEREOF, the said PRINCIPAL has caused this instrument to be signed by its officer \_\_\_\_\_ day of \_\_\_\_\_ A.D., \_\_\_\_\_

In TESTIMONY WHEREOF, the said SURETY has caused this instrument to be signed by its officer \_\_\_\_\_ day of \_\_\_\_\_ A.D., \_\_\_\_\_

(Company Name)

(Company Name)

By \_\_\_\_\_ (Signature and Title)

By \_\_\_\_\_ (Signature of Attorney-in-Fact)

Notary for PRINCIPAL

Notary for SURETY

STATE OF \_\_\_\_\_
COUNTY OF \_\_\_\_\_

STATE OF \_\_\_\_\_
COUNTY OF \_\_\_\_\_

Signed and attested before me on \_\_\_\_\_ (date)
by \_\_\_\_\_

Signed and attested before me on \_\_\_\_\_ (date)
by \_\_\_\_\_

(Name of Notary Public)

(Name of Notary Public)

(Seal) \_\_\_\_\_ (Signature of Notary Public)

(Seal) \_\_\_\_\_ (Signature of Notary Public)

(Date Commission Expires)

(Date Commission Expires)

In lieu of completing the above section of the Proposal Bid Bond form, the Principal may file an Electronic Bid Bond. By signing the proposal the Principal is ensuring the identified electronic bid bond has been executed and the Principal and Surety are firmly bound unto the State of Illinois under the conditions of the bid bond as shown above.

Electronic Bid Bond ID # \_\_\_\_\_ Company/Bidder Name \_\_\_\_\_ Signature and Title \_\_\_\_\_

**(1) Policy**

It is public policy that disadvantageded businesses as defined in 49 CFR Part 26 and the Special Provision shall have the maximum opportunity to participate in the performance of contracts financed in whole or in part with Federal or State funds. Consequently the requirements of 49 CFR Part 26 apply to this contract.

**(2) Obligation**

The contractor agrees to ensure that disadvantageded businesses as defined in 49 CFR Part 26 and the Special Provision have the maximum opportunity to participate in the performance of contracts or subcontracts financed in whole or in part with Federal or State funds. The contractor shall take all necessary and reasonable steps in accordance with 49 CFR Part 26 and the Special Provision to ensure that said businesses have the maximum opportunity to compete for and perform under this contract. The contractor shall not discriminate on the basis of race, color, national origin or sex in the award and performance of contracts.

**(3) Project and Bid Identification**

Complete the following information concerning the project and bid:

Route _____	Total Bid _____
Section _____	Contract DBE Goal _____ (Percent) _____ (Dollar Amount)
Project _____	
County _____	
Letting Date _____	
Contract No. _____	
Letting Item No. _____	

**(4) Assurance**

I, acting in my capacity as an officer of the undersigned bidder (or bidders if a joint venture), hereby assure the Department that on this project my company : (check one)

- Meets or exceeds contract award goals and has provided documented participation as follows:  
Disadvantaged Business Participation \_\_\_\_\_ percent

Attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

- Failed to meet contract award goals and has included good faith effort documentation to meet the goals and that my company has provided participation as follows:

Disadvantaged Business Participation \_\_\_\_\_ percent

The contract goals should be accordingly modified or waived. Attached is all information required by the Special Provision in support of this request including good faith effort. Also attached are the signed participation statements, forms SBE 2025, required by the Special Provision evidencing availability and use of each business participating in this plan and assuring that each business will perform a commercially useful function in the work of the contract.

\_\_\_\_\_  
Company

By \_\_\_\_\_

Title \_\_\_\_\_

Date \_\_\_\_\_

The "as read" Low Bidder is required to comply with the Special Provision.

Submit only one utilization plan for each project. The utilization plan shall be submitted in accordance with the special provision.

Bureau of Small Business Enterprises  
2300 South Dirksen Parkway  
Springfield, Illinois 62764

**Local Let Projects**  
Submit forms to the  
Local Agency



# PROPOSAL ENVELOPE



## PROPOSALS

for construction work advertised for bids by the  
Illinois Department of Transportation

Item No.	Item No.	Item No.

Submitted By:

Name:
Address:
Phone No.

Bidders should use an IDOT proposal envelope or affix this form to the front of a 10" x 13" envelope for the submittal of bids. If proposals are mailed, they should be enclosed in a second or outer envelope addressed to:

Engineer of Design and Environment - Room 326  
Illinois Department of Transportation  
2300 South Dirksen Parkway  
Springfield, Illinois 62764

### **NOTICE**

**Individual bids, including Bid Bond and/or supplemental information if required, should be securely stapled.**

# CONTRACTOR OFFICE COPY OF CONTRACT SPECIFICATIONS

## NOTICE

None of the following material needs to be returned with the bid package unless the special provisions require documentation and/or other information to be submitted.

**Contract No. 61C74  
COOK County  
Section 13-00136-00-RR (Maywood)  
Project CMM-4003(277)  
Route MAIN STREET (Maywood Commuter Station)  
District 1 Construction Funds**



**Illinois Department of Transportation**

## **SUBCONTRACTOR DOCUMENTATION**

Public Acts 96-0795, 96-0920, and 97-0895 enacted substantial changes to the provisions of the Code (30 ILCS 500). Among the changes are provisions affecting subcontractors. The Contractor awarded this contract will be required as a material condition of the contract to implement and enforce the contract requirements applicable to subcontractors that entered into a contractual agreement with a total value of \$50,000 or more with a person or entity who has a contract subject to the Code and approved in accordance with article 108.01 of the Standard Specifications for Road and Bridge Construction.

If the Contractor seeks approval of subcontractors to perform a portion of the work, and approval is granted by the Department, the Contractor shall provide a copy of the subcontract to the Illinois Department of Transportation's CPO upon request within 15 calendar days after execution of the subcontract.

Financial disclosures required pursuant to Sec. 50-35 of the Code must be submitted for all applicable subcontractors. The subcontract shall contain the certifications required to be made by subcontractors pursuant to Article 50 of the Code. This Notice to Bidders includes a document incorporating all required subcontractor certifications and disclosures for use by the Contractor in compliance with this mandate. The document is entitled State Required Ethical Standards Governing Subcontractors.

## RETURN WITH SUBCONTRACT

### STATE ETHICAL STANDARDS GOVERNING SUBCONTRACTORS

Article 50 of the Code establishes the duty of all State CPOs, SPOs, and their designees to maximize the value of the expenditure of public moneys in procuring goods, services, and contracts for the State of Illinois and to act in a manner that maintains the integrity and public trust of State government. In discharging this duty, they are charged by law to use all available information, reasonable efforts, and reasonable actions to protect, safeguard, and maintain the procurement process of the State of Illinois.

The certifications hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed should the Department approve the subcontractor. The CPO may terminate or void the contract approval if it is later determined that the bidder or subcontractor rendered a false or erroneous certification. If a false certification is made by a subcontractor the contractor's submitted bid and the executed contract may not be declared void unless the contractor refuses to terminate the subcontract upon the State's request after a finding that the subcontractor's certification was false.

Section 50-2 of the Code provides that every person that has entered into a multi-year contract and every subcontractor with a multi-year subcontract shall certify, by July 1 of each fiscal year covered by the contract after the initial fiscal year, to the responsible CPO whether it continues to satisfy the requirements of Article 50 pertaining to the eligibility for a contract award. If a contractor or subcontractor is not able to truthfully certify that it continues to meet all requirements, it shall provide with its certification a detailed explanation of the circumstances leading to the change in certification status. A contractor or subcontractor that makes a false statement material to any given certification required under Article 50 is, in addition to any other penalties or consequences prescribed by law, subject to liability under the Whistleblower Reward and Protection Act for submission of a false claim.

#### **A. Bribery**

Section 50-5. Bribery.

(a) Prohibition. No person or business shall be awarded a contract or subcontract under this Code who:

(1) has been convicted under the laws of Illinois or any other state of bribery or attempting to bribe an officer or employee of the State of Illinois or any other state in that officer's or employee's official capacity; or

(2) has made an admission of guilt of that conduct that is a matter of record but has not been prosecuted for that conduct.

(b) Businesses. No business shall be barred from contracting with any unit of State or local government, or subcontracting under such a contract, as a result of a conviction under this Section of any employee or agent of the business if the employee or agent is no longer employed by the business and:

(1) the business has been finally adjudicated not guilty; or

(2) the business demonstrates to the governmental entity with which it seeks to contract, or which is signatory to the contract to which the subcontract relates, and that entity finds that the commission of the offense was not authorized, requested, commanded, or performed by a director, officer, or high managerial agent on behalf of the business as provided in paragraph (2) of subsection (a) of Section 5-4 of the Criminal Code of 2012.

(c) Conduct on behalf of business. For purposes of this Section, when an official, agent, or employee of a business committed the bribery or attempted bribery on behalf of the business and in accordance with the direction or authorization of a responsible official of the business, the business shall be chargeable with the conduct.

(d) Certification. Every bid submitted to and contract executed by the State, and every subcontract subject to Section 20-120 of the Code shall contain a certification by the contractor or the subcontractor, respectively, that the contractor or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any certifications required by this Section are false. A contractor who makes a false statement, material to the certification, commits a Class 3 felony.

The contractor or subcontractor certifies that it is not barred from being awarded a contract under Section 50-5.

#### **B. Felons**

Section 50-10. Felons.

(a) Unless otherwise provided, no person or business convicted of a felony shall do business with the State of Illinois or any State agency, or enter into a subcontract, from the date of conviction until 5 years after the date of completion of the sentence for that felony, unless no person held responsible by a prosecutorial office for the facts upon which the conviction was based continues to have any involvement with the business.

(b) Certification. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder or contractor or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO may declare the related contract void if any of the certifications required by this Section are false.

**RETURN WITH SUBCONTRACT**

**C. Debt Delinquency**

Section 50-11 and 50-12. Debt Delinquency.

The contractor or bidder or subcontractor, respectively, certifies that it, or any affiliate, is not barred from being awarded a contract or subcontract under the Code. Section 50-11 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it knows or should know that it, or any affiliate, is delinquent in the payment of any debt to the State as defined by the Debt Collection Board. Section 50-12 prohibits a person from entering into a contract with a State agency, or entering into a subcontract, if it, or any affiliate, has failed to collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act. The bidder or contractor or subcontractor, respectively, further acknowledges that the CPO may declare the related contract void if this certification is false or if the bidder, contractor, or subcontractor, or any affiliate, is determined to be delinquent in the payment of any debt to the State during the term of the contract.

**D. Prohibited Bidders, Contractors and Subcontractors**

Section 50-10.5 and 50-60(c). Prohibited bidders, contractors and subcontractors.

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-10.5 that no officer, director, partner or other managerial agent of the contracting business has been convicted of a felony under the Sarbanes-Oxley Act of 2002 or a Class 3 or Class 2 felony under the Illinois Securities Law of 1953 or if in violation of Subsection (c) for a period of five years from the date of conviction. Every bid submitted to and contract executed by the State and every subcontract subject to Section 20-120 of the Code shall contain a certification by the bidder, contractor, or subcontractor, respectively, that the bidder, contractor, or subcontractor is not barred from being awarded a contract or subcontract under this Section and acknowledges that the CPO shall declare the related contract void if any of the certifications completed pursuant to this Section are false.

**E. Section 42 of the Environmental Protection Act**

The bidder or contractor or subcontractor, respectively, certifies in accordance with 30 ILCS 500/50-14 that the bidder, contractor, or subcontractor, is not barred from being awarded a contract or entering into a subcontract under this Section which prohibits the bidding on or entering into contracts with the State of Illinois or a State agency, or entering into any subcontract, that is subject to the Code by a person or business found by a court or the Pollution Control Board to have committed a willful or knowing violation of Section 42 of the Environmental Protection Act for a period of five years from the date of the order. The bidder or contractor or subcontractor, respectively, acknowledges that the CPO may declare the contract void if this certification is false.

**The undersigned, on behalf of the subcontracting company, has read and understands the above certifications and makes the certifications as required by law.**

_____ Name of Subcontracting Company		
_____ Authorized Officer	_____ Date	



**RETURN WITH SUBCONTRACT**  
**SUBCONTRACTOR DISCLOSURES**

**I. DISCLOSURES**

- A.** The disclosures hereinafter made by the subcontractor are each a material representation of fact upon which reliance is placed. The subcontractor further certifies that the Department has received the disclosure forms for each subcontract.

The CPO may void the bid, contract, or subcontract, respectively, if it is later determined that the bidder or subcontractor rendered a false or erroneous disclosure. A contractor or subcontractor may be scuspended or debarred for violations of the Code. Furthermore, the CPO may void the contract.

**B. Financial Interests and Conflicts of Interest**

1. Section 50-35 of the Code provides that all subcontracts with a total value of \$50,000 or more, from subcontractors identified in Section 20-120 of the Code, shall be accompanied by disclosure of the financial interests of the subcontractor. This disclosed information for the subcontractor, will be maintained as public information subject to release by request pursuant to the Freedom of Information Act, filed with the Procurement Policy Board, and shall be incorporated as a material term of the Prime Contractor's contract. Furthermore, pursuant to this Section, the Procurement Policy Board may recommend to allow or void a contract or subcontract based on a potential conflict of interest.

The financial interests to be disclosed shall include ownership or distributive income share that is in excess of 5%, or an amount greater than 60% of the annual salary of the Governor, of the subcontracting entity or its parent entity, whichever is less, unless the subcontractor is a publicly traded entity subject to Federal 10K reporting, in which case it may submit its 10K disclosure in place of the prescribed disclosure. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. The disclosure shall include the names, addresses, and dollar or proportionate share of ownership of each individual making the disclosure, their instrument of ownership or beneficial relationship, and notice of any potential conflict of interest resulting from the current ownership or beneficial interest of each individual making the disclosure having any of the relationships identified in Section 50-35 and on the disclosure form.

**The current annual salary of the Governor is \$177,412.00.**

In addition, all disclosures shall indicate any other current or pending contracts, subcontracts, proposals, leases, or other ongoing procurement relationships the subcontracting entity has with any other unit of state government and shall clearly identify the unit and the contract, subcontract, proposal, lease, or other relationship.

2. Disclosure Forms. Disclosure Form A is attached for use concerning the individuals meeting the above ownership or distributive share requirements. A separate Disclosure Form A must be submitted with the bid for each individual meeting the above requirements. In addition, a second form (Disclosure Form B) provides for the disclosure of current or pending procurement relationships with other (non-IDOT) state agencies and a total ownership certification.

**C. Disclosure Form Instructions**

**Form A Instructions for Financial Information & Potential Conflicts of Interest**

If the subcontractor is a publicly traded entity subject to Federal 10K reporting, the 10K Report may be submitted to meet the requirements of Form A. If a subcontractor is a privately held entity that is exempt from Federal 10K reporting, but has more than 100 shareholders, it may submit the information that Federal 10K companies are required to report, and list the names of any individual or entity holding any ownership share that is in excess of 5%. If a subcontractor is not subject to Federal 10K reporting, the subcontractor must determine if any individuals are required by law to complete a financial disclosure form. To do this, the subcontractor should answer each of the following questions. A "YES" answer indicates Form A must be completed. If the answer to each of the following questions is "NO", then the NOT APPLICABLE STATEMENT on the second page of Form A must be signed and dated by an individual that is authorized to execute contracts for the subcontracting company. Note: These questions are for assistance only and are not required to be completed.

1. Does anyone in your organization have a direct or beneficial ownership share of greater than 5% of the bidding entity or parent entity? YES \_\_\_ NO \_\_\_
2. Does anyone in your organization have a direct or beneficial ownership share of less than 5%, but which has a value greater than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_
3. Does anyone in your organization receive more than 60% of the annual salary of the Governor of the subcontracting entity's or parent entity's distributive income? YES \_\_\_ NO \_\_\_

(Note: Distributive income is, for these purposes, any type of distribution of profits. An annual salary is not distributive income.)

4. Does anyone in your organization receive greater than 5% of the subcontracting entity's or parent entity's total distributive income, but which is less than 60% of the annual salary of the Governor? YES \_\_\_ NO \_\_\_

(Note: Only one set of forms needs to be completed per individual per subcontract even if a specific individual would require a yes answer to more than one question.)

A "YES" answer to any of these questions requires the completion of Form A. The subcontractor must determine each individual in the subcontracting entity or the subcontracting entity's parent company that would cause the questions to be answered "Yes". Each form must be signed and dated by an individual that is authorized to execute contracts for your organization. The individual signing can be, but does not have to be, the individual for which the form is being completed. The subcontractor is responsible for the accuracy of any information provided.

If the answer to each of the above questions is "NO", then the NOT APPLICABLE STATEMENT on page 2 of Form A must be signed and dated by an individual that is authorized to execute contracts for your company.

## RETURN WITH SUBCONTRACT

### **Form B: Instructions for Identifying Other Contracts & Procurement Related Information**

Disclosure Form B must be completed for each subcontract submitted by the subcontracting entity. *Note: Checking the NOT APPLICABLE STATEMENT on Form A does not allow the subcontractor to ignore Form B. Form B must be completed, checked, and dated or the subcontract will not be approved.*

The Subcontractor shall identify, by checking Yes or No on Form B, whether it has any pending contracts, subcontracts, leases, bids, proposals, or other ongoing procurement relationship with any other (non-IDOT) State of Illinois agency. If "No" is checked, the subcontractor only needs to complete the check box on the bottom of Form B. If "Yes" is checked, the subcontractor must list all non-IDOT State of Illinois agency pending contracts, subcontracts, leases, bids, proposals, and other ongoing procurement relationships. These items may be listed on Form B or on an attached sheet(s). Contracts with cities, counties, villages, etc. are not considered State of Illinois agency contracts and are not to be included. Contracts or subcontracts with other State of Illinois agencies such as the Department of Natural Resources or the Capital Development Board must be included.

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form A Subcontractor: Financial Information & Potential Conflicts of Interest Disclosure

Subcontractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). Subcontractors desiring to enter into a subcontract of a State of Illinois contract must disclose the financial information and potential conflict of interest information as specified in this Disclosure Form.

The current annual salary of the Governor is \$177,412.00.

DISCLOSURE OF FINANCIAL INFORMATION

1. Disclosure of Financial Information. The individual named below has an interest in the SUBCONTRACTOR (or its parent) in terms of ownership or distributive income share in excess of 5%, or an interest which has a value of more than 60% of the annual salary of the Governor.

FOR INDIVIDUAL (type or print information) NAME: ADDRESS Type of ownership/distributable income share: stock sole proprietorship Partnership other: (explain on separate sheet): % or \$ value of ownership/distributable income share:

2. Disclosure of Potential Conflicts of Interest. Check "Yes" or "No" to indicate which, if any, of the following potential conflict of interest relationships apply. If the answer to any question is "Yes", please attach additional pages and describe.

(a) State employment, currently or in the previous 3 years, including contractual employment of services. Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

1. Are you currently an officer or employee of either the Capitol Development Board or the Illinois State Toll Highway Authority? Yes \_\_\_ No \_\_\_

2. Are you currently appointed to or employed by any agency of the State of Illinois? If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, provide the name the State agency for which you are employed and your annual salary.

**RETURN WITH SUBCONTRACT**

3. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor?  
Yes \_\_\_ No \_\_\_

4. If you are currently appointed to or employed by any agency of the State of Illinois, and your annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?  
Yes \_\_\_ No \_\_\_

---

(b) State employment of spouse, father, mother, son, or daughter, including contractual employment services in the previous 2 years.

Yes \_\_\_ No \_\_\_

If your answer is yes, please answer each of the following questions.

1. Is your spouse or any minor children currently an officer or employee of the Capitol Development Board or the Illinois State Toll Highway Authority?  
Yes \_\_\_ No \_\_\_

2. Is your spouse or any minor children currently appointed to or employed by any agency of the State of Illinois? If your spouse or minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, provide the name of your spouse and/or minor children, the name of the State agency for which he/she is employed and his/her annual salary. \_\_\_\_\_

3. If your spouse or any minor children is/are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you entitled to receive (i) more than 7 1/2% of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of 100% of the annual salary of the Governor?  
Yes \_\_\_ No \_\_\_

4. If your spouse or any minor children are currently appointed to or employed by any agency of the State of Illinois, and his/her annual salary exceeds 60% of the annual salary of the Governor, are you and your spouse or minor children entitled to receive (i) more than 15 % in the aggregate of the total distributable income of your firm, partnership, association or corporation, or (ii) an amount in excess of two times the salary of the Governor?  
Yes \_\_\_ No \_\_\_

---

(c) Elective status; the holding of elective office of the State of Illinois, the government of the United States, any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois currently or in the previous 3 years.  
Yes \_\_\_ No \_\_\_

---

(d) Relationship to anyone holding elective office currently or in the previous 2 years; spouse, father, mother, son, or daughter.  
Yes \_\_\_ No \_\_\_

---

(e) Appointive office; the holding of any appointive government office of the State of Illinois, the United States of America, or any unit of local government authorized by the Constitution of the State of Illinois or the statutes of the State of Illinois, which office entitles the holder to compensation in excess of the expenses incurred in the discharge of that office currently or in the previous 3 years.  
Yes \_\_\_ No \_\_\_

---

(f) Relationship to anyone holding appointive office currently or in the previous 2 years; spouse, father, mother, son, or daughter.  
Yes \_\_\_ No \_\_\_

---

(g) Employment, currently or in the previous 3 years, as or by any registered lobbyist of the State government.  
Yes \_\_\_ No \_\_\_

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**RETURN WITH SUBCONTRACT**

(h) Relationship to anyone who is or was a registered lobbyist in the previous 2 years; spouse, father, mother, son, or daughter. Yes \_\_\_ No \_\_\_

(i) Compensated employment, currently or in the previous 3 years, by any registered election or reelection committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

(j) Relationship to anyone; spouse, father, mother, son, or daughter; who was a compensated employee in the last 2 years by any registered election or re-election committee registered with the Secretary of State or any county clerk of the State of Illinois, or any political action committee registered with either the Secretary of State or the Federal Board of Elections. Yes \_\_\_ No \_\_\_

**3 Communication Disclosure.**

Disclose the name and address of each lobbyist and other agent of the bidder or offeror who is not identified in Section 2 of this form, who is has communicated, is communicating, or may communicate with any State officer or employee concerning the bid or offer. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the process and throughout the term of the contract. If no person is identified, enter "None" on the line below:

Name and address of person(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**RETURN WITH SUBCONTRACT**

**4. Suspension or Debarment Disclosure.** For each of the persons identified under Sections 2 and 3 of this form, disclose whether any of the following has occurred within the previous 10 years: suspension or debarment from contracting with any governmental entity; professional licensure discipline; bankruptcies; adverse civil judgments and administrative findings; and criminal felony convictions. This disclosure is a continuing obligation and must be promptly supplemented for accuracy throughout the procurement process and term of the contract. If no person is identified, enter "None" on the line below:

Name of person(s): \_\_\_\_\_

Nature of disclosure: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**APPLICABLE STATEMENT**

**This Disclosure Form A is submitted on behalf of the INDIVIDUAL named on previous page. Under penalty of perjury, I certify the contents of this disclosure to be true and accurate to the best of my knowledge.**

Completed by:  \_\_\_\_\_ Date \_\_\_\_\_  
Signature of Individual or Authorized Officer

**NOT APPLICABLE STATEMENT**

**Under penalty of perjury, I have determined that no individuals associated with this organization meet the criteria that would require the completion of this Form A.**

**This Disclosure Form A is submitted on behalf of the SUBCONTRACTOR listed on the previous page.**

\_\_\_\_\_ Date \_\_\_\_\_  
Signature of Authorized Officer

RETURN WITH SUBCONTRACT

ILLINOIS DEPARTMENT OF TRANSPORTATION

Form B Subcontractor: Other Contracts & Financial Related Information Disclosure

Form with fields: Subcontractor Name, Legal Address, City, State, Zip, Telephone Number, Email Address, Fax Number (if available)

Disclosure of the information contained in this Form is required by Section 50-35 of the Code (30 ILCS 500). This information shall become part of the publicly available contract file. This Form B must be completed for subcontracts with a total value of \$50,000 or more, from subcontractors identified in Section 20-120 of the Code, and for all open-ended contracts.

DISCLOSURE OF OTHER CONTRACTS, SUBCONTRACTS, AND PROCUREMENT RELATED INFORMATION

1. Identifying Other Contracts & Procurement Related Information. The SUBCONTRACTOR shall identify whether it has any pending contracts, subcontracts, including leases, bids, proposals, or other ongoing procurement relationship with any other State of Illinois agency: Yes \_\_\_ No \_\_\_ If "No" is checked, the subcontractor only needs to complete the signature box on this page.

2. If "Yes" is checked. Identify each such relationship by showing State of Illinois agency name and other descriptive information such as bid or project number (attach additional pages as necessary). SEE DISCLOSURE FORM INSTRUCTIONS:

THE FOLLOWING STATEMENT MUST BE CHECKED

Signature box with fields: Signature of Authorized Officer, Date

OWNERSHIP CERTIFICATION

Please certify that the following statement is true if the individuals for all submitted Form A disclosures do not total 100% of ownership

Any remaining ownership interest is held by individuals receiving less than \$106,447.20 of the bidding entity's or parent entity's distributive income or holding less than a 5% ownership interest.

Yes No N/A (Form A disclosure(s) established 100% ownership)



- 1. TIME AND PLACE OF OPENING BIDS.** Sealed proposals for the improvement described herein will be received by the Department of Transportation. Electronic bids are to be submitted to the electronic bidding system (iCX-Integrated Contractors Exchange). Paper-based bids are to be submitted to the Chief Procurement Officer for the Department of Transportation in care of the Chief Contracts Official at the Harry R. Hanley Building, 2300 South Dirksen Parkway, in Springfield, Illinois until 10:00 a.m. July 29, 2016. All bids will be gathered, sorted, publicly opened and read in the auditorium at the Department of Transportation's Harry R. Hanley Building shortly after 10:00 a.m.
- 2. DESCRIPTION OF WORK.** The proposed improvement is identified and advertised for bids in the Invitation for Bids as:

**Contract No. 61C74  
COOK County  
Section 13-00136-00-RR (Maywood)  
Project CMM-4003(277)  
Route MAIN STREET (Maywood Commuter Station)  
District 1 Construction Funds**

**This project consists of the construction of a warming shelter at the METRA Maywood Station, located on the north side of the Union Pacific-Milwaukee West Line adjacent to Main Street and between 3rd and 5th Avenue in the Village of Maywood. Project also includes retaining walls, parking facility reconstruction and lighting improvements.**

- 3. INSTRUCTIONS TO BIDDERS.** (a) This Notice, the invitation for bids, proposal and letter of award shall, together with all other documents in accordance with Article 101.09 of the Standard Specifications for Road and Bridge Construction, become part of the contract. Bidders are cautioned to read and examine carefully all documents, to make all required inspections, and to inquire or seek explanation of the same prior to submission of a bid.  
  
(b) State law, and, if the work is to be paid wholly or in part with Federal-aid funds, Federal law requires the bidder to make various certifications as a part of the proposal and contract. By execution and submission of the proposal, the bidder makes the certification contained therein. A false or fraudulent certification shall, in addition to all other remedies provided by law, be a breach of contract and may result in termination of the contract.
- 4. AWARD CRITERIA AND REJECTION OF BIDS.** This contract will be awarded to the lowest responsive and responsible bidder considering conformity with the terms and conditions established by the Department in the rules, Invitation for Bids and contract documents. The issuance of plans and proposal forms for bidding based upon a prequalification rating shall not be the sole determinant of responsibility. The Department reserves the right to determine responsibility at the time of award, to reject any or all proposals, to readvertise the proposed improvement, and to waive technicalities.

By Order of the  
Illinois Department of Transportation

Randall S. Blankenhorn,  
Secretary



INDEX  
FOR  
SUPPLEMENTAL SPECIFICATIONS  
AND RECURRING SPECIAL PROVISIONS

Adopted April 1, 2016

This index contains a listing of SUPPLEMENTAL SPECIFICATIONS, frequently used RECURRING SPECIAL PROVISIONS, and LOCAL ROADS AND STREETS RECURRING SPECIAL PROVISIONS.

No ERRATA this year.

SUPPLEMENTAL SPECIFICATIONS

Std. Spec. Sec.

Page No.

No Supplemental Specifications this year.

CHECK SHEET  
FOR  
RECURRING SPECIAL PROVISIONS

Adopted April 1, 2016

The following RECURRING SPECIAL PROVISIONS indicated by an "X" are applicable to this contract and are included by reference:

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<u>LR #</u>	<u>Pg #</u>	<u>Special Provision Title</u>	<u>Effective</u>	<u>Revised</u>
LR SD12		<input type="checkbox"/> Slab Movement Detection Device	Nov. 11, 1984	Jan. 1, 2007
LR SD13		<input type="checkbox"/> Required Cold Milled Surface Texture	Nov. 1, 1987	Jan. 1, 2007
LR 107-2		<input type="checkbox"/> Railroad Protective Liability Insurance for Local Lettings	Mar. 1, 2005	Jan. 1, 2006
LR 107-4	619	<input checked="" type="checkbox"/> Insurance	Feb. 1, 2007	Aug. 1, 2007
LR 108		<input type="checkbox"/> Combination Bids	Jan. 1, 1994	Mar. 1, 2005
LR 109		<input type="checkbox"/> Equipment Rental Rates	Jan. 1, 2012	
LR 212		<input type="checkbox"/> Shaping Roadway	Aug. 1, 1969	Jan. 1, 2002
LR 355-1		<input type="checkbox"/> Bituminous Stabilized Base Course, Road Mix or Traveling Plant Mix	Oct. 1, 1973	Jan. 1, 2007
LR 355-2		<input type="checkbox"/> Bituminous Stabilized Base Course, Plant Mix	Feb. 20, 1963	Jan. 1, 2007
LR 400-1		<input type="checkbox"/> Bituminous Treated Earth Surface	Jan. 1, 2007	Apr. 1, 2012
LR 400-2		<input type="checkbox"/> Bituminous Surface Plant Mix (Class B)	Jan. 1, 2008	
LR 400-3		<input type="checkbox"/> Hot In-Place Recycling (HIR) – Surface Recycling	Jan. 1, 2012	
LR 400-4		<input type="checkbox"/> Full-Depth Reclamation (FDR) with Emulsified Asphalt	Apr. 1, 2012	Jun. 1, 2012
LR 400-5		<input type="checkbox"/> Cold In-Place Recycling (CIR) With Emulsified Asphalt	Apr. 1, 2012	Jun. 1, 2012
LR 400-6		<input type="checkbox"/> Cold In Place Recycling (CIR) with Foamed Asphalt	June 1, 2012	
LR 400-7		<input type="checkbox"/> Full-Depth Reclamation (FDR) with Foamed Asphalt	June 1, 2012	
LR 402		<input type="checkbox"/> Salt Stabilized Surface Course	Feb. 20, 1963	Jan. 1, 2007
LR 403-1		<input type="checkbox"/> Surface Profile Milling of Existing, Recycled or Reclaimed Flexible Pavement	Apr. 1, 2012	Jun. 1, 2012
LR 403-2		<input type="checkbox"/> Bituminous Hot Mix Sand Seal Coat	Aug. 1, 1969	Jan. 1, 2007
LR 406		<input type="checkbox"/> Filling HMA Core Holes with Non-shrink Grout	Jan. 1, 2008	
LR 420		<input type="checkbox"/> PCC Pavement (Special)	May 12, 1964	Jan. 2, 2007
LR 442		<input type="checkbox"/> Bituminous Patching Mixtures for Maintenance Use	Jan. 1, 2004	Jun. 1, 2007
LR 451		<input type="checkbox"/> Crack Filling Bituminous Pavement with Fiber-Asphalt	Oct. 1, 1991	Jan. 1, 2007
LR 503-1		<input type="checkbox"/> Furnishing Class SI Concrete	Oct. 1, 1973	Jan. 1, 2002
LR 503-2		<input type="checkbox"/> Furnishing Class SI Concrete (Short Load)	Jan. 1, 1989	Jan. 1, 2002
LR 542		<input type="checkbox"/> Pipe Culverts, Type _____ (Furnished)	Sep. 1, 1964	Jan. 1, 2007
LR 663		<input type="checkbox"/> Calcium Chloride Applied	Jun. 1, 1958	Jan. 1, 2007
LR 702		<input type="checkbox"/> Construction and Maintenance Signs	Jan. 1, 2004	Jun. 1, 2007
LR 1000-1		<input type="checkbox"/> Cold In-Place Recycling (CIR) and Full Depth Reclamation (FDR) with Emulsified Asphalt Mix Design Procedures	Apr. 1, 2012	Jun. 1, 2012
LR 1000-2		<input type="checkbox"/> Cold In-Place Recycling (CIR) and Full Depth Reclamation (FDR) with Foamed Asphalt Mix Design Procedures	June 1, 2012	
LR 1004		<input type="checkbox"/> Coarse Aggregate for Bituminous Surface Treatment	Jan. 1, 2002	Jan. 1, 2007
LR 1030		<input type="checkbox"/> Growth Curve	Mar. 1, 2008	Jan. 1, 2010
LR 1032-1		<input type="checkbox"/> Emulsified Asphalts	Jan. 1, 2007	Feb. 7, 2008
LR 1102		<input type="checkbox"/> Road Mix or Traveling Plan Mix Equipment	Jan. 1, 2007	

## BDE SPECIAL PROVISIONS

The following special provisions indicated by an "x" are applicable to this contract. An \* indicates a new or revised special provision for the letting.

<u>File Name</u>	<u>Pg.</u>		<u>Special Provision Title</u>	<u>Effective</u>	<u>Revised</u>
80099			Accessible Pedestrian Signals (APS)	April 1, 2003	Jan. 1, 2014
80274			Aggregate Subgrade Improvement	April 1, 2012	April 1, 2016
80192			Automated Flagger Assistance Device	Jan. 1, 2008	
80173			Bituminous Materials Cost Adjustments	Nov. 2, 2006	July 1, 2015
80241			Bridge Demolition Debris	July 1, 2009	
50261			Building Removal-Case I (Non-Friable and Friable Asbestos)	Sept. 1, 1990	April 1, 2010
50481			Building Removal-Case II (Non-Friable Asbestos)	Sept. 1, 1990	April 1, 2010
50491			Building Removal-Case III (Friable Asbestos)	Sept. 1, 1990	April 1, 2010
50531			Building Removal-Case IV (No Asbestos)	Sept. 1, 1990	April 1, 2010
* 80366			Butt Joints	July 1, 2016	
80360	620	X	Coarse Aggregate Quality	July 1, 2015	
80198			Completion Date (via calendar days)	April 1, 2008	
80199			Completion Date (via calendar days) Plus Working Days	April 1, 2008	
* 80293			Concrete Box Culverts with Skews > 30 Degrees and Design Fills ≤ 5 Feet	April 1, 2012	July 1, 2016
80311			Concrete End Sections for Pipe Culverts	Jan. 1, 2013	April 1, 2016
80277			Concrete Mix Design – Department Provided	Jan. 1, 2012	April 1, 2016
80261	622	X	Construction Air Quality – Diesel Retrofit	June 1, 2010	Nov. 1, 2014
* 80029	625	X	Disadvantaged Business Enterprise Participation	Sept. 1, 2000	July 2, 2016
80363			Engineer's Field Office	April 1, 2016	
80358	636	X	Equal Employment Opportunity	April 1, 2015	
80364	640	X	Errata for the 2016 Standard Specifications	April 1, 2016	
80229			Fuel Cost Adjustment	April 1, 2009	July 1, 2015
80304			Grooving for Recessed Pavement Markings	Nov. 1, 2012	Aug. 1, 2014
80246	644	X	Hot-Mix Asphalt – Density Testing of Longitudinal Joints	Jan. 1, 2010	April 1, 2016
80347			Hot-Mix Asphalt – Pay for Performance Using Percent Within Limits – Jobsite Sampling	Nov. 1, 2014	April 1, 2016
* 80367			Light Poles	July 1, 2016	
* 80368			Light Tower	July 1, 2016	
80336			Longitudinal Joint and Crack Patching	April 1, 2014	April 1, 2016
* 80369			Mast Arm Assembly and Pole	July 1, 2016	
80045			Material Transfer Device	June 15, 1999	Aug. 1, 2014
80342			Mechanical Side Tie Bar Inserter	Aug. 1, 2014	April 1, 2016
* 80370			Mechanical Splicers	July 1, 2016	
80165			Moisture Cured Urethane Paint System	Nov. 1, 2006	Jan. 1, 2010
80361			Overhead Sign Structures Certification of Metal Fabricator	Nov. 1, 2015	April 1, 2016
80349			Pavement Marking Blackout Tape	Nov. 1, 2014	April 1, 2016
* 80371			Pavement Marking Removal	July 1, 2016	
80298			Pavement Marking Tape Type IV	April 1, 2012	April 1, 2016
80365			Pedestrian Push-Button	April 1, 2016	
* 80372			Preventive Maintenance – Bituminous Surface Treatment (A-1)	Jan. 1, 2009	July 1, 2016
* 80373			Preventive Maintenance – Cape Seal	Jan. 1, 2009	July 1, 2016
* 80374			Preventive Maintenance – Micro-Surfacing	Jan. 1, 2009	July 1, 2016
* 80375			Preventive Maintenance – Slurry Seal	Jan. 1, 2009	July 1, 2016
* 80359			Portland Cement Concrete Bridge Deck Curing	April 1, 2015	July 1, 2016
80353			Portland Cement Concrete Inlay or Overlay	Jan. 1, 2015	April 1, 2016



80338			Portland Cement Concrete Partial Depth Hot-Mix Asphalt Patching	April 1, 2014	April 1, 2016
80300			Preformed Plastic Pavement Marking Type D - Inlaid	April 1, 2012	April 1, 2016
80328	645	X	Progress Payments	Nov. 2, 2013	
34261			Railroad Protective Liability Insurance	Dec. 1, 1986	Jan. 1, 2006
80157	646	X	Railroad Protective Liability Insurance (5 and 10)	Jan. 1, 2006	
80306			Reclaimed Asphalt Pavement (RAP) and Reclaimed Asphalt Shingles (RAS)	Nov. 1, 2012	April 1, 2016
80340			Speed Display Trailer	April 2, 2014	April 1, 2016
80127	648	X	Steel Cost Adjustment	April 2, 2004	July 1, 2015
80362	652	X	Steel Slag in Trench Backfill	Jan. 1, 2016	
80317			Surface Testing of Hot-Mix Asphalt Overlays	Jan. 1, 2013	April 1, 2016
80355			Temporary Concrete Barrier	Jan. 1, 2015	July 1, 2015
20338	653	X	Training Special Provisions	Oct. 15, 1975	
80318			Traversable Pipe Grate	Jan. 1, 2013	April 1, 2014
80288	656	X	Warm Mix Asphalt	Jan. 1, 2012	April 1, 2016
80302	658	X	Weekly DBE Trucking Reports	June 2, 2012	April 2, 2015
80289			Wet Reflective Thermoplastic Pavement Marking	Jan. 1, 2012	
80071			Working Days	Jan. 1, 2002	

The following special provisions and recurring special provisions are in the 2016 Standard Specifications.

<u>File Name</u>	<u>Special Provision Title</u>	<u>New Location</u>	<u>Effective</u>	<u>Revised</u>
80240	Above Grade Inlet Protection	Articles 280.02, 280.04, and 1081.15	July 1, 2009	Jan. 1, 2012
80310	Coated Galvanized Steel Conduit	Articles 811.03	Jan. 1, 2013	Jan. 1, 2015
80341	Coated Nonmetallic Conduit	Article 1088.01	Aug. 1, 2014	Jan. 1, 2015
80294	Concrete Box Culverts with Skews ≤ 30 Degrees Regardless of Design Fill and Skews > 30 Degrees With Design Fills > 5 Feet	Article 540.04	April 1, 2012	April 1, 2014
80334	Concrete Gutter, Curb, Median, and Paved Ditch	Articles 606.02, 606.07, and 1050.04	April , 2014	Aug. 1, 2014
80335	Contract Claims	Article 109.09	April 1, 2014	
Chk Sht #27	English Substitution of Metric Reinforcement Bars	Article 508.09	April 1, 1996	Jan. 1, 2011
80265	Friction Aggregate	Articles 1004.01 and 1004.03	Jan. 1, 2011	Nov. 1, 2014
80329	Glare Screen	Sections 638 and 1085	Jan. 1, 2014	
Chk Sht #20	Guardrail and Barrier Wall Delineation	Sections 635, 725, 782, and 1097	Dec. 15, 1993	Jan. 1, 2012
80322	Hot-Mix Asphalt – Mixture Design Composition and Volumetric Requirements	Sections 312, 355, 406, 407, 442, 482, 601, 1003, 1004, 1030, and 1102	Nov. 1, 2013	Nov. 1, 2014
80323	Hot-Mix Asphalt – Mixture Design Verification and Production	Sections 406, 1030, and 1102	Nov. 1, 2013	Nov. 1, 2014
80348	Hot-Mix Asphalt – Prime Coat	Sections 403, 406, 407, 408, 1032, and 1102	Nov. 1, 2014	
80315	Insertion Lining of Culverts	Sections 543 and 1029	Jan. 1, 2013	Nov. 1, 2013
80351	Light Tower	Article 1069.08	Jan. 1, 2015	
80324	LRFD Pipe Culvert Burial Tables	Sections 542 and 1040	Nov. 1, 2013	April 1, 2015
80325	LRFD Storm Sewer Burial Tables	Sections 550 and 1040	Nov. 1, 2013	April 1, 2015
80337	Paved Shoulder Removal	Article 440.07	April 1, 2014	
80254	Pavement Patching	Article 701.17	Jan. 1, 2010	
80352	Pavement Striping – Symbols	Article 780.14	Jan. 1, 2015	
Chk Sht #19	Pipe Underdrains	Section 601 and Articles 1003.01, 1003.04, 1004.05, 1040.06, and 1080.05	Sept. 9, 1987	Jan. 1, 2007

<u>File Name</u>	<u>Special Provision Title</u>	<u>New Location</u>	<u>Effective</u>	<u>Revised</u>
80343	Precast Concrete Handhole	Articles 814.02, 814.03, and 1042.17	Aug. 1, 2014	
80350	Retroreflective Sheeting for Highway Signs	Article 1091.03	Nov. 1, 2014	
80327	Reinforcement Bars	Section 508 and Articles 421.04, 442.06, 1006.10	Nov. 1, 2013	
80344	Rigid Metal Conduit	Article 1088.01	Aug. 1, 2014	
80354	Sidewalk, Corner, or Crosswalk Closure	Article 1106.02	Jan. 1, 2015	April 1, 2015
80301	Tracking the Use of Pesticides	Article 107.23	Aug. 1, 2012	
80356	Traffic Barrier Terminals Type 6 or 6B	Article 631.02	Jan. 1, 2015	
80345	Underpass Luminaire	Articles 821.06 and 1067.04	Aug. 1, 2014	April 1, 2015
80354	Urban Half Road Closure with Mountable Median	Articles 701.18, 701.19, and 701.20	Jan. 1, 2015	July 1, 2015
80346	Waterway Obstruction Warning Luminaire	Article 1067.07	Aug. 1, 2014	April 1, 2015

The following special provisions require additional information from the designer. The additional information needs to be included in a separate document attached to this check sheet. The Project Development and Implementation section will then include the information in the applicable special provision. The Special Provisions are:

- Bridge Demolition Debris
- Building Removal-Case I
- Building Removal-Case II
- Building Removal-Case III
- Building Removal-Case IV
- Completion Date
- Completion Date Plus Working Days
- DBE Participation
- Material Transfer Device
- Railroad Protective Liability Insurance
- Training Special Provisions
- Working Days

**GUIDE BRIDGE SPECIAL PROVISION INDEX/CHECK SHEET**

Effective as of the: July 29, 2016 Letting

Pg #	√	File Name	Title	Effective	Revised
		GBSP 4	Polymer Modified Portland Cement Mortar	June 7, 1994	Apr 1, 2016
		GBSP 12	Drainage System	June 10, 1994	Jun 24, 2015
		GBSP 13	High-Load Multi-Rotational Bearings	Oct 13, 1988	Apr 1, 2016
		GBSP 14	Jack and Remove Existing Bearings	April 20, 1994	Jan 1, 2007
		GBSP 15	Three Sided Precast Concrete Structure	July 12, 1994	Dec 29, 2014
		GBSP 16	Jacking Existing Superstructure	Jan 11, 1993	Jan 1, 2007
		GBSP 17	Bonded Preformed Joint Seal	July 12, 1994	Jan 1, 2007
		GBSP 18	Modular Expansion Joint	May 19, 1994	Dec 29, 2014
		GBSP 21	Cleaning and Painting Contact Surface Areas of Existing Steel Structures	June 30, 2003	May 18, 2011
		GBSP 25	Cleaning and Painting Existing Steel Structures	Oct 2, 2001	Apr 22, 2016
		GBSP 26	Containment and Disposal of Lead Paint Cleaning Residues	Oct 2, 2001	Apr 22, 2016
		GBSP 28	Deck Slab Repair	May 15, 1995	Oct 15, 2011
		GBSP 29	Bridge Deck Microsilica Concrete Overlay	May 15, 1995	Apr 1, 2016
		GBSP 30	Bridge Deck Latex Concrete Overlay	May 15, 1995	Jun 24, 2015
		GBSP 31	Bridge Deck High-Reactivity Metakaolin (HRM) Conc Overlay	Jan 21, 2000	Apr 1, 2016
		GBSP 33	Pedestrian Truss Superstructure	Jan 13, 1998	Dec 29, 2014
		GBSP 34	Concrete Wearing Surface	June 23, 1994	Apr 1, 2016
		GBSP 35	Silicone Bridge Joint Sealer	Aug 1, 1995	Oct 15, 2011
		GBSP 45	Bridge Deck Thin Polymer Overlay	May 7, 1997	Feb 6, 2013
		GBSP 51	Pipe Underdrain for Structures	May 17, 2000	Jan 22, 2010
		GBSP 53	Structural Repair of Concrete	Mar 15, 2006	Apr 1, 2016
		GBSP 55	Erection of Curved Steel Structures	June 1, 2007	
		GBSP 56	Setting Piles in Rock	Nov 14, 1996	Apr 1, 2016
		GBSP 59	Diamond Grinding and Surface Testing Bridge Sections	Dec 6, 2004	Jan 3, 2014
		GBSP 60	Containment and Disposal of Non-Lead Paint Cleaning Residues	Nov 25, 2004	Apr 22, 2016
		GBSP 61	Slipform Parapet	June 1, 2007	Apr 22, 2016
		GBSP 67	Structural Assessment Reports for Contractor's Means and Methods	Mar 6, 2009	Oct 5, 2015
		GBSP 71	Aggregate Column Ground Improvement	Jan 15, 2009	Oct 15, 2011
		GBSP 72	Bridge Deck Fly Ash or GGBF Slag Concrete Overlay	Jan 18, 2011	Jun 24, 2015
		GBSP 73	Cofferdams	Oct 15, 2011	
		GBSP 75	Bond Breaker for Prestressed Concrete Bulb-T Beams	April 19, 2012	
659	X	GBSP 76	Granular Backfill for Structures	April 19, 2012	Oct 30, 2012
		GBSP 77	Weep Hole Drains for Abutments, Wingwalls, Retaining Walls And Culverts	April 19, 2012	Oct 22, 2013
		GBSP 78	Bridge Deck Construction	Oct 22, 2013	Apr 1, 2016
		GBSP 79	Bridge Deck Grooving (Longitudinal)	Dec 29, 2014	Apr 1, 2016
		GBSP 84	Precast, Prestressed Concrete Beams	Oct 5, 2015	
		GBSP 85	Micropiles	Apr 19, 1996	Oct 5, 2015
		GBSP 86	Drilled Shafts	Oct 5, 2015	Apr 1, 2016
		GBSP 87	Lightweight Cellular Concrete Fill	Nov 11, 2011	Apr 1, 2016
		GBSP 88	Corrugated Structural Plate Structures	Apr 22, 2016	

LIST ANY ADDITIONAL SPECIAL PROVISIONS BELOW

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The following Guide Bridge Special Provisions have been incorporated into the 2016 Standard Specifications:

File Name	Title	Std Spec Location
GBSP32	Temporary Sheet Piling	522
GBSP38	Mechanically Stabilized Earth Retaining Walls	522
GBSP42	Drilled Soldier Pile Retaining Wall	522
GBSP43	Driven Soldier Pile Retaining Wall	522
GBSP44	Temporary Soil Retention System	522
GBSP46	Geotextile Retaining Walls	522
GBSP57	Temporary Mechanically Stabilized Earth Retaining Walls	522
GBSP62	Concrete Deck Beams	504
GBSP64	Segmental Concrete Block Wall	522
GBSP65	Precast Modular Retaining Wall	522
GBSP74	Permanent Steel Sheet Piling (LRFD)	522
GBSP80	Fabric Reinforced Elastomeric	1028

The following Guide Bridge Special Provisions have been discontinued or have been superseded:

File Name	Title	Disposition:
GBSP70	Braced Excavation	Use TSRS per Sec 522

## **SPECIAL PROVISIONS**

### **SPECIAL PROVISIONS**

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction", adopted April 1, 2016, the "Supplemental Specifications and Recurring Special Provisions", adopted April 1, 2016 (as indicated on the check sheet included herein), the latest edition of the "Illinois Manual on Uniform Traffic Control Devices for Streets and Highways" and "Standard Specifications for Water and Sewer Main Construction in Illinois" and the Construction Specifications Institute (CSI) special provisions included in effect on the date of invitation for bids. These Special Provisions included herein apply to and govern the proposed improvement designated as Main Street (Section 13-00136-00-RR) Maywood Commuter Station Improvements, and in case of conflict with any part or parts of said specifications, said Special Provisions shall take precedent and shall govern.

### **LOCATION OF PROJECT**

This project is located on the north side of the Union Pacific-Milwaukee West Line adjacent to Main Street and between 3<sup>rd</sup> and 5<sup>th</sup> Avenues in the Village of Maywood, Cook County, Illinois. The project begins approximately east of the 5<sup>th</sup> Avenue R.O.W. and ends approximately 835 feet west of 5<sup>th</sup> Avenue. The gross length of the project is 835 feet (0.158 mile). The net length of the project is also 835 feet (0.158 mile).

### **DESCRIPTION OF PROJECT**

The work to be performed consists of the construction of a warming shelter on the north side of the Union Pacific-Milwaukee West Line. The new warming shelter will replace the existing bus shelter located on the inbound Metra platform. The proposed warming shelter will be masonry finished with approximately 700 SQ FT of enclosed area and covered extension on the east side of approximately 200 SQ FT. The improvement will also include replacement of a deteriorated retaining wall, platform repair, bus shelter relocation and removal, electrical conduit jack and boring, drainage rehabilitation, ADA improvements and upgraded parking lot facilities.

### **SOILS REPORT**

In addition to the provisions of Section 105.04 of the "Standard Specifications for the Road and Bridge Construction", a soils report is available for review at the office of the Engineer. Recommendations contained in the report are the recommendations of Tetra Tech Inc. base on soil borings. Actual conditions encountered during construction may necessitate revisions to these recommendations.

The soils report is for informational purposes only. The accuracy of the report is not guaranteed by the Owner nor Christopher B. Burke Engineering Ltd.

**PROTECTION AND RESTORATION OF PROPERTY**

In addition to the requirements of Article 107.20 of the Standard Specifications, the existing drainage facilities shall remain in use during the period of construction, unless otherwise noted in the Contract Plans.

Locations of existing drainage structures and sewers, as shown on the Contract plans, are approximate. Prior to commencing work, the Contractor, at his own expense shall determine the exact location of existing structures which are within the proposed construction site.

All drainage structures are to be kept free from any debris resulting from construction operations. All work and material necessary to prevent accumulation of debris in the drainage structures will be considered as included in the cost of the Contract. Any accumulation of debris in the drainage structures resulting from construction operations shall be removed at the Contractor's own expense, and no extra compensation will be allowed.

Unless reconstruction or adjustment of an existing manhole, catch basin, or inlet is called for in the contract plans or ordered by the Engineer, the proposed work shall meet the existing elevations of these structures. Should reconstruction or adjustment of a drainage structure be required by the Engineer in the field, the necessary work and payment shall be done in accordance with Section 602 and 605 and Article 104.02 respectively of the Standard Specifications, unless otherwise noted in the plans or Special Provisions.

The Contractor shall take all necessary precautions when working near or above existing sewers in order to protect these pipes during construction from any damage resulting from his operations. Existing sewers damaged because of noncompliance with this provision shall be replaced as directed by the Engineer, in accordance with Section 550 of the Standard Specifications and at the Contractor's own expense, and no extra compensation will be allowed.

During construction, if the Contractor encounters or otherwise becomes aware of any sewers, underdrains or field drains within the right of way other than those shown on the plans, he shall so inform the Engineer who shall direct the work necessary to maintain or replace the facilities in service and protect them from damage during construction if maintained. Existing facilities to be maintained that are damaged because of noncompliance with this provision shall be replaced at the Contractor's own expense. Should the Engineer have directed the replacement of the facility, the necessary work and payment shall be done in accordance with Section 550 or 601 and Article 104.02 respectively of the Standard Specifications.

**UTILITY POLES AND UTILITY VAULTS**

If it is determined by the Engineer that any utility poles and/or vaults interfere with construction of this improvement, the Contractor shall contact the utility company and arrange for the company to move its pole and/or adjust the vault. Any expenses incurred by the Contractor in connection with making the necessary arrangements shall be borne by the Contractor and be considered included in the cost of the Contract.

**VANDALISM**

Special attention is called to the Special Provision for "Inspection" as well as Article 107.30 of the "Standard Specifications". **Any defaced work shall be corrected or replaced by the Contractor at his sole expense prior to final payment.** The Department and Villages shall cooperate with the Contractor to minimize vandalism, but the Contractor shall be ultimately responsible to correct any damage. The Department and Villages will not be responsible for the security of the work site in this regard, other than normal patrolling and response to emergencies. The cost of additional security required to meet this provision shall be solely the Contractor's responsibility.



**FAILURE TO COMPLETE THE WORK ON TIME**

Effective: September 30, 1985

Revised: January 1, 2007

Should the Contractor fail to complete the work on or before the completion date as specified in the Special Provision for "Completion Date Plus Working Days", or within such extended time as may have been allowed by the Department, the Contractor shall be liable to the Department in the amount of \$1,500.00, not as a penalty but as liquidated damages, for each calendar day or a portion thereof of overrun in the contract time or such extended time as may have been allowed.

In fixing the damages as set out herein, the desire is to establish a certain mode of calculation for the work since the Department's actual loss, in the event of delay, cannot be predetermined, would be difficult of ascertainment, and a matter of argument and unprofitable litigation. This said mode is an equitable rule for measurement of the Department's actual loss and fairly takes into account the loss of use of the roadway if the project is delayed in completion. The Department shall not be required to provide any actual loss in order to recover these liquidated damages provided herein, as said damages are very difficult to ascertain. Furthermore, no provision of this clause shall be construed as a penalty, as such is not the intention of the parties.

A calendar day is every day shown on the calendar and starts at 12:00 midnight and ends at the following 12:00 midnight, twenty-four hours later.

**COMPLETION DATE PLUS WORKING DAYS**

Effective: September 30, 1985

Revised: January 1, 2007

Revise Article 108.05 (b) of the Standard Specifications as follows:

"When a completion date plus working days is specified, the Contractor shall complete all contract items and safely open all roadways to traffic by 11:59 PM on Jan. 27, 2017, except as specified herein.

The Contractor will be allowed to complete all clean-up work and punch list items within 20 working days after the completion date for opening the roadway to traffic. Under extenuating circumstances the Engineer may direct that certain items of work, not affecting the safe opening of the roadway to traffic, may be completed within the working days allowed for clean up work and punch list items. Temporary lane closures for this work may be allowed at the discretion of the Engineer.

Article 108.09 or the Special Provision for "Failure to Complete the Work on Time", if included in this contract, shall apply to both the completion date and the number of working days.

**MAINTENANCE OF ROADWAYS**

Effective: September 30, 1985

Revised: November 1, 1996

Beginning on the date that work begins on this project, the Contractor shall assume responsibility for normal maintenance of all existing roadways within the limits of the improvement. This normal maintenance shall include all repair work deemed necessary by the Engineer, but shall not include snow removal operations. Traffic control and protection for maintenance of roadways will be provided by the Contractor as required by the Engineer.

If items of work have not been provided in the contract, or otherwise specified for payment, such items, including the accompanying traffic control and protection required by the Engineer, will be paid for in accordance with Article 109.04 of the Standard Specifications.

**STATUS OF UTILITIES (D-1)**

Effective: June 1, 2016

Utility companies and/or municipal owners located within the construction limits of this project have provided the following information in regard to their facilities and the proposed improvements. The tables below contain a description of specific conflicts to be resolved and/or facilities which will require some action on the part of the Department's contractor to proceed with work. Each table entry includes an identification of the action necessary and, if applicable, the estimated duration required for the resolution.

UTILITIES TO BE ADJUSTED

Conflicts noted below have been identified by following the suggested staging plan included in the contract. The company has been notified of all conflicts and will be required to obtain the necessary permits to complete their work; in some instances resolution will be a function of the construction staging. The responsible agency must relocate or complete new installations as noted in the action column; this work has been deemed necessary to be complete for the Department's contractor to then work in the stage under which the item has been listed.

STAGE / LOCATION	TYPE	DESCRIPTION	RESPONSIBLE AGENCY	ACTION
Spring 2016	Fiber Optic	Relocation	Sprint	Coordination
Continuous	Underground	Transferring services from old to new pipe	Nicor Gas	Coordination
Summer 2016	3 <sup>rd</sup> Mainline Track	Construction of new mainline track	Union Pacific Railroad	Coordination

No conflicts to be resolved (or if there are conflicts they are to be listed as noted above)

The following contact information is what was used during the preparation of the plans as provided by the Agency/Company responsible for resolution of the conflict.

Agency/Company Responsible to Resolve Conflict	Name of contact	Address	Phone	e-mail address
<b>Sprint</b>	James Burton	5600 N River Rd Rosemont, IL 60018	708-955-6659	na
<b>Nicor Gas</b>	Constance Lane	1844 Ferry Dr. Naperville, IL 60563	630-388-3830	na
<b>Union Pacific RR</b>	Claire Anderson	2 N. Riverside, 17 <sup>th</sup> Floor Chicago, IL 60606	312-496-4726	na

UTILITIES TO BE WATCHED AND PROTECTED

The areas of concern noted below have been identified by following the suggested staging plan included for the contract. The information provided is not a comprehensive list of all remaining utilities, but those which during coordination were identified as ones which might require the Department's contractor to take into consideration when making the determination of the means and methods that would be required to construct the proposed improvement. In some instances the contractor will be responsible to notify the owner in advance of the work to take place so necessary staffing on the owners part can be secured.

The following contact information is what was used during the preparation of the plans as provided by the owner of the facility.

Agency/Company Responsible to Resolve Conflict	Name of contact	Address	Phone	e-mail address
<b>AT&amp;T – Distribution</b>	David Phelps	1000 Commerce Dr. Floor 1 Oak Brook, IL 60523	630-573-5450	na

<b>AT&amp;T – Transmission</b>	Bobby Akhter	4513 Western Ave. Lisle, IL 60532	630-810-6274	na
<b>Comcast</b>	Martha Gieras	688 Industrial Dr. Elmhurst, IL 60126	630-600-6352	na
<b>ComEd</b>	Joe Stacho	1 N. 423 Swift Rd. Lombard, IL 60148	630-424-5704	na
<b>Village of Maywood</b>	David Myers	40 Madison Street Maywood, IL 60153	708-450-4429	na

The above represents the best information available to the Department and is included for the convenience of the bidder. The days required for conflict resolution should be taken into account in the bid as this information has also been factored into the timeline identified for the project when setting the completion date. The applicable portions of the Standard Specifications for Road and Bridge Construction shall apply.

Estimated duration of time provided in the action column for the first conflicts identified will begin on the date of the executed contract regardless of the status of the utility relocations. The responsible agencies will be working toward resolving subsequent conflicts in conjunction with contractor activities in the number of days noted.

The estimated relocation dates must be part of the progress schedule submitted by the contractor. A utility kickoff meeting will be scheduled between the Department, the Department's contractor and the utility companies. The Department's contractor is responsible for contacting J.U.L.I.E. prior to any and all excavation work.

**PUBLIC CONVENIENCE AND SAFETY (DIST 1)**

Effective: May 1, 2012

Revised: July 15, 2012

Add the following to the end of the fourth paragraph of Article 107.09:

“If the holiday is on a Saturday or Sunday, and is legally observed on a Friday or Monday, the length of Holiday Period for Monday or Friday shall apply.”

Add the following sentence after the Holiday Period table in the fourth paragraph of Article 107.09:

“The Length of Holiday Period for Thanksgiving shall be from 5:00 AM the Wednesday prior to 11:59 PM the Sunday After”

Delete the fifth paragraph of Article 107.09 of the Standard Specifications:

“On weekends, excluding holidays, roadways with Average Daily Traffic of 25,000 or greater, all lanes shall be open to traffic from 3:00 P.M. Friday to midnight Sunday except where structure construction or major rehabilitation makes it impractical.”

## PRESSURE TESTING OF WATER MAIN

After the pipe has been laid and partially backfilled as specified herein, all newly-laid pipe or any valved sections of it shall, unless otherwise expressly specified, be subjected to a hydrostatic pressure of 150 psi at the lowest elevation of the pipe section. The Engineer shall be given 24 hours' notice prior to the beginning of testing. The duration of each pressure test shall be not less than four hours. Water main testing shall be in accordance with the applicable portions of AWWA Standards C600 and C603, or as otherwise modified herein.

Procedure for Test - The Contractor shall notify the Village at least 24 hours prior to the pressure test. Valves will be turned on only under the supervision of the Village, and the Village will witness all pressure testing.

Each section of pipe to be tested, as determined by the Engineer, shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump pipe connection and all necessary apparatus, including gauges and meters, shall be furnished by the Contractor. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevations and afterwards tightly plugged. Any cracked or defective pipes, fittings, valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced by the Contractor with sound material, and test shall be repeated until satisfactory to the Engineer and the Village. The provisions of AWWA C600 and C603, where applicable, shall apply.

The pressure testing shall be accomplished with fire hydrant auxiliary valves open.

Leakage Test: After completion of the pressure test, a leakage test shall be conducted to determine the quantity of water lost by leakage under the specified test pressure.

1. Test pressure is defined as the maximum operating pressure of the section under test, and is based on the elevation of the lowest point in the line or section under test corrected to the elevation of the test gauge. Applicable provisions of AWWA C600 and C603 shall apply. The minimum duration of each leakage test shall be one (1) hour in addition to the pressure test period.

2. Allowable leakage in gallons per hour for cast iron water main shall not be greater than that determined by the following formula:

$$L = \frac{ND \sqrt{P}}{7400}$$

Note: L = Allowable leakage in gallons per hour  
N = Number of joints in length of pipeline tested  
D = Nominal diameter of the pipe in inches  
P = Average test pressure during leakage test in pounds per square inch gauge

3. Leakage is defined as the quantity of water to be supplied in the newly laid pipe or any valved section under test, which is necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled.



Immediately after a passed test the pressure shall be drained through a fire hydrant until it is below the potable system pressure.

## **DISINFECTION OF WATER MAIN**

Disinfection of water main shall be completed in accordance with Section 41-2.14 of the Water and Sewer Specifications, except as modified in this Special Provision.

The Village shall be notified at least 24 hours before the disinfection procedure. Representatives of the water division must be present during the procedure.

### **A. Flushing**

Sections of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a tap should be provided that is large enough to develop a velocity of at least two and five-tenths (2.5) feet per second in the main. One two and one-half (2 1/2) inch hydrant opening will, under normal pressures, provide this velocity in pipe sized up to and including twelve (12) inches.

All taps required for chlorination or flushing purposes, or for temporary or permanent release of air, shall be provided for by the Contractor as part of the construction of water mains.

### **B. Requirement of Chlorine**

A free chlorine residual of at least 50 ppm and no more than 400 ppm must be reached throughout the entire length and branch lines of the water main. After the super-chlorinated water has sat in the main for 24 hours, a chlorine residual test shall be taken to insure the residual has not dropped by over one-half.

### **C. Form of Applied Chlorine**

Chlorine shall be applied by the method which follows, subject to the review of the Engineer.

Chlorination shall be made by the use of chlorine gas only. The dry gas shall be fed directly through proper devices for regulating the rate of flow and providing effective diffusion of the gas into the water within the pipe being treated. Chlorinating devices for feeding the chlorine gas must provide means for preventing the backflow of water into the chlorine. The chlorine gas shall be injected into the main at intervals of no more than 1,000 feet.

### **D. Point of Application**

The preferred point of application of the chlorine gas is at the beginning of the pipe line extension or any valved section of it, and through a corporation stop inserted in the pipe. The water injector for delivering the chlorine-bearing water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipe line extension. Alternate points of application may be used subject to the review of the Engineer.

### **E. Preventing Reverse Flow**

Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used if desired.

F. Retention Period

Treated water shall be retained in the pipe at least twenty-four (24) hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least twenty-five (25) mg/l.

G. Chlorinating Valves and Hydrants

In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent and under normal operating pressure.

H. Final Flushing and Testing

Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its entire length shows, upon test, a chlorine residual of less than one (1) mg/l. In the event chlorine is normally used in the source of supply, then the test shall show a residual of not in excess of that carried in the system.

At this time a water sample will be taken by the Contractor or his representative and sent to a state-certified water lab of his choice. Also at this time the Village will witness the sampling. The Contractor shall take two (2) samples, 24 hours apart with satisfactory results or the procedure shall be repeated.

I. Repetition of Flushing and Testing

Should the initial treatment result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor until satisfactory results are obtained. After water main passes chlorination testing, the corporation stop used to chlorinate the main shall be shut off and any piping removed.



**DRAINAGE AND INLET PROTECTION UNDER TRAFFIC (D-1)**

Effective: April 1, 2011  
Revised: April 2, 2011

Add the following to Article 603.02 of the Standard Specifications:

- “(i) Temporary Hot-Mix Asphalt (HMA) Ramp (Note 1) ..... 1030
- “(j) Temporary Rubber Ramps (Note 2)

Note 1. The HMA shall have maximum aggregate size of 3/8 in. (95 mm).

Note 2. The rubber material shall be according to the following.

Property	Test Method	Requirement
Durometer Hardness, Shore A	ASTM D 2240	75 ±15
Tensile Strength, psi (kPa)	ASTM D 412	300 (2000) min
Elongation, percent	ASTM D 412	90 min
Specific Gravity	ASTM D 792	1.0 - 1.3
Brittleness, °F (°C)	ASTM D 746	-40 (-40)”

Revise Article 603.07 of the Standard Specifications to read:

**“603.07 Protection Under Traffic.** After the casting has been adjusted and the Class PP concrete has been placed, the work shall be protected by a barricade and two lights according to Article 701.17(e)(3)b.

When castings are under traffic before the final surfacing operation has been started, properly sized temporary ramps shall be placed around the drainage and/or utility castings according to the following methods.

- (a) Temporary Asphalt Ramps. Temporary hot-mix asphalt ramps shall be placed around the casting, flush with its surface and decreasing to a featheredge in a distance of 2 ft (600 mm) around the entire surface of the casting.
- (b) Temporary Rubber Ramps. Temporary rubber ramps shall only be used on roadways with permanent posted speeds of 40 mph or less and when the height of the casting to be protected meets the proper sizing requirements for the rubber ramps as shown below.

Dimension	Requirement
Inside Opening	Outside dimensions of casting + 1 in. (25 mm)
Thickness at inside edge	Height of casting ± 1/4 in. (6 mm)
Thickness at outside edge	1/4 in. (6 mm) max.

Width, measured from inside opening to outside edge	8 1/2 in. (215 mm) min
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Placement shall be according to the manufacturer's specifications.

Temporary ramps for castings shall remain in place until surfacing operations are undertaken within the immediate area of the structure. Prior to placing the surface course, the temporary ramp shall be removed. Excess material shall be disposed of according to Article 202.03."

**HMA MIXTURE DESIGN REQUIREMENTS (D-1)**

Effective: January 1, 2013  
 Revised: April 1, 2016

**1) Design Composition and Volumetric Requirements**

Revise the table in Article 406.06(d) of the Standard Specifications to read:

"MINIMUM COMPACTED LIFT THICKNESS	
Mixture Composition	Thickness, in. (mm)
IL-4.75	3/4 (19)
SMA-9.5, IL-9.5, IL-9.5L	1 1/2 (38)
SMA-12.5	2 (50)
IL-19.0, IL-19.0L	2 1/4 (57)"

Revise the table in Article 1004.03(c) of the Standard Specifications to read:

"Use	Size/Application	Gradation No.
Class A-1, 2, & 3	3/8 in. (10 mm) Seal	CA 16
Class A-1	1/2 in. (13 mm) Seal	CA 15
Class A-2 & 3	Cover	CA 14
HMA High ESAL	IL-19.0 IL-9.5	CA 11 <sup>1/</sup> CA 16, CA 13 <sup>3/</sup>
HMA Low ESAL	IL-19.0L IL-9.5L Stabilized Subbase or Shoulders	CA 11 <sup>1/</sup> CA 16
SMA <sup>2/</sup>	1/2 in. (12.5mm) Binder & Surface IL 9.5 Surface	CA13 <sup>3/</sup> , CA14 or CA16  CA16, CA 13 <sup>3/</sup>

1/ CA 16 or CA 13 may be blended with the gradations listed.

2/ The coarse aggregates used shall be capable of being combined with stone sand, slag sand, or steel slag sand meeting the FA/FM 20 gradation and mineral filler to meet the approved mix design and the mix requirements noted herein.

3/ CA 13 shall be 100 percent passing the 1/2 in. (12.5mm) sieve.

Revise Article 1004.03(e) of the Supplemental Specifications to read:

"(e) Absorption. For SMA the coarse aggregate shall also have water absorption ≤ 2.0 percent."

Revise the last paragraph of Article 1102.01 (a) (5) of the Standard Specifications to read:

“IL-4.75 and Stone Matrix Asphalt (SMA) mixtures which contain aggregate having absorptions greater than or equal to 2.0 percent, or which contain steel slag sand, shall have minimum surge bin storage plus haul time of 1.5 hours.”

Revise the nomenclature table in Article 1030.01 of the Standard Specifications to read:

“High ESAL	IL-19.0 binder; IL-9.5 surface; IL-4.75; SMA-12.5, SMA-9.5
Low ESAL	IL-19.0L binder; IL-9.5L surface; Stabilized Subbase (HMA) <sup>1/</sup> ; HMA Shoulders <sup>2/</sup>

1/ Uses 19.0L binder mix.

2/ Uses 19.0L for lower lifts and 9.5L for surface lift.”

Revise Article 1030.02 of the Standard Specifications and Supplemental Specifications to read:

**“1030.02 Materials.** Materials shall be according to the following.

Item .....	Article/Section
(a) Coarse Aggregate .....	1004.03
(b) Fine Aggregate .....	1003.03
(c) RAP Material .....	1031
(d) Mineral Filler .....	1011
(e) Hydrated Lime .....	1012.01
(f) Slaked Quicklime (Note 1)	
(g) Performance Graded Asphalt Binder (Note 2) .....	1032
(h) Fibers (Note 3)	
(i) Warm Mix Asphalt (WMA) Technologies (Note 4)	

Note 1. Slaked quicklime shall be according to ASTM C 5.

Note 2. The asphalt binder shall be an SBS PG 76-28 when the SMA is used on a full-depth asphalt pavement and SBS PG 76-22 when used as an overlay, except where modified herein. The asphalt binder shall be an Elvaloy or SBS PG 76-22 for IL-4.75, except where modified herein. The elastic recovery shall be a minimum of 80.

Note 3. A stabilizing additive such as cellulose or mineral fiber shall be added to the SMA mixture according to Illinois Modified AASHTO M 325. The stabilizing additive shall meet the Fiber Quality Requirements listed in Illinois Modified AASHTO M 325. Prior to approval and use of fibers, the Contractor shall submit a notarized certification by the producer of these materials stating they meet these requirements. Reclaimed Asphalt Shingles (RAS) may be used in Stone Matrix Asphalt (SMA) mixtures designed with an SBA polymer modifier as a fiber additive if the mix design with RAS included meets AASHTO T305 requirements. The RAS shall be from a certified source that



produces either Type 1 or Type 2. Material shall meet requirements noted herein and the actual dosage rate will be determined by the Engineer.

Note 4. Warm mix additives or foaming processes shall be selected from the current Bureau of Materials and Physical Research Approved List, "Warm Mix Asphalt Technologies".

Revise Article 1030.04(a)(1) of the Standard Specifications and the Supplemental Specifications to read:

"(1) High ESAL Mixtures. The Job Mix Formula (JMF) shall fall within the following limits.

High ESAL, MIXTURE COMPOSITION (% PASSING) <sup>1/</sup>										
Sieve Size	IL-19.0 mm		SMA <sup>4/</sup> IL-12.5 mm		SMA <sup>4/</sup> IL-9.5 mm		IL-9.5 mm		IL-4.75 mm	
	min	max	min	max	min	max	min	max	min	max
1 1/2 in. (37.5 mm)										
1 in. (25 mm)		100								
3/4 in. (19 mm)	90	100		100						
1/2 in. (12.5 mm)	75	89	80	100		100	100			100
3/8 in. (9.5 mm)				65	90	100	90	100		100
#4 (4.75 mm)	40	60	20	30	36	50	34	69	90	100
#8 (2.36 mm)	20	42	16	24 <sup>5/</sup>	16	32 <sup>5/</sup>	34 <sup>6/</sup>	52 <sup>2/</sup>	70	90
#16 (1.18 mm)	15	30					10	32	50	65
#30 (600 μm)			12	16	12	18				
#50 (300 μm)	6	15					4	15	15	30
#100 (150 μm)	4	9					3	10	10	18
#200 (75 μm)	3	6	7.0	9.0 <sup>3/</sup>	7.5	9.5 <sup>3/</sup>	4	6	7	9 <sup>3/</sup>
Ratio Dust/Asphalt Binder		1.0		1.5		1.5		1.0		1.0

- 1/ Based on percent of total aggregate weight.
- 2/ The mixture composition shall not exceed 44 percent passing the #8 (2.36 mm) sieve for surface courses with Ndesign = 90.
- 3/ Additional minus No. 200 (0.075 mm) material required by the mix design shall be mineral filler, unless otherwise approved by the Engineer.
- 4/ The maximum percent passing the #635 (20 μm) sieve shall be ≤ 3 percent.
- 5/ When establishing the Adjusted Job Mix Formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted above the percentage stated on the table.

- 6/ When establishing the Adjusted Job Mix Formula (AJMF) the percent passing the #8 (2.36 mm) sieve shall not be adjusted below 34 percent.

Revise Article 1030.04(b)(1) of the Standard Specifications to read:

- “(1) High ESAL Mixtures. The target value for the air voids of the HMA shall be 4.0 percent and for IL-4.75 it shall be 3.5 percent at the design number of gyrations. The VMA and VFA of the HMA design shall be based on the nominal maximum size of the aggregate in the mix, and shall conform to the following requirements.

VOLUMETRIC REQUIREMENTS High ESAL				
	Voids in the Mineral Aggregate (VMA), % minimum			Voids Filled with Asphalt Binder (VFA), %
Ndesign	IL-19.0	IL-9.5	IL-4.75 <sup>1/</sup>	
50	13.5	15.0	18.5	65 – 78 <sup>2/</sup>
70				65 - 75
90				

1/ Maximum Draindown for IL-4.75 shall be 0.3 percent

2/ VFA for IL-4.75 shall be 72-85 percent”

Replace Article 1030.04(b)(3) of the Standard Specifications with the following:

- “(3) SMA Mixtures.

Volumetric Requirements SMA <sup>1/</sup>			
Ndesign	Design Air Voids Target %	Voids in the Mineral Aggregate (VMA), % min.	Voids Filled with Asphalt (VFA), %
80 <sup>4/</sup>	3.5	17.0 <sup>2/</sup>	75 - 83
		16.0 <sup>3/</sup>	

1/ Maximum draindown shall be 0.3 percent. The draindown shall be determined at the JMF asphalt binder content at the mixing temperature plus 30 °F.

2/ Applies when specific gravity of coarse aggregate is  $\geq 2.760$ .

3/ Applies when specific gravity of coarse aggregate is  $< 2.760$ .

4/ Blending of different types of aggregate will not be permitted.

For surface course, the coarse aggregate can be crushed steel slag, crystalline crushed stone or crushed sandstone. For binder course, coarse aggregate shall be crushed stone (dolomite), crushed gravel, crystalline crushed stone, or crushed sandstone.

Add to the end of Article 1030.05 (d) (2) a. of the Standard Specifications:

"During production, the Contractor shall test SMA mixtures for draindown according to AASHTO T305 at a frequency of 1 per day of production."

Delete last sentence of the second paragraph of Article 1102.01(a) (4) b. 2.

Add to the end of Article 1102.01 (a) (4) b. 2.:

"As an option, collected dust (baghouse) may be used in lieu of manufactured mineral filler according to the following:

- (a.) Sufficient collected dust (baghouse) is available for production of the SMA mix for the entire project.
- (b.) A mix design was prepared based on collected dust (baghouse).

## **2) Design Verification and Production**

Revise Article 1030.04 (d) of the Standard Specifications to read:

"(d) Verification Testing. High ESAL, IL-4.75, and SMA mix designs submitted for verification will be tested to ensure that the resulting mix designs will pass the required criteria for the Hamburg Wheel Test (IL mod AASHTO T-324) and the Tensile Strength Test (IL mod AASHTO T-283). The Department will perform a verification test on gyratory specimens compacted by the Contractor. If the mix fails the Department's verification test, the Contractor shall make the necessary changes to the mix and resubmit compacted specimens to the Department for verification. If the mix fails again, the mix design will be rejected.

All new and renewal mix designs will be required to be tested, prior to submittal for Department verification and shall meet the following requirements:

- (1) Hamburg Wheel Test criteria. The maximum allowable rut depth shall be 0.5 in. (12.5 mm). The minimum number of wheel passes at the 0.5 in. (12.5 mm) rut depth criteria shall be based on the high temperature binder grade of the mix as specified in the mix requirements table of the plans.

Illinois Modified AASHTO T 324 Requirements <sup>1/</sup>

Asphalt Binder Grade	# Repetitions	Max Rut Depth (mm)
PG 70 -XX (or higher)	20,000	12.5
PG 64 -XX (or lower)	10,000	12.5

1/ When produced at temperatures of  $275 \pm 5$  °F ( $135 \pm 3$  °C) or less, loose Warm Mix Asphalt shall be oven aged at  $270 \pm 5$  °F ( $132 \pm 3$  °C) for two hours prior to gyratory compaction of Hamburg Wheel specimens.

Note: For SMA Designs (N-80) the maximum rut depth is 6.0 mm at 20,000 repetitions.  
 For IL 4.75mm Designs (N-50) the maximum rut depth is 9.0mm at 15,000 repetitions.

(2) Tensile Strength Criteria. The minimum allowable conditioned tensile strength shall be 60 psi (415 kPa) for non-polymer modified performance graded (PG) asphalt binder and 80 psi (550 kPa) for polymer modified PG asphalt binder. The maximum allowable unconditioned tensile strength shall be 200 psi (1380 kPa)."

Production Testing. Revise first paragraph of Article 1030.06(a) of the Standard Specifications to read:

"(a) High ESAL, IL-4.75, WMA, and SMA Mixtures. For each contract, a 300 ton (275 metric tons) test strip, except for SMA mixtures it will be 400 ton (363 metric ton), will be required at the beginning of HMA production for each mixture with a quantity of 3000 tons (2750 metric tons) or more according to the Manual of Test Procedures for Materials "Hot Mix Asphalt Test Strip Procedures".

Add the following after the sixth paragraph in Article 1030.06 (a) of the Standard Specifications:

"The Hamburg Wheel test shall also be conducted on all HMA mixtures from a sample taken within the first 500 tons (450 metric tons) on the first day of production or during start up with a split reserved for the Department. The mix sample shall be tested according to the Illinois Modified AASHTO T 324 and shall meet the requirements specified herein. Mix production shall not exceed 1500 tons (1350 metric tons) or one day's production, whichever comes first, until the testing is completed and the mixture is found to be in conformance. The requirement to cease mix production may be waived if the plant produced mixture demonstrates conformance prior to start of mix production for a contract.

If the mixture fails to meet the Hamburg Wheel criteria, no further mixture will be accepted until the Contractor takes such action as is necessary to furnish a mixture meeting the criteria"

Method of Measurement:

Add the following after the fourth paragraph of Article 406.13 (b):

"The plan quantities of SMA mixtures shall be adjusted using the actual approved binder and surface Mix Design's  $G_{mb}$ ."

Basis of Payment.

Replace the fourth paragraph of Article 406.14 of the Standard Specifications with the following:

"Stone matrix asphalt will be paid for at the contract unit price per ton (metric ton) for POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, STONE MATRIX ASPHALT, of the mixture composition and  $N_{design}$  specified; and POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, STONE MATRIX ASPHALT, of the mixture composition and  $N_{design}$  specified."

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## ADJUSTMENTS AND RECONSTRUCTIONS

Effective: March 15, 2011

Revise the first paragraph of Article 602.04 to read:

**“602.04 Concrete.** Cast-in-place concrete for structures shall be constructed of Class SI concrete according to the applicable portions of Section 503. Cast-in-place concrete for pavement patching around adjustments and reconstructions shall be constructed of Class PP-1 concrete, unless otherwise noted in the plans, according to the applicable portions of Section 1020.”

Revise the third, fourth and fifth sentences of the second paragraph of Article 602.11(c) to read:

“Castings shall be set to the finished pavement elevation so that no subsequent adjustment will be necessary, and the space around the casting shall be filled with Class PP-1 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e)(3)b.”

Revise Article 603.05 to read:

**“603.05 Replacement of Existing Flexible Pavement.** After the castings have been adjusted, the surrounding space shall be filled with Class PP-1 concrete, unless otherwise noted in the plans, to the elevation of the surface of the base course or binder course. HMA surface or binder course material shall not be allowed. The pavement may be opened to traffic according to Article 701.17(e)(3)b.”

Revise Article 603.06 to read:

**“603.06 Replacement of Existing Rigid Pavement.** After the castings have been adjusted, the pavement and HMA that was removed, shall be replaced with Class PP-1 concrete, unless otherwise noted in the plans, not less than 9 in. (225 mm) thick. The pavement may be opened to traffic according to Article 701.17(e)(3)b.

The surface of the Class PP concrete shall be constructed flush with the adjacent surface.”

Revise the first sentence of Article 603.07 to read:

**“603.07 Protection Under Traffic.** After the casting has been adjusted and the Class PP concrete has been placed, the work shall be protected by a barricade and two lights according to Article 701.17(e)(3)b.”

**COARSE AGGREGATE FOR BACKFILL, TRENCH BACKFILL AND BEDDING (D-1)**

Effective: November 1, 2011

Revised: November 1, 2013

This work shall be according to Section 1004.05 of the Standard Specifications except for the following:

Reclaimed Asphalt Pavement (RAP) maybe blended with gravel, crushed gravel, crushed stone crushed concrete, crushed slag, chats, crushed sand stone or wet bottom boiler slag. The RAP used shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications". The RAP shall be uniformly graded and shall pass the 1.0 in. (25 mm) screen. When RAP is blended with any of the coarse aggregate listed above, the blending shall be done mechanically with calibrated feeders. The feeders shall have an accuracy of  $\pm 2.0$  percent of the actual quantity of material delivered. The final blended product shall not contain more than 40 percent by weight RAP.

The coarse aggregate listed above shall meet CA 6 and CA 10 gradations prior to being blended with the processed and uniformly graded RAP. Gradation deleterious count shall not exceed 10% of total RAP and 5% of other by total weight.

**FRICITION AGGREGATE (D-1)**

Effective: January 1, 2011  
 Revised: April 29, 2016

Revise Article 1004.03(a) of the Standard Specifications to read:

**"1004.03 Coarse Aggregate for Hot-Mix Asphalt (HMA).** The aggregate shall be according to Article 1004.01 and the following.

(a) Description. The coarse aggregate for HMA shall be according to the following table.

Use	Mixture	Aggregates Allowed
Class A	Seal or Cover	<u>Allowed Alone or in Combination</u> <sup>5/</sup> : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag Crushed Concrete
HMA Low ESAL	Stabilized Subbase or Shoulders	<u>Allowed Alone or in Combination</u> <sup>5/</sup> : Gravel Crushed Gravel Carbonate Crushed Stone Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag <sup>1/</sup> Crushed Concrete
HMA High ESAL Low ESAL	Binder IL-19.0 or IL-19.0L  SMA Binder	<u>Allowed Alone or in Combination</u> <sup>5/ 6/</sup> : Crushed Gravel Carbonate Crushed Stone <sup>2/</sup> Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Concrete <sup>3/</sup>



Use	Mixture	Aggregates Allowed	
HMA High ESAL Low ESAL	C Surface and Leveling Binder IL-9.5 or IL-9.5L  SMA Ndesign 50 Surface	<u>Allowed Alone or in Combination</u> <sup>5/</sup> :	
		Crushed Gravel Carbonate Crushed Stone <sup>2/</sup> Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag <sup>4/</sup> Crushed Concrete <sup>3/</sup>	
HMA High ESAL	D Surface and Leveling Binder IL-9.5  SMA Ndesign 50 Surface	<u>Allowed Alone or in Combination</u> <sup>5/</sup> :	
		Crushed Gravel Carbonate Crushed Stone (other than Limestone) <sup>2/</sup> Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag <sup>4/</sup> Crushed Concrete <sup>3/</sup>	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		25% Limestone	Dolomite
		50% Limestone	Any Mixture D aggregate other than Dolomite
		75% Limestone	Crushed Slag (ACBF) or Crushed Sandstone
HMA High ESAL	E Surface IL-9.5  SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination</u> <sup>5/ 6/</sup> :	
		Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag  No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>

Use	Mixture	Aggregates Allowed	
		50% Dolomite <sup>2/</sup>	Any Mixture E aggregate
		75% Dolomite <sup>2/</sup>	Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or Crystalline Crushed Stone
		75% Crushed Gravel <sup>2/</sup> or Crushed Concrete <sup>3/</sup>	Crushed Sandstone, Crystalline Crushed Stone, Crushed Slag (ACBF), or Crushed Steel Slag
HMA High ESAL	F Surface IL-9.5  SMA Ndesign 80 Surface	<u>Allowed Alone or in Combination</u> <sup>5/ 6/</sup> :	
		Crystalline Crushed Stone Crushed Sandstone Crushed Slag (ACBF) Crushed Steel Slag No Limestone.	
		<u>Other Combinations Allowed:</u>	
		<i>Up to...</i>	<i>With...</i>
		50% Crushed Gravel <sup>2/</sup> , Crushed Concrete <sup>3/</sup> , or Dolomite <sup>2/</sup>	Crushed Sandstone, Crushed Slag (ACBF), Crushed Steel Slag, or Crystalline Crushed Stone

- 1/ Crushed steel slag allowed in shoulder surface only.
- 2/ Carbonate crushed stone (limestone) and/or crushed gravel shall not be used in SMA Ndesign 80. In SMA Ndesign 50, carbonate crushed stone shall not be blended with any of the other aggregates allowed alone in Ndesign 50 SMA binder or Ndesign 50 SMA surface.
- 3/ Crushed concrete will not be permitted in SMA mixes.
- 4/ Crushed steel slag shall not be used as leveling binder.
- 5/ When combinations of aggregates are used, the blend percent measurements shall be by volume."
- 6/ Combining different types of aggregate will not be permitted in SMA Ndesign 80."

**GROUND TIRE RUBBER (GTR) MODIFIED ASPHALT BINDER (D-1)**

Effective: June 26, 2006  
Revised: April 1, 2016

Add the following to the end of article 1032.05 of the Standard Specifications:

“(c) Ground Tire Rubber (GTR) Modified Asphalt Binder. A quantity of 10.0 to 14.0 percent GTR (Note 1) shall be blended by dry unit weight with a PG 64-28 to make a GTR 70-28 or a PG 58-28 to make a GTR 64-28. The base PG 64-28 and PG 58-28 asphalt binders shall meet the requirements of Article 1032.05(a). Compatible polymers may be added during production. The GTR modified asphalt binder shall meet the requirements of the following table.

Test	Asphalt Grade GTR 70-28	Asphalt Grade GTR 64-28
Flash Point (C.O.C.), AASHTO T 48, °F (°C), min.	450 (232)	450 (232)
Rotational Viscosity, AASHTO T 316 @ 275 °F (135 °C), Poises, Pa-s, max.	30 (3)	30 (3)
Softening Point, AASHTO T 53, °F (°C), min.	135 (57)	130 (54)
Elastic Recovery, ASTM D 6084, Procedure A (sieve waived) @ 77 °F, (25 °C), aged, ss, 100 mm elongation, 5 cm/min., cut immediately, %, min.	65	65

Note 1. GTR shall be produced from processing automobile and/or light truck tires by the ambient grinding method. GTR shall not exceed 1/16 in. (2 mm) in any dimension and shall contain no free metal particles or other materials. A mineral powder (such as talc) meeting the requirements of AASHTO M 17 may be added, up to a maximum of four percent by weight of GTR to reduce sticking and caking of the GTR particles. When tested in accordance with Illinois modified AASHTO T 27, a 50 g sample of the GTR shall conform to the following gradation requirements:

Sieve Size	Percent Passing
No. 16 (1.18 mm)	100
No. 30 (600 μm)	95 ± 5
No. 50 (300 μm)	> 20

Add the following to the end of Note 1. of article 1030.03 of the Standard Specifications:

“A dedicated storage tank for the Ground Tire Rubber (GTR) modified asphalt binder shall be provided. This tank must be capable of providing continuous mechanical mixing throughout by continuous agitation and recirculation of the asphalt binder to provide a uniform mixture. The tank shall be heated and capable of maintaining the temperature of

the asphalt binder at 300 °F to 350 °F (149 °C to 177 °C). The asphalt binder metering systems of dryer drum plants shall be calibrated with the actual GTR modified asphalt binder material with an accuracy of  $\pm 0.40$  percent.”

Revise 1030.02(c) of the Standard Specifications to read:

“(c) RAP Materials (Note 5) .....1031”

Add the following note to 1030.02 of the Standard Specifications:

Note 5. When using reclaimed asphalt pavement and/or reclaimed asphalt shingles, the maximum asphalt binder replacement percentage shall be according to the most recent special provision for recycled materials.

**HEAT OF HYDRATION CONTROL FOR CONCRETE STRUCTURES (D-1)**

Effective: November 1, 2013

Article 1020.15 shall not apply.

**RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES (D-1)**

Effective: November 1, 2012

Revise: April 2, 2016

Revise Section 1031 of the Standard Specifications to read:

**“SECTION 1031. RECLAIMED ASPHALT PAVEMENT AND RECLAIMED ASPHALT SHINGLES**

**1031.01 Description.** Reclaimed asphalt pavement and reclaimed asphalt shingles shall be according to the following.

- (a) Reclaimed Asphalt Pavement (RAP). RAP is the material resulting from cold milling or crushing an existing hot-mix asphalt (HMA) pavement. RAP will be considered processed FRAP after completion of both crushing and screening to size. The Contractor shall supply written documentation that the RAP originated from routes or airfields under federal, state, or local agency jurisdiction.
- (b) Reclaimed Asphalt Shingles (RAS). Reclaimed asphalt shingles (RAS). RAS is from the processing and grinding of preconsumer or post-consumer shingles. RAS shall be a clean and uniform material with a maximum of 0.5 percent unacceptable material, as defined in Bureau of Materials and Physical Research Policy Memorandum, “Reclaimed Asphalt Shingle (RAS) Sources”, by weight of RAS. All RAS used shall come from a Bureau of Materials and Physical Research approved processing facility where it shall be ground and processed to 100 percent passing the 3/8 in. (9.5 mm) sieve and 90 percent passing the #4 (4.75 mm) sieve. RAS shall meet the testing requirements specified herein. In addition, RAS shall meet the following Type 1 or Type 2 requirements.
  - (1) Type 1. Type 1 RAS shall be processed, preconsumer asphalt shingles salvaged from the manufacture of residential asphalt roofing shingles.
  - (2) Type 2. Type 2 RAS shall be processed post-consumer shingles only, salvaged from residential, or four unit or less dwellings not subject to the National Emission Standards for Hazardous Air Pollutants (NESHAP).

**1031.02 Stockpiles.** RAP and RAS stockpiles shall be according to the following.

- (a) RAP Stockpiles. The Contractor shall construct individual, sealed RAP stockpiles meeting one of the following definitions. Additional processed RAP (FRAP) shall be stockpiled in a separate working pile, as designated in the QC Plan, and only added to the sealed stockpile when test results for the working pile are complete and are found to meet tolerances specified herein for the original sealed FRAP stockpile. Stockpiles shall be sufficiently separated to prevent intermingling at the base. All stockpiles (including unprocessed RAP and FRAP) shall be identified by signs indicating the type as listed below (i.e. “Non- Quality, FRAP -#4 or Type 2 RAS”, etc...).
- (1) Fractionated RAP (FRAP). FRAP shall consist of RAP from Class I, Superpave HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in FRAP shall be crushed aggregate and may represent more than one aggregate type and/or

quality, but shall be at least C quality. All FRAP shall be processed prior to testing and sized into fractions with the separation occurring on or between the #4 (4.75 mm) and 1/2 in. (12.5 mm) sieves. Agglomerations shall be minimized such that 100 percent of the RAP in the coarse fraction shall pass the maximum sieve size specified for the mix the FRAP will be used in.

- (2) Restricted FRAP (B quality) stockpiles shall consist of RAP from Class I, Superpave (High ESAL), or HMA (High ESAL). If approved by the Engineer, the aggregate from a maximum 3.0 in. (75 mm) single combined pass of surface/binder milling will be classified as B quality. All millings from this application will be processed into FRAP as described previously.
- (3) Conglomerate. Conglomerate RAP stockpiles shall consist of RAP from Class I, Superpave HMA (High and Low ESAL) or equivalent mixtures. The coarse aggregate in this RAP shall be crushed aggregate and may represent more than one aggregate type and/or quality, but shall be at least C quality. This RAP may have an inconsistent gradation and/or asphalt binder content prior to processing. All conglomerate RAP shall be processed (FRAP) prior to testing. Conglomerate RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.
- (4) Conglomerate "D" Quality (DQ). Conglomerate DQ RAP stockpiles shall consist of RAP from HMA shoulders, bituminous stabilized subbases or Superpave (Low ESAL)/HMA (Low ESAL) IL-19.0L binder mixture. The coarse aggregate in this RAP may be crushed or round but shall be at least D quality. This RAP may have an inconsistent gradation and/or asphalt binder content. Conglomerate DQ RAP stockpiles shall not contain steel slag or other expansive material as determined by the Department.
- (5) Non-Quality. RAP stockpiles that do not meet the requirements of the stockpile categories listed above shall be classified as "Non-Quality".

RAP or FRAP containing contaminants, such as earth, brick, sand, concrete, sheet asphalt, bituminous surface treatment (i.e. chip seal), pavement fabric, joint sealants, plant cleanout etc., will be unacceptable unless the contaminants are removed to the satisfaction of the Engineer. Sheet asphalt shall be stockpiled separately.

- (b) RAS Stockpiles. Type 1 and Type 2 RAS shall be stockpiled separately and shall be sufficiently separated to prevent intermingling at the base. Each stockpile shall be signed indicating what type of RAS is present.

However, a RAS source may submit a written request to the Department for approval to blend mechanically a specified ratio of Type 1 RAS with Type 2 RAS. The source will not be permitted to change the ratio of the blend without the Department prior written approval. The Engineer's written approval will be required, to mechanically blend RAS with any fine aggregate produced under the AGCS, up to an equal weight of RAS, to improve workability. The fine aggregate shall be "B Quality" or better from an approved Aggregate Gradation Control System source. The fine aggregate shall be one that is approved for use in the HMA mixture and accounted for in the mix design and during HMA production.

Records identifying the shingle processing facility supplying the RAS, RAS type, and lot number shall be maintained by project contract number and kept for a minimum of three years.

**1031.03 Testing.** FRAP and RAS testing shall be according to the following.

(a) FRAP Testing. When used in HMA, the FRAP shall be sampled and tested either during processing or after stockpiling. It shall also be sampled during HMA production.

(1) During Stockpiling. For testing during stockpiling, washed extraction samples shall be run at the minimum frequency of one sample per 500 tons (450 metric tons) for the first 2000 tons (1800 metric tons) and one sample per 2000 tons (1800 metric tons) thereafter. A minimum of five tests shall be required for stockpiles less than 4000 tons (3600 metric tons).

(2) Incoming Material. For testing as incoming material, washed extraction samples shall be run at a minimum frequency of one sample per 2000 tons (1800 metric tons) or once per week, whichever comes first.

(3) After Stockpiling. For testing after stockpiling, the Contractor shall submit a plan for approval to the District proposing a satisfactory method of sampling and testing the RAP/FRAP pile either in-situ or by restockpiling. The sampling plan shall meet the minimum frequency required above and detail the procedure used to obtain representative samples throughout the pile for testing.

Before extraction, each field sample of FRAP, shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedure. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

(b) RAS Testing. RAS shall be sampled and tested during stockpiling according to Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Shingle (RAS) Sources". The Contractor shall also sample as incoming material at the HMA plant.

(1) During Stockpiling. Washed extraction and testing for unacceptable materials shall be run at the minimum frequency of one sample per 200 tons (180 metric tons) for the first 1000 tons (900 metric tons) and one sample per 1000 tons (900 metric tons) thereafter. A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). Once a  $\leq 1000$  ton (900 metric ton), five-sample/test stockpile has been established it shall be sealed. Additional incoming RAS shall be in a separate working pile as designated in the Quality Control plan and only added to the sealed stockpile when the test results of the working pile are complete and are found to meet the tolerances specified herein for the original sealed RAS stockpile.

(2) Incoming Material. For testing as incoming material at the HMA plant, washed extraction shall be run at the minimum frequency of one sample per 250 tons (227 metric tons). A minimum of five samples are required for stockpiles less than 1000 tons (900 metric tons). The incoming material test results shall meet the tolerances specified herein.



The Contractor shall obtain and make available all test results from start of the initial stockpile sampled and tested at the shingle processing facility in accordance with the facility's QC Plan.

Before extraction, each field sample shall be split to obtain two samples of test sample size. One of the two test samples from the final split shall be labeled and stored for Department use. The Contractor shall extract the other test sample according to Department procedures. The Engineer reserves the right to test any sample (split or Department-taken) to verify Contractor test results.

**1031.04 Evaluation of Tests.** Evaluation of test results shall be according to the following.

- (a) Evaluation of FRAP Test Results. All test results shall be compiled to include asphalt binder content, gradation and, when applicable (for slag),  $G_{mm}$ . A five test average of results from the original pile will be used in the mix designs. Individual extraction test results run thereafter, shall be compared to the average used for the mix design, and will be accepted if within the tolerances listed below.

Parameter	FRAP
No. 4 (4.75 mm)	± 6 %
No. 8 (2.36 mm)	± 5 %
No. 30 (600 μm)	± 5 %
No. 200 (75 μm)	± 2.0 %
Asphalt Binder	± 0.3 %
$G_{mm}$	± 0.03 <sup>1/</sup>

1/ For stockpile with slag or steel slag present as determined in the current Manual of Test Procedures Appendix B 21, "Determination of Reclaimed Asphalt Pavement Aggregate Bulk Specific Gravity".

If any individual sieve and/or asphalt binder content tests are out of the above tolerances when compared to the average used for the mix design, the FRAP stockpile shall not be used in Hot-Mix Asphalt unless the FRAP representing those tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

The Contractor shall maintain a representative moving average of five tests to be used for Hot-Mix Asphalt production.

With the approval of the Engineer, the ignition oven may be substituted for extractions according to the ITP, "Calibration of the Ignition Oven for the Purpose of Characterizing Reclaimed Asphalt Pavement (RAP)" or Illinois Modified AASHTO T-164-11, Test Method A.

- (b) Evaluation of RAS Test Results. All of the test results, with the exception of percent unacceptable materials, shall be compiled and averaged for asphalt binder content and gradation. A five test average of results from the original pile will be used in the mix designs. Individual test results run thereafter, when compared to the average used for the mix design, will be accepted if within the tolerances listed below.

Parameter	RAS
No. 8 (2.36 mm)	± 5 %
No. 16 (1.18 mm)	± 5 %
No. 30 (600 µm)	± 4 %
No. 200 (75 µm)	± 2.5 %
Asphalt Binder Content	± 2.0 %

If any individual sieve and/or asphalt binder content tests are out of the above tolerances when compared to the average used for the mix design, the RAS shall not be used in Hot-Mix Asphalt unless the RAS representing those tests is removed from the stockpile. All test data and acceptance ranges shall be sent to the District for evaluation.

- (c) Quality Assurance by the Engineer. The Engineer may witness the sampling and splitting conduct assurance tests on split samples taken by the Contractor for quality control testing a minimum of once a month.

The overall testing frequency will be performed over the entire range of Contractor samples for asphalt binder content and gradation. The Engineer may select any or all split samples for assurance testing. The test results will be made available to the Contractor as soon as they become available.

The Engineer will notify the Contractor of observed deficiencies.

Differences between the Contractor's and the Engineer's split sample test results will be considered acceptable if within the following limits.

Test Parameter	Acceptable Limits of Precision	
	FRAP	RAS
% Passing: <sup>1/</sup>		
1/2 in.	5.0%	
No. 4	5.0%	
No. 8	3.0%	4.0%
No. 30	2.0%	3.0%
No. 200	2.2%	2.5%
Asphalt Binder Content	0.3%	1.0%
G <sub>mm</sub>	0.030	

1/ Based on washed extraction.

In the event comparisons are outside the above acceptable limits of precision, the Engineer will immediately investigate.

- (d) Acceptance by the Engineer. Acceptable of the material will be based on the validation of the Contractor's quality control by the assurance process.

**1031.05 Quality Designation of Aggregate in RAP and FRAP.**

- (a) RAP. The aggregate quality of the RAP for homogeneous, conglomerate, and conglomerate "D" quality stockpiles shall be set by the lowest quality of coarse aggregate in the RAP stockpile and are designated as follows.
- (1) RAP from Class I, Superpave/HMA (High ESAL), or (Low ESAL) IL-9.5L surface mixtures are designated as containing Class B quality coarse aggregate.
  - (2) RAP from Superpave/HMA (Low ESAL) IL-19.0L binder mixture is designated as Class D quality coarse aggregate.
  - (3) RAP from Class I, Superpave/HMA (High ESAL) binder mixtures, bituminous base course mixtures, and bituminous base course widening mixtures are designated as containing Class C quality coarse aggregate.
  - (4) RAP from bituminous stabilized subbase and BAM shoulders are designated as containing Class D quality coarse aggregate.
- (b) FRAP. If the Engineer has documentation of the quality of the FRAP aggregate, the Contractor shall use the assigned quality provided by the Engineer.

If the quality is not known, the quality shall be determined as follows. Fractionated RAP stockpiles containing plus #4 (4.75 mm) sieve coarse aggregate shall have a maximum tonnage of 5,000 tons (4,500 metric tons). The Contractor shall obtain a representative sample witnessed by the Engineer. The sample shall be a minimum of 50 lb (25 kg). The sample shall be extracted according to Illinois Modified AASHTO T 164 by a consultant laboratory prequalified by the Department for the specified testing. The consultant laboratory shall submit the test results along with the recovered aggregate to the District Office. The cost for this testing shall be paid by the Contractor. The District will forward the sample to the Bureau of Materials and Physical Research Aggregate Lab for MicroDeval Testing, according to ITP 327. A maximum loss of 15.0 percent will be applied for all HMA applications. The fine aggregate portion of the fractionated RAP shall not be used in any HMA mixtures that require a minimum of "B" quality aggregate or better, until the coarse aggregate fraction has been determined to be acceptable thru a MicroDeval Testing.

**1031.06 Use of FRAP and/or RAS in HMA.** The use of FRAP and/or RAS shall be the Contractor's option when constructing HMA in all contracts.

- (a) FRAP. The use of FRAP in HMA shall be as follows.
- (1) Coarse Aggregate Size (after extraction). The coarse aggregate in all FRAP shall be equal to or less than the nominal maximum size requirement for the HMA mixture to be produced.
  - (2) Steel Slag Stockpiles. FRAP stockpiles containing steel slag or other expansive material, as determined by the Department, shall be homogeneous and will be approved for use in HMA (High ESAL and Low ESAL) mixtures regardless of lift or mix type.
  - (3) Use in HMA Surface Mixtures (High and Low ESAL). FRAP stockpiles for use in HMA surface mixtures (High and Low ESAL) shall have coarse aggregate that is

Class B quality or better. FRAP shall be considered equivalent to limestone for frictional considerations unless produced/screened to minus 3/8 inch.

- (4) Use in HMA Binder Mixtures (High and Low ESAL), HMA Base Course, and HMA Base Course Widening. FRAP stockpiles for use in HMA binder mixtures (High and Low ESAL), HMA base course, and HMA base course widening shall be FRAP in which the coarse aggregate is Class C quality or better.
- (5) Use in Shoulders and Subbase. FRAP stockpiles for use in HMA shoulders and stabilized subbase (HMA) shall be FRAP, Restricted FRAP, conglomerate, or conglomerate DQ.
- (b) RAS. RAS meeting Type 1 or Type 2 requirements will be permitted in all HMA applications as specified herein.
- (c) FRAP and/or RAS Usage Limits. Type 1 or Type 2 RAS may be used alone or in conjunction with FRAP in HMA mixtures up to a maximum of 5.0 percent by weight of the total mix.

When FRAP is used alone or FRAP is used in conjunction with RAS, the percent of virgin asphalt binder replacement (ABR) shall not exceed the amounts indicated in the table below for a given N Design.

Max Asphalt Binder Replacement for FRAP with RAS Combination

HMA Mixtures <sup>1/ 2/ 4/</sup>	Maximum % ABR		
	Binder/Leveling Binder	Surface	Polymer Modified <sup>3/</sup>
30L	50	40	30
50	40	35	30
70	40	30	30
90	40	30	30
4.75 mm N-50			40
SMA N-80			30

- 1/ For Low ESAL HMA shoulder and stabilized subbase, the percent asphalt binder replacement shall not exceed 50 % of the total asphalt binder in the mixture.
- 2/ When the binder replacement exceeds 15 % for all mixes, except for SMA and IL-4.75, the high and low virgin asphalt binder grades shall each be reduced by one grade (i.e. 25 % binder replacement using a virgin asphalt binder grade of PG64-22 will be reduced to a PG58-28). When constructing full depth HMA and the ABR is less than 15 %, the required virgin asphalt binder grade shall be PG64-28.
- 3/ When the ABR for SMA or IL-4.75 is 15 % or less, the required virgin asphalt binder shall be SBS PG76-22 and the elastic recovery shall be a minimum of 80. When the ABR for SMA or IL-4.75 exceeds

15%, the virgin asphalt binder grade shall be SBS PG70-28 and the elastic recovery shall be a minimum of 80.

- 4/ When FRAP or RAS is used alone, the maximum percent asphalt binder replacement designated on the table shall be reduced by 10 %.

**1031.07 HMA Mix Designs.** At the Contractor's option, HMA mixtures may be constructed utilizing RAP/FRAP and/or RAS material meeting the detailed requirements specified herein.

- (a) FRAP and/or RAS. FRAP and /or RAS mix designs shall be submitted for verification. If additional FRAP or RAS stockpiles are tested and found to be within tolerance, as defined under "Evaluation of Tests" herein, and meet all requirements herein, the additional FRAP or RAS stockpiles may be used in the original design at the percent previously verified.
- (b) RAS. Type 1 and Type 2 RAS are not interchangeable in a mix design. A RAS stone bulk specific gravity (Gsb) of 2.300 shall be used for mix design purposes.

**1031.08 HMA Production.** HMA production utilizing FRAP and/or RAS shall be as follows.

To remove or reduce agglomerated material, a scalping screen, gator, crushing unit, or comparable sizing device approved by the Engineer shall be used in the RAS and FRAP feed system to remove or reduce oversized material. If material passing the sizing device adversely affects the mix production or quality of the mix, the sizing device shall be set at a size specified by the Engineer.

If during mix production, corrective actions fail to maintain FRAP, RAS or QC/QA test results within control tolerances or the requirements listed herein the Contractor shall cease production of the mixture containing FRAP or RAS and conduct an investigation that may require a new mix design.

- (a) RAS. RAS shall be incorporated into the HMA mixture either by a separate weight depletion system or by using the RAP weigh belt. Either feed system shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes. The portion of RAS shall be controlled accurately to within  $\pm 0.5$  percent of the amount of RAS utilized. When using the weight depletion system, flow indicators or sensing devices shall be provided and interlocked with the plant controls such that the mixture production is halted when RAS flow is interrupted.
- (b) HMA Plant Requirements. HMA plants utilizing FRAP and/or RAS shall be capable of automatically recording and printing the following information.
- (1) Dryer Drum Plants.
- a. Date, month, year, and time to the nearest minute for each print.
  - b. HMA mix number assigned by the Department.
  - c. Accumulated weight of dry aggregate (combined or individual) in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).

- d. Accumulated dry weight of RAS and FRAP in tons (metric tons) to the nearest 0.1 ton (0.1 metric ton).
  - e. Accumulated mineral filler in revolutions, tons (metric tons), etc. to the nearest 0.1 unit.
  - f. Accumulated asphalt binder in gallons (liters), tons (metric tons), etc. to the nearest 0.1 unit.
  - g. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.
  - h. Aggregate RAS and FRAP moisture compensators in percent as set on the control panel. (Required when accumulated or individual aggregate and RAS and FRAP are printed in wet condition.)
  - i. When producing mixtures with FRAP and/or RAS, a positive dust control system shall be utilized.
  - j. Accumulated mixture tonnage.
  - k. Dust Removed (accumulated to the nearest 0.1 ton (0.1 metric ton))
- (2) Batch Plants.
- a. Date, month, year, and time to the nearest minute for each print.
  - b. HMA mix number assigned by the Department.
  - c. Individual virgin aggregate hot bin batch weights to the nearest pound (kilogram).
  - d. Mineral filler weight to the nearest pound (kilogram).
  - f. RAS and FRAP weight to the nearest pound (kilogram).
  - g. Virgin asphalt binder weight to the nearest pound (kilogram).
  - h. Residual asphalt binder in the RAS and FRAP material as a percent of the total mix to the nearest 0.1 percent.

The printouts shall be maintained in a file at the plant for a minimum of one year or as directed by the Engineer and shall be made available upon request. The printing system will be inspected by the Engineer prior to production and verified at the beginning of each construction season thereafter.

**1031.09 RAP in Aggregate Surface Course and Aggregate Wedge Shoulders, Type B.**  
The use of RAP or FRAP in aggregate surface course and aggregate shoulders shall be as follows.

- (a) Stockpiles and Testing. RAP stockpiles may be any of those listed in Article 1031.02, except "Non-Quality" and "FRAP". The testing requirements of Article 1031.03 shall not

apply. RAP used shall be according to the current Bureau of Materials and Physical Research Policy Memorandum, "Reclaimed Asphalt Pavement (RAP) for Aggregate Applications".

- (b) Gradation. The RAP material shall meet the gradation requirements for CA 6 according to Article 1004.01(c), except the requirements for the minus No. 200 (75  $\mu$ m) sieve shall not apply. The sample for the RAP material shall be air dried to constant weight prior to being tested for gradation."

**SLIPFORM PAVING (D-1)**

Effective: November 1, 2014

Revise Article 1020.04 Table 1, Note (5) of Standard Specifications to read:

“The slump range for slipform construction shall be 1/2 to 1 1/2 in.”

Revise Article 1020.04 Table 1 (metric), Note (5) of Standard Specifications to read:

“The slump range for slipform construction shall be 13 to 40 mm.”



**BUS SHELTER REMOVE AND RELOCATE**

**Description.** This work shall consist of removal and relocation of the existing shelter to the concrete pad location as shown on plans. Included in cost is the removal and disposal of northern section of concrete pad as shown on plans. This includes the saw cut limits. The removal of concrete pad shall allow for proper installation of subbase aggregate material and concrete ramp as a connection from existing platform to proposed warming shelter.

**Method of Measurement.** This work will be measured for payment as a each.

**Basis of Payment.** This item will be paid for at the contract unit price per each for BUS SHELTER REMOVE AND RELOCATE, which price shall be payment in full for all necessary work and equipment needed to complete task.

**REMOVE TIMBER RETAINING WALL**

**Description.** This work shall consist of removal and disposal of the top two timber ties of the existing timber retaining wall at the limits of the proposed platform location. Temporary sheeting piles may be installed prior to removal of retaining wall to support existing platform. The remaining timber retaining wall shall be buried in place during installation of connection between existing platform to proposed shelter.

**Method of Measurement.** This work will be measured for payment as a lump sum.

**Basis of Payment.** This item will be paid for at the contract unit price per lump sum for REMOVE TIMBER RETAINING WALL, which price shall be payment in full for all necessary work and equipment needed to complete task. Disposal of retaining wall is included in lump sum price.

## **DECORATIVE STEEL RAILING**

**Description.** This work shall be according to the details shown on the plans. This includes providing all material, construction and installation of handrails at staircase locations per plans and details and all material, construction and installation of railing systems per plans and details.

### **Performance Requirements.**

- A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Cold-Formed Structural Steel: AISI "Specification for the Design of Cold-Formed Steel Structural Members."
  
- B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
  - 1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
    - b. Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  
  - 2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
    - b. Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  
  - 3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system, including panels, intermediate rails, balusters, or other elements composing the infill area. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

- C. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

## Products.

### 1. MANUFACTURERS

- A. Manufacturers: The handrail system shall be manufactured and installed by a local metal fabricator with not less than 5 years experience doing work similar to that required for this project.

### 2. METALS

- A. General: Provide metal free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

- B. Steel and Iron: Provide steel and iron in the form indicated complying with the following requirements:

1. Steel Tubing: Product type (manufacturing method) and other requirements as follows:
  - a. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless otherwise indicated or required by structural loads.
  - b. Hot-Formed Steel Tubing: ASTM A 501.
  - c. For exterior installations provide tubing with hot-dip galvanized coating per ASTM A 53.
2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
3. Gray Iron Castings: ASTM A 48, Class 30.
4. Malleable Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

- C. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

### 3. MISCELLANEOUS MATERIALS

- A. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as required for color match, strength, corrosion resistance, and compatibility in fabricated items.

### 4. FASTENERS

A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings. For steel railings and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, except where otherwise indicated.

C. Postinstalled Anchors: Expansion type anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

### 5. PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

### 6. GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Nonshrink, Nonmetallic Grouts:
  - a. B-6 Construction Grout; W. R. Bonsal Co.
  - b. Diamond-Crete Grout; Concrete Service Materials Co.
  - c. Supreme; Cormix Construction Chemicals.
  - d. Sure-grip High Performance Grout; Dayton Superior Corp.
  - e. Euco N-S Grout; Euclid Chemical Co.
  - f. Five Star Grout; Five Star Products.
  - g. Crystex; L & M Construction Chemicals, Inc.
  - h. Vibropruf #11; Lambert Corp.
  - i. Masterflow 928 and 713; Master Builders Technologies, Inc.
  - j. Sealtight 588 Grout; W. R. Meadows, Inc.
  - k. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.
  - l. Kemset; The Spray-Cure Company.

## 7. FABRICATION

- A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than that required to support structural loads.
- B. Assemble railing systems in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members by mitering and welding at elbow bends.
- D. Welded Connections: Fabricate railing systems and handrails for connecting members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

- E. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- F. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
- G. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- H. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.
- I. Provide weep holes or another means to drain entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.
- J. Fabricate joints that will be exposed to weather in a watertight manner.
- K. Close exposed ends of handrail and railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of the railing and wall is 1/4 inch (6 mm) or less.

## 8. IRON AND STEEL FINISHES

- A. Galvanizing: Hot-dip galvanize components of railings and handrails to comply with applicable standard listed below:
  - 1. ASTM A 123 for galvanizing iron and steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.
- B. Fill vent and drain holes that will be exposed in the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized handrails and railing systems, provide galvanized fittings, brackets, fasteners, and other ferrous components.
- D. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- E. Apply shop primer to prepared surfaces of handrails and railing components, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting. Primer need not be applied to surfaces to be

embedded in concrete. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

## **Execution.**

### **1. PREPARATION**

- E. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchorages.

### **2. INSTALLATION, GENERAL**

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
  - 5. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
  - 6. Set posts plumb within a tolerance of 1/4 inch in 12 feet (2 mm in 1 m).
  - 7. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (2 mm in 1 m).
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- D. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by structural loads.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings systems and for properly transferring loads to in-place construction.



### 3. RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

### 4. ANCHORING POSTS

- A. Anchor posts in concrete by forming or core-drilling holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) greater than outside diameter of post. Clean holes of all loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's directions.
- B. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch (3-mm) buildup, sloped away from post.

### 5. ANCHORING RAIL ENDS

- A. Anchor rail ends into concrete with round flanges connected to rail ends and anchored into wall construction with postinstalled anchors and bolts.

### 6. ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
- B. Locate brackets at spacing required to support structural loads.
- C. Secure wall brackets and wall return fittings to building construction. For concrete anchorage, use drilled-in expansion shield and concealed hanger bolt.

### 7. ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- B. For Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

### 8. PROTECTION

- A. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

**Method of Measurement.** This work will be measured for payment per foot.

**Basis of Payment.** This item will be paid for at the contract unit price per foot for DECORATIVE STEEL RAILING, which price shall be payment in full for all necessary work and equipment needed to complete task.

**ORNAMENTAL FENCE, WROUGHT IRON**

**Description.** This work shall be according to the details shown on the plans. This includes providing all material, construction and installation of ornamental fence at locations shown on plans and in accordance to details

**Performance Requirements.**

- A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Cold-Formed Structural Steel: AISI "Specification for the Design of Cold-Formed Steel Structural Members."
- B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
  - 1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
    - b. Uniform load of 50 lbf per linear foot (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf per linear foot (1460 N/m) applied vertically downward.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  - 2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
    - a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
    - b. Uniform load of 50 lbf per linear foot (730 N/m) applied in any direction.
    - c. Concentrated and uniform loads above need not be assumed to act concurrently.
  - 3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in the system, including panels, intermediate rails, balusters, or other elements composing the infill area. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.
- C. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and

installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

## Products.

### 1. MANUFACTURERS

A. Manufacturers: The handrail system shall be manufactured and installed by a local metal fabricator with not less than 5 years experience doing work similar to that required for this project.

### 2. METALS

A. General: Provide metal free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Steel and Iron: Provide steel and iron in the form indicated complying with the following requirements:

1. Steel Tubing: Product type (manufacturing method) and other requirements as follows:

- a. Cold-Formed Steel Tubing: ASTM A 500, Grade A, unless otherwise indicated or required by structural loads.

- b. Hot-Formed Steel Tubing: ASTM A 501.

- c. For exterior installations provide tubing with hot-dip galvanized coating per ASTM A 53.

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

3. Gray Iron Castings: ASTM A 48, Class 30.

4. Malleable Iron Castings: ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

C. Brackets, Flanges, and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

### 3. MISCELLANEOUS MATERIALS

- A. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded or brazed and as required for color match, strength, corrosion resistance, and compatibility in fabricated items.

### 4. FASTENERS

A. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railing to other types of construction indicated and capable of withstanding design loadings. For steel railings and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

B. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined. Provide concealed fasteners for interconnecting handrail and railing components and for attaching them to other work, except where otherwise indicated.

C. Postinstalled Anchors: Expansion type anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

### 5. PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

### 6. GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Nonshrink, Nonmetallic Grouts:
  - a. B-6 Construction Grout; W. R. Bonsal Co.
  - b. Diamond-Crete Grout; Concrete Service Materials Co.
  - c. Supreme; Cormix Construction Chemicals.
  - d. Sure-grip High Performance Grout; Dayton Superior Corp.
  - e. Euco N-S Grout; Euclid Chemical Co.
  - f. Five Star Grout; Five Star Products.
  - g. Crystex; L & M Construction Chemicals, Inc.
  - h. Vibropruf #11; Lambert Corp.
  - i. Masterflow 928 and 713; Master Builders Technologies, Inc.
  - j. Sealtight 588 Grout; W. R. Meadows, Inc.
  - k. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.
  - l. Kemset; The Spray-Cure Company.

## 7. FABRICATION

- A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than that required to support structural loads.
- B. Assemble railing systems in shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Form changes in direction of railing members by mitering and welding at elbow bends.
- D. Welded Connections: Fabricate railing systems and handrails for connecting members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

- E. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.
- F. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
- G. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
- H. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.
- I. Provide weep holes or another means to drain entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.
- J. Fabricate joints that will be exposed to weather in a watertight manner.
- K. Close exposed ends of handrail and railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of the railing and wall is 1/4 inch (6 mm) or less.

## 8. IRON AND STEEL FINISHES

- A. Galvanizing: Hot-dip galvanize components of railings and handrails to comply with applicable standard listed below:
  - 1. ASTM A 123 for galvanizing iron and steel products made from rolled, pressed, and forged steel shapes, castings, plates, bars, and strips.
- B. Fill vent and drain holes that will be exposed in the finished work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. For galvanized handrails and railing systems, provide galvanized fittings, brackets, fasteners, and other ferrous components.
- D. Preparation for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- E. Apply shop primer to prepared surfaces of handrails and railing components, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting. Primer need not be applied to surfaces to be

embedded in concrete. Stripe paint all edges, corners, crevices, bolts, welds, and sharp edges.

## **Execution.**

### **1. PREPARATION**

- A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchorages.

### **2. INSTALLATION, GENERAL**

- A. Fit exposed connections accurately together to form tight, hairline joints.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
  - 5. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
  - 6. Set posts plumb within a tolerance of 1/4 inch in 12 feet (2 mm in 1 m).
  - 7. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (2 mm in 1 m).
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- D. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by structural loads.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings systems and for properly transferring loads to in-place construction.



### 3. RAILING CONNECTIONS

- A. **Welded Connections:** Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

### 4. ANCHORING POSTS

- A. Anchor posts in concrete by forming or core-drilling holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) greater than outside diameter of post. Clean holes of all loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout mixed and placed to comply with anchoring material manufacturer's directions.
- B. Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8-inch (3-mm) buildup, sloped away from post.

### 5. ANCHORING RAIL ENDS

- A. Anchor rail ends into concrete with round flanges connected to rail ends and anchored into wall construction with postinstalled anchors and bolts.

### 6. ATTACHING HANDRAILS TO WALLS

- A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.
- B. Locate brackets at spacing required to support structural loads.
- C. Secure wall brackets and wall return fittings to building construction. For concrete anchorage, use drilled-in expansion shield and concealed hanger bolt.

### 7. ADJUSTING AND CLEANING

- A. **Touchup Painting:** Immediately after erection, clean bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.
- B. **For Galvanized Surfaces:** Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

### 8. PROTECTION

- A. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

**Method of Measurement.** This work will be measured for payment per foot.

**Basis of Payment.** This item will be paid for at the contract unit price per foot for ORNAMENTAL FENCE, WROUGHT IRON, which price shall be payment in full for all necessary work and equipment needed to complete task.

**PLUMBING EQUIPMENT, ACCESSORIES AND RELATED SYSTEMS**

**Description.** This work is described in the CSI specifications sections of this special provision. Please refer to those sections for details.

**Method of Measurement.** This work will be measured for payment as a lump sum.

**Basis of Payment.** This item will be paid for at the contract unit price per lump sum for PLUMBING EQUIPMENT, ACCESSORIES AND RELATED SYSTEMS, which price shall be payment in full for all necessary work and equipment needed to complete task.

## **INTERPRETIVE SIGNAGE COMPLETE**

**Description.** This work shall consist of providing and installing Metra specific signs associated with the warming shelter building. The signs and their locations are specified in the plans and details. This work shall consist of furnishing and installing Building Signage and all other related items at the locations shown in the plans or as directed by the ENGINEER. This work shall include all signs, all mounting devices, hardware, and related appurtenances; and all labor, tools, and equipment necessary to complete the work as specified, including clean-up and restoration of the location.

Reference Specifications: Work under this item shall be performed in accordance with applicable portions of the following standards:

1. AWS D1.1 "Structural Welding Code," American Welding Society.
2. Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, adopted April 1, 2016 (IDOT).
3. Metra sign program specifications. Refer to Metra website "Metrarailtech.com" for sign program, specifications, sign types and details.

Work under this item shall be performed in accordance with Articles 664.04, 664.05, 1006.27(a), 1006.29, 1006.34(a), 1085.57, 1090.01, 1091.01, and Sections 729, 826, 1003, 1004, 1020, and 1021 of the Standard Specifications, except as herein modified.

### **Products.**

#### **1 MATERIALS**

- A. Sign Panels - Sign Panels shall conform to Section 720 of the IDOT Standard Specification for Road and Bridge Construction adopted April 1, 2016 2007 (IDOT).
- B. Metal Posts - Installation shall be performed as shown on the Drawings.
  1. Type A, metal posts shall conform to Section 729 (IDOT).
- C. Sign Panel Mounting Hardware.
  1. All mounting hardware shall be zinc, cadmium plated steel or stainless steel.
  2. All bolts and nuts shall have National Coarse Thread (UNC).

#### **2 CONCRETE MATERIALS**

Concrete materials shall meet the requirements of Sections 1020 and 1021 the Standard Specifications. The concrete shall be Class SI and meet the following requirements:

- A. Portland Cement: ASTM CI 50, domestic brand, Type I, normal Portland Cement; Type III for high-early strength Portland cement as per the requirements of Section 1001 of the Standard Specifications. Air entraining cement is not acceptable.
- B. High-early strength concrete may be used subject to ENGINEER's approval. All provisions of the specifications shall apply except that the 7-day compressive strength shall equal the 28 day compressive strength required for normal concrete.
- C. Admixtures: Admixtures shall meet the requirements of Article 1020.05 and Section 1021 of the Standard Specifications.
- D. Water-Reducing Admixture: As per the requirements of Article 1021 .03 of the Standard Specifications.
- E. Air-Entraining Admixture: Use air-entraining admixtures in all concrete, as per the requirements of Article 1021.02 of the Standard Specifications. Add air entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having an air content of not less than 5% nor more than 8% of the volume of the concrete.
- F. Calcium Chloride: Shall not be used.
- G. Concrete Curing Materials: Burlap curing blankets, waterproof paper blankets, white polyethylene sheeting, and burlap-polyethylene blanket shall meet the requirements of Section 1022 of the Standard Specifications.
- H. Ready Mix Concrete:
  - 1. All ready-mixed concrete shall comply with Article 1020.11 of the Standard Specifications
  - 2. The ready-mixed concrete producer shall submit duplicate delivery tickets, one for the Contractor and one for the ENGINEER, with each load of concrete delivered to the site.
  - 3. Delivery tickets shall provide the following information:
    - a. Date
    - b. Name of ready-mix concrete plant
    - c. Contractor
    - d. Job Location
    - e. Type of cement (Standard or H.E.S.)
    - f. Cement content in bags per cubic yard of concrete
    - g. Truck number
    - h. Time dispatched, and time unloaded
    - i. Amount of concrete in load in cubic yards
    - j. Admixtures in concrete, if any

### 3 LEGEND FOR SIGNS

- A. Regulatory signs shall be as per "Standard Highway Signs" as specified in the Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration.
- B. Legends shall include letters, numbers, arrows, symbols, borders, and other applications shown for sign panels. Enlargement or reduction of earthwork shall be done photographically. Hand-cut masks or templates will not be accepted.

### Execution.

### 1 INSTALLATION

- A. Sign Panel - Sign Panel shall be installed using all required post and mounting hardware in accordance with the details shown on the drawings or as directed by the Owner. The Contractor shall use only one type of sign base material and sign legend throughout this work, unless otherwise specified.
- B. Legends shall include letters, numbers, arrows, symbols, borders and other applications shown for sign panels. Enlargement or reduction of earthwork shall be done photographically. Hand-cut masks or templates will not be accepted.
- C. Installation work shall be performed by skilled workmen, specially trained in this type of work.
- D. Before sign components are delivered to the site, examine the locations in which the signs are to be erected, and report in writing to the ENGINEER any conditions which will prevent proper execution of the work or endanger its permanency. The erection of the signs shall not proceed until such conditions are corrected or adjusted to the satisfaction of the ENGINEER.

### 2 CONCRETE PLACEMENT:

Work under this item shall be performed in accordance with Section 420 of the Standard Specifications, except as herein modified.

- A. Pre-placement Inspection: Before placing concrete, inspect and complete any formwork installation, and items to be embedded or cast-in. Notify other trades to permit the installation of their Work; cooperate with other trades in setting such work as required.
- B. General Requirements: Comply with Section 420 of the Standard Specifications.
- C. Temperature Control for Placement: Comply with Article 1020.14 of the Standard Specifications.
- D. Concrete Curing and Protection: Concrete curing shall meet the requirements of Article 1020.13 of the Standard Specifications.

3 CLEANING

- A. Protective coverings shall be removed to expose finished surfaces. Exposed surfaces shall be cleaned. Rubbish and debris resulting from the work shall be removed from site and legally disposed of away from the premises.

**Method of Measurement.** This work will be measured for payment as each.

**Basis of Payment.** This item will be paid for at the contract unit price per each for INTERPRETIVE SIGNAGE COMPLETE, which price shall be payment in full for all necessary work and equipment needed to complete task.

## **SIGN AND POST**

**Description.** This work shall consist of providing and installing ADA parking signs and post as shown on plans and in details. This work shall consist of furnishing and installing Parking Lot Signage, posts, post foundations, hardware and all other related items at the locations shown in the plans or as directed by the ENGINEER. This work shall include all signs, all mounting devices, hardware, and related appurtenances; and all labor, tools, and equipment necessary to complete the work as specified, including clean-up and restoration of the location.

Reference Specifications: Work under this item shall be performed in accordance with applicable portions of the following standards:

1. AWS D1.1 "Structural Welding Code," American Welding Society.
2. Illinois Department of Transportation Standard Specifications for Road and Bridge Construction, adopted April 1, 2016 (IDOT).
3. Metra sign program specifications. Refer to Metra website "Metrarailtech.com" for sign program, specifications, sign types and details.

Work under this item shall be performed in accordance with Articles 664.04, 664.05, 1006.27(a), 1006.29, 1006.34(a), 1085.57, 1090.01, 1091.01, and Sections 729, 826, 1003, 1004, 1020, and 1021 of the Standard Specifications, except as herein modified.

### **Products.**

#### **1 MATERIALS**

- A. Sign Panels - Sign Panels shall conform to Section 720 of the IDOT Standard Specification for Road and Bridge Construction adopted April 1, 2016 (IDOT).
- B. Metal Posts - Installation shall be performed as shown on the Drawings.
  1. Type A, metal posts shall conform to Section 729 (IDOT).
- C. Sign Panel Mounting Hardware.
  1. All mounting hardware shall be zinc, cadmium plated steel or stainless steel.
  2. All bolts and nuts shall have National Coarse Thread (UNC).

#### **2 CONCRETE MATERIALS**

Concrete materials shall meet the requirements of Sections 1020 and 1021 the Standard Specifications. The concrete shall be Class SI and meet the following requirements:

- A. Portland Cement: ASTM C1 50, domestic brand, Type I, normal Portland Cement; Type III for high-early strength Portland cement as per the requirements of



Section 1001 of the Standard Specifications. Air entraining cement is not acceptable.

- B. High-early strength concrete may be used subject to ENGINEER'S approval. All provisions of the specifications shall apply except that the 7-day compressive strength shall equal the 28 day compressive strength required for normal concrete.
- C. Admixtures: Admixtures shall meet the requirements of Article 1020.05 and Section 1021 of the Standard Specifications.
- D. Water-Reducing Admixture: As per the requirements of Article 1021 .03 of the Standard Specifications.
- E. Air-Entraining Admixture: Use air-entraining admixtures in all concrete, as per the requirements of Article 1021.02 of the Standard Specifications. Add air entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having an air content of not less than 5% nor more than 8% of the volume of the concrete.
- F. Calcium Chloride: Shall not be used.
- G. Concrete Curing Materials: Burlap curing blankets, waterproof paper blankets, white polyethylene sheeting, and burlap-polyethylene blanket shall meet the requirements of Section 1022 of the Standard Specifications.
- H. Ready Mix Concrete:
  - 1. All ready-mixed concrete shall comply with Article 1020.11 of the Standard Specifications
  - 2. The ready-mixed concrete producer shall submit duplicate delivery tickets, one for the Contractor and one for the ENGINEER, with each load of concrete delivered to the site.
  - 3. Delivery tickets shall provide the following information:
    - a. Date
    - b. Name of ready-mix concrete plant
    - c. Contractor
    - d. Job Location
    - e. Type of cement (Standard or H.E.S.)
    - f. Cement content in bags per cubic yard of concrete
    - g. Truck number
    - h. Time dispatched, and time unloaded
    - i. Amount of concrete in load in cubic yards
    - j. Admixtures in concrete, if any

### 3 LEGEND FOR SIGNS

- A. Regulatory signs shall be as per "Standard Highway Signs" as specified in the Manual on Uniform Traffic Control Devices, U.S. Department of Transportation, Federal Highway Administration.
- B. Legends shall include letters, numbers, arrows, symbols, borders, and other applications shown for sign panels. Enlargement or reduction of earthwork shall be done photographically. Hand-cut masks or templates will not be accepted.

### Execution.

### 1 INSTALLATION

- A. Sign Panel - Sign Panel shall be installed using all required post and mounting hardware in accordance with the details shown on the drawings or as directed by the Owner. The Contractor shall use only one type of sign base material and sign legend throughout this work, unless otherwise specified.
- B. Legends shall include letters, numbers, arrows, symbols, borders and other applications shown for sign panels. Enlargement or reduction of earthwork shall be done photographically. Hand-cut masks or templates will not be accepted.
- C. Installation work shall be performed by skilled workmen, specially trained in this type of work.
- D. Before sign components are delivered to the site, examine the locations in which the signs are to be erected, and report in writing to the ENGINEER any conditions which will prevent proper execution of the work or endanger its permanency. The erection of the signs shall not proceed until such conditions are corrected or adjusted to the satisfaction of the ENGINEER.

### 2 CONCRETE PLACEMENT

Work under this item shall be performed in accordance with Section 420 of the Standard Specifications, except as herein modified.

- A. Pre-placement Inspection: Before placing concrete, inspect and complete any formwork installation, and items to be embedded or cast-in. Notify other trades to permit the installation of their Work; cooperate with other trades in setting such work as required.
- B. General Requirements: Comply with Section 420 of the Standard Specifications.
- C. Temperature Control for Placement: Comply with Article 1020.14 of the Standard Specifications.
- D. Concrete Curing and Protection: Concrete curing shall meet the requirements of Article 1020.13 of the Standard Specifications.

### 3 CLEANING

- A. Protective coverings shall be removed to expose finished surfaces. Exposed surfaces shall be cleaned. Rubbish and debris resulting from the work shall be removed from site and legally disposed of away from the premises.

**Method of Measurement.** This work will be measured for payment as each.

**Basis of Payment.** This item will be paid for at the contract unit price per each for SIGN AND POST, which price shall be payment in full for all necessary work and equipment needed to complete task.

**MECHANICAL WORK COMPLETE**

**Description.** This work is described in the CSI specifications sections of this special provision. Please refer to those sections for details.

**Method of Measurement.** This work will be measured for payment as a lump sum.

**Basis of Payment.** This item will be paid for at the contract unit price per lump sum for MECHANICAL WORK COMPLETE, which price shall be payment in full for all necessary work and equipment needed to complete task.

**LUMINAIRE, LED, HORIZONTAL MOUNT, LOW WATTAGE**

**Description:** This item shall consist of Furnishing and installing a proposed LED cobra head type luminaire on a roadway type light pole. The luminaire model no. and wattage as shown on the Plans shall be used.

**Materials and Construction Requirements:** This work shall consist of electrically connecting a proposed Led luminaire with integral multi-volt electronic driver to a single phase, lighting system. Connection shall be made as indicated on the contract plan drawings and shall be in conformance with the Standard Specifications, N.E.C. and local ordinances. Contractor to furnish and install splicing material, fuse holders, fusing, and pole wiring as shown on the drawings.

**Measurement and Basis of Payment:** This work shall be paid for at the contract unit price Each for LUMINAIRE, LED, HORIZONTAL MOUNT, LOW WATTGE which shall be payment in full for all work listed herein or as directed by the Owner.

**ABANDON EXISTING WATER MAIN, FILL WITH CLSM**

**Description.** The Contractor shall fill existing water main that is to be abandoned. The Contractor shall cap the ends of the existing water main that is to be filled. The controlled low-strength material used to fill the water main and the filling operation shall be in accordance with Section 593 of the Standard Specifications. Capping the water main will be paid for separately as CUT AND CAP EXISTING WATER MAIN.

**Method of Measurement.** Abandon existing water main, fill with CLSM will be measured for payment in feet along the centerline of the water main being filled.

**Basis of Payment.** This work will be paid for at the contract unit price per foot for ABANDON EXISTING WATER MAIN, FILL WITH CLSM.

**WATER MAIN LINE STOP**

**Description.** This work shall consist of the placement of a self-contained unit of the size indicated on the plans for the purpose of abandoning a section of water main without interruption of service to that section of main that is to remain active.

The line stop unit shall be a self-contained hydraulic (hand pump operated) ram. The line stopping device shall be of such a design that when hydraulic pressure is applied, the rubber will expand and conform to the inside diameter of the pipe and tuberculation inside the main (if any) will be moved outside of the sealing area. The line stop shall be of the "Short Stop" variety which will require removing only the top of the pipe during operation. All fittings shall employ an inside diameter thread, screw-type connection. After insertion of the plug, a screw-on cap shall be used and bolted down. The system shall be capable of containing a water pressure of 150 psi. Shop drawings for line stop sleeves shall be submitted for approval by the Engineer prior to delivery to the job site.

**Basis of Payment.** This work will be paid for at the contract unit price each for WATER MAIN LINE STOP, of the diameter specified, which price shall be payment in full for all excavation, legal disposal of excavated material and trench backfill.

**CUT AND CAP EXISTING WATER MAIN**

This work shall consist of cutting the existing water main to be abandoned at locations shown on the Plans. Existing water main to be abandoned in place shall be capped and the water main that will remain in service shall be plugged.

Before the water main is capped, it shall be filled with CLSM. This work will be paid for separately as ABANDON EXISTING WATER MAIN, FILL WITH CLSM.

This work shall be paid for at the contract unit price per each for CUT AND CAP EXISTING WATER MAIN, of the size specified, which price shall be payment in full for performing the work therein and shall include fittings, all saw cutting, excavation and compaction of backfill (including trench backfill), and any mortaring required around pipes



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**LIGHT POLE FOUNDATION, 24" DIAMETER, OFFSET**

**Description:** This item shall consist of furnishing and installing a 24 inch diameter, offset, light pole foundation.

**Materials and Construction Requirements:** The concrete foundation shall be furnished and installed per the details in the contract drawings, and shall be in conformance with Section 836 of the Standard Specifications and local ordinances.

**Measurement and Basis of Payment:** This work shall be paid for at the contract unit price Foot for LIGHT POLE FOUNDATION, 24" DIAMETER, OFFSET, which shall be payment in full for all work listed herein or as directed by the Owner. Ground rods shall be as specified on drawings and will be paid for separately.

**BUILDING**

**Description.** This work is described in the CSI specifications sections of this special provision. Please refer to those sections for details.

**Method of Measurement.** This work will be measured for payment as a lump sum.

**Basis of Payment.** This item will be paid for at the contract unit price per lump sum for BUILDING, which price shall be payment in full for all necessary work and equipment needed to complete task.

**ELECTRICAL SYSTEM COMPLETE**

**Description.** This work is described in the CSI specifications sections of this special provision. Please refer to those sections for details.

**Method of Measurement.** This work will be measured for payment as a lump sum.

**Basis of Payment.** This item will be paid for at the contract unit price per lump sum for ELECTRICAL SYSTEM COMPLETE, which price shall be payment in full for all necessary work and equipment needed to complete task.

**FENCE REMOVAL**

**Description.** This item consists of removing and disposing of existing fence at locations as shown on the plans and where directed by the Engineer. This work shall also include the removal and disposal of gates. The Contractor shall exercise care so as not to damage fence and gates that are to remain. Existing posts shall be pulled and the resulting hole backfilled with sand. Concrete foundations shall also be disposed of off-site.

The Contractor shall ensure that a temporary (or permanent) fence is in place at the end of each day to maintain a barrier between the Maywood Metra Station and Main Street. The temporary fence will be included in the cost of FENCE REMOVAL.

**Basis of Payment.** This work will be paid for at the contract unit price per foot for FENCE REMOVAL.

**TEMPORARY SHEET PILING (SPECIAL)**

**Description.** This work shall consist of furnishing, driving, adjusting for stage construction when required and subsequent removal of the sheet piling according to the dimensions and details shown on the plans and according to the applicable portions of Section 512 of the Standard Specifications.

This work shall also include furnishing, installing and subsequent removal of all miscellaneous steel shapes, plates and connecting hardware when required to attach the sheeting to an existing substructure unit and/or to facilitate stage construction.

**General.** The Contractor may propose other means of supporting the sides of the excavation provided they are done so at no extra cost to the department. If the Contractor elects to vary from the design requirements shown on the plans, the revised design calculations and details shall be submitted to the Engineer for approval. The calculations shall be prepared and sealed by an Illinois Licensed Structural Engineer. This approval will not relieve the Contractor of responsibility for the safety of the excavation. Approval shall be contingent upon acceptance by all involved utilities and/or railroads.

**Material.** The sheet piling shall be made of steel and may be new or used material, at the option of the Contractor. The sheet piling shall have a minimum section modulus as shown on the plans or in the approved Contractor's alternate design. The sheeting shall have a minimum yield strength of 38.5 ksi (265 MPa) unless otherwise specified. The sheeting, used by the Contractor, shall be identifiable and in good condition free of bends and other structural defects. The Contractor shall furnish a copy of the published sheet pile section properties to the Engineer for verification purposes. The Engineer's approval will be required prior to driving any sheeting. All driven sheeting not approved by the Engineer shall be removed at the Contractor's expense.

**Construction.** The Contractor shall verify locations of all underground utilities before driving any sheet piling. Any disturbance or damage to existing structures, utilities or other property, caused by the Contractor's operation, shall be repaired by the Contractor in a manner satisfactory to the Engineer at no additional cost to the Department. The Contractor shall be responsible for determining the appropriate equipment necessary to drive the sheeting to the tip elevation(s) specified on the plans or according to the Contractor's approved design. The sheet piling shall be driven, as a minimum, to the tip elevation(s) specified, prior to commencing any related excavation. If unable to reach the minimum tip elevation, the adequacy of the sheet piling design will require re-evaluation by the Department prior to allowing excavation adjacent to the sheet piling in question. The Contractor shall not excavate below the maximum excavation line shown on the plans without the prior permission of the Engineer. The sheet piling shall remain in place until the Engineer determines it is no longer required.

The sheet piling shall be removed and disposed of by the Contractor when directed by the Engineer. When allowed, the Contractor may elect to cut off a portion of the sheet piling leaving the remainder in place. The remaining sheet piling shall be a minimum of

12 in. (300 mm) below the finished grade or as directed by the Engineer. Removed sheet piling shall become the property of the Contractor.

When an obstruction is encountered, the Contractor shall notify the Engineer and upon concurrence of the Engineer, the Contractor shall begin working to break up, push aside, or remove the obstruction. An obstruction shall be defined as any object (such as but not limited to, boulders, logs, old foundations etc.) where it's presence was not obvious or specifically noted on the plans prior to bidding, that cannot be driven through or around with normal driving procedures, but requires additional excavation or other procedures to remove or miss the obstruction.

**Method of Measurement.** The temporary sheet piling will be measured for payment in place in square feet (square meter). Any temporary sheet piling cut off, left in place, or driven to dimensions other than those shown on the contract plans without the written permission of the Engineer, shall not be measured for payment but shall be done at the contractor's expense.

If the Contractor is unable to drive the sheeting to the specified tip elevation(s) and can demonstrate that any further effort to drive it would only result in damaging the sheeting, then the Contractor shall be paid based on the plan quantity of temporary sheeting involved. However, no additional payment will be made for any walers, bracing, or other supplement to the temporary sheet piling, which may be required as a result of the re-evaluation in order to insure the original design intent was met. Portions of the temporary sheet piling left in place for reuse in later stages of construction shall only be measured for payment once.

**Basis of Payment.** This work will be paid for at the contract unit price per square foot (square meter) for TEMPORARY SHEET PILING. Payment for any excavation performed in conjunction with this work will not be included in this item but shall be paid for as specified elsewhere in this contract. Obstruction mitigation shall be paid for according to Article 109.04 of the Standard Specifications.

**PRESSURE CONNECTION TO EXISTING WATER MAIN**

**Description.** This work shall consist of installing pressure connections of the sizes indicated at the locations shown on the contract plans in conformance with the following specifications. This work shall be done under pressure to insure that no customers on the water system are out of service while this work is being performed.

Pressure connections shall be made through a gate valve that complies with the special provision for Water Valves and a Mueller stainless steel tapping sleeve of the appropriate dimension. A valve vault shall house the pressure connection. Pressure connections shall be made only in the presence of an authorized Village of Maywood representative.

**Measurement and Payment:** This work will be paid for at the contract unit price each for PRESSURE CONNECTION TO EXISTING WATER MAIN, of the size indicated, which price shall include the furnishing of the tapping sleeve and tapping valve, and all necessary bolts and accessories; and installing the valve and sleeve and executing a cut through the valve into the main, removing the severed section of the main for a complete installation, and installing a valve vault and frame and lid. All excavation and backfill necessary for the installation shall be included.



**SANITARY SEWER 8"**

**Description.** This work shall conform to Section 550 of the Standard Specifications and to the Standard Specifications for Water and Sewer Main Construction in Illinois. This work shall consist of removing a portion of existing sanitary sewer and replacing the removed portion with new PVC sewer pipe at the same location. This work shall be completed at the locations shown on the plans or as directed by the Engineer.

The locations and limits of the removals and replacement as shown on the plans have been determined from televised inspections of the existing sanitary sewer. The Contractor shall first sawcut for the point repair. This cost for sawcutting will not be paid for separately but shall be considered as included in the cost of SANITARY SEWER. The Contractor shall excavate and expose the existing sanitary sewer at these locations to determine the exact limits of removal and replacement and sizes of lateral connections. The cost for the exploratory excavation will not be paid for separately but shall be considered included in the cost to the contract unit price for SANITARY SEWER of the diameter specified. All tee replacements and up to four feet of the service lateral shall be included in the cost of SANITARY SEWER to the point repair. All pipes, tees and other fittings shall be SDR 26. Trench backfill will be required as stated in the Special Provision, but shall be paid for separately as TRENCH BACKFILL.

**Construction Requirements.** The excavation, bedding, pipe laying, backfilling, and clean up shall be completed in accordance with the applicable portions of Divisions II and III of the Standard Specifications for Water and Sewer Main Construction in Illinois. The bedding for the pipe shall be CA-11 or CA-13 coarse aggregate, and shall be placed from 6" below the pipe to 12" over the top of the pipe. The cost for the bedding shall be included in the cost to the contract unit price for SANITARY SEWER of the diameter specified.

The existing storm/sanitary sewer shall be replaced with polyvinyl chloride (PVC) pipe conforming to ASTM B1784 (AWWA Standard SDR 26-3034) with Elastomeric seals (gasket) conforming to ASTM-F477. The Standard Dimension Ratio (SDR) for the PVC sewer pipe shall be 26-3034. The pipe shall have push-on joints.

Connections to existing storm/sanitary sewer pipe shall be made with non-shear band couplings subject to the review of the Engineer. The couplings shall be equipped with stainless steel bands.

**Method of Measurement and Basis of Payment.** This work will be measured and paid for at the contract unit price per foot for SANITARY SEWER 8", of the diameter specified. Removal of the existing sewer will be considered included in the cost of SANITARY SEWER. The contract unit price shall include all labor, material, and equipment necessary to complete the work as specified. It is the Contractor's responsibility to verify existing depths. No additional compensation will be made for variances in the depth of the sewer pipe.

Any additional or overage footage from the scheduled repair that is required to complete the work will not be paid for separately.

**TRAFFIC CONTROL AND PROTECTION, (SPECIAL)**

**Description.** This work shall consist of all labor, materials, transportation, handling and incidental work necessary to furnish, install, maintain and remove all traffic control devices required and as approved by the Engineer.

**Construction Requirements.** The CONTRACTOR shall provide the ENGINEER, at the preconstruction meeting, a proposed plan for traffic control and protection throughout the duration of the project. At the preconstruction meeting, the CONTRACTOR shall furnish the name of the individual in his direct employ who is to be responsible for the installation and maintenance of the traffic control for this project. If the actual installation and maintenance are to be accomplished by a subcontractor, consent shall be requested of the ENGINEER at the time of the preconstruction meeting in accordance with Article 108.01 of the Standard Specifications. This shall not relieve the CONTRACTOR of the requirement to have a responsible individual in his direct employ supervise the work.

Construction operations shall be conducted in a manner such that streets will be open to emergency traffic.

**Method of Measurement.** This work will not be measured for payment.

**Basis of Payment.** This work will be paid for at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION, (SPECIAL).

**SECTION 01 01 01 - SUMMARY OF BUILDING WORK**

**PART 1 - GENERAL:**

**1.1 GENERAL WORK**

- A. The requirement of Division 100, General Requirements, shall apply to all Building and Site General Work.
- B. The Building General Work shall include, but not be limited to, the following:
  - 1. Operation and continued maintenance of the existing platform and electrical during construction until the new building and site work are commissioned.
  - 2. All site work consisting of site clearing, new pavement, earth excavation and backfill, installation of new fence and retaining walls as indicated on the Drawings and as specified herein.
  - 3. All general demolition work as indicated on the Drawings as described in the Specifications and Plans.
  - 4. All unit masonry work consisting of Concrete Masonry Unit (CMU) work and faced brickwork as indicated on the Drawings and as specified herein.
  - 5. All miscellaneous metal work as indicated on the Drawings and as specified herein.
  - 6. All carpentry work as indicated on the Drawings and as specified herein.
  - 7. All roofing work as indicated on the Drawings and as specified herein.
  - 8. All sheet metal work as indicated on the Drawings and as specified herein.
  - 9. All sealant work as indicated on the Drawings and as specified herein.
  - 10. All board insulation work as indicated on the Drawings and as specified herein.
  - 11. All doors and hardware as indicated on the Drawings and as specified herein.
  - 12. All painting as indicated on the Drawings and as specified herein.
  - 13. The station identification plate, shop desk, pump dolly, bulletin board, staff gauges, first aid kit, fire extinguishers, electric clock and trash can as indicated on the Drawings and as specified herein.
  - 14. Fiberglass ladder and railing as specified herein.

15. All handrail material and installation along staircase and ramps as shown on the Drawings and as specified herein.

## 1.2 MECHANICAL WORK COMPLETE

- A. The requirements of the Special Provisions and Division 100, General Requirements, shall apply to all Building Mechanical Work described herein.
- B. The Building Mechanical Work shall include, but not be limited to, furnishing and installing the following items as indicated on the Project Drawings and in the Special Provisions:
  1. New gas fired tankless water heater installed complete and operational, including all appurtenances.
  2. New water supply, piping and fixtures, fittings, wall castings, flow meter and appurtenances.
  3. New waste water sewer lines including all piping, fittings, wall castings and appurtenances.
  4. New janitor's mop sink and basin including all piping, fittings, wall castings and appurtenances.
  5. All required pipe and equipment support systems, hangers, and appurtenances; required for the installation of all piping, pumps, valves, and other mechanical items.
  6. New gas service piping to building and interior gas piping for new furnace and tankless water heater, including appurtenant items.
  7. Any miscellaneous mechanical items that are ancillary to the Work described above.

## 1.3 HEATING AND VENTILATION

- A. The requirement of Division 100, General Requirements, shall apply to all Pump Station Heating and Ventilation Work.
- B. The Building Heating and Ventilation Work shall include, but not be limited to, the following:
  1. New forced air furnace heating system, heated floor system and supplemental gas fired unit heaters in mechanical room and janitor's closet.

1.4 ELECTRICAL SYSTEM

- A. The requirements of Division 100, General Requirements, shall apply to all Building Electrical Work.
- B. The Building Electrical Work shall include, but not be limited to, the following:
  - 1. Maintenance of the existing electric service, including all metering.
  - 2. Installation and connection of a new electric service including all metering in accordance with Commonwealth Edison Requirements.
  - 3. New Metra electric cabinet and Voice of Metra cabinet.
  - 4. Installation of new electrical panels.
  - 5. New control and auto dialer panels.
  - 6. New lighting fixtures, lighting panel board and wiring devices.
  - 7. New power, lighting, control and signal wires and cables.
  - 8. New heated floor system.
  - 9. New electric heaters, complete.
  - 10. New float type level sensing control system.
  - 11. New heat and smoke detectors and intrusion alarm system.
  - 12. New door access system.

1.5 SUBMITTALS

- A. Except as specified elsewhere herein, materials and equipment shall be in conformance with the requirements of Section 106 of the Standard Specifications.
- B. Materials and equipment shall be the products of established and reputable manufacturers and shall be suitable for the service required. Unless otherwise specifically indicated, all materials and equipment shall be new. The Contractor is obligated to conduct his own search into the timely availability of the specified equipment and materials to ensure that they are in strict conformance with the contract documents and that delivery schedules are compatible with project time constraints. Materials or equipment items which are similar or identical shall be the product of the same manufacturer. The cost of submittals, certifications, any required samples, and similar costs shall not be separately paid for but shall be included in the pay item bid price for the respective material or work.
- C. All equipment, products, and materials incorporated in the work shall be submitted for approval.
- D. Specific submittals required for individual elements of work are specified in the individual Specification sections. Except as otherwise indicated in Specification sections, requirements specified herein shall apply for each indicated type of submittal. Procedures concerning items such as a listing of manufacturers, suppliers, subcontractors, construction progress schedule, schedule of Shop Drawing submissions, bonds, payment applications, insurance certificates, and schedule of values are specified elsewhere.

E. Work Related Submittals

1. Equal" Items include material or equipment ENGINEER to accept, after Bids are received, as specified or described in Specifications by item or name of particular supplier.
2. Shop Drawings include technical data and drawings specially prepared for this Project, including fabrication and installation drawings, diagrams, actual performance curves, data sheets, schedules, templates, patterns, reports, instructions, design mix formulas, measurements, and similar information not in standard printed form. Standard information prepared without specific reference to the Project is not considered a Shop Drawing.
3. Product Data include standard printed information on manufactured products and systems that has not been specially prepared for this project, including manufacturer's product specifications and installation instructions, catalog cuts, standard wiring diagrams, printed performance curves, mill reports, and standard color charts.
4. Samples include both fabricated and manufactured physical examples of materials, products, and units of work, partial cuts of manufactured or fabricated work, swatches showing color, texture, and pattern, and units of work to be used for independent inspection and testing. Mock-ups are special forms of samples, which are too large or otherwise inconvenient for handling in manner specified for transmittal of sample submittals.
5. Miscellaneous Submittals are work-related submittals that do not fit in the previous categories, such as guarantees, warranties, certifications, experience records, maintenance agreements, Operating and Maintenance Manuals, workmanship bonds, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, and similar information, devices, and materials applicable to the Work.

F. Scheduling

1. A preliminary schedule of shop drawings and sample submittals shall be submitted for approval, in duplicate.
2. Prior to final payment, the original and one copy of all bonds, warranties, guarantees, and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the one year correction period shall be delivered to the ENGINEER.
3. Within 60 days of the contract award, the Contractor shall submit, for approval, complete manufacturer's product data (for standard products and components) and detailed shop drawings (for fabricated equipment). Submittals need not include all project equipment and materials in one submittal; however, the submittals for the equipment and materials for

each individual pay item shall be complete in every respect. Partial submittals may be returned without review. The Contractor may request, in writing, permission to make a partial submittal; the Engineer will evaluate the circumstances of the request and may accept to review such partial submittal. However, no additional compensation or extension of time will be allowed for extra costs or delays incurred due to partial or late submittals.

- G. Each submittal shall be accompanied by a transmittal containing the following information:
- a. Contractor's Name
  - b. Supplier's Name
  - c. Manufacturer's Name
  - d. Date of submittal and dates of previous submittals containing the same material
  - e. Project Route/Name
  - f. Section
  - g. Submittal and transmittal number
  - h. Contract identification
  - i. Identification of equipment and material with equipment identification numbers, motor numbers, and Specification section number
  - j. Variations from Contract Documents and any limitations which may impact the Work.
  - k. Drawing sheet and detail number as appropriate.

Multi-part submittal forms will be provided by the department to the Contractor to facilitate the submittal and review process. The Contractor shall complete all submittal information on the form and shall sign the submittal as indicated.

H. Exceptions, Deviations, and Substitutions

1. In general, exceptions to and deviations from the requirements of the Contract Documents will not be allowed. It is the CONTRACTOR's responsibility to note any deviations from Contract requirements at the time of submittal and to make any requests for deviations in writing. In general, substitutions must demonstrate that the proposed substitution is superior to the equipment or material required by the Contract Documents. No exceptions, deviations, or substitutions will be permitted without approval.
2. Data for items to be submitted for review, as substitution shall be collected into one submittal for each item of material or equipment.
3. Request shall be submitted with other scheduled submittals for the material or equipment allowing time for ENGINEER to evaluate the additional information required to be submitted. If CONTRACTOR requests to substitute for material or equipment specified but not identified in Specifications as requiring submittals, substitution submittal request shall be included in Submittal schedule and submitted as

scheduled.

I. Shop Drawings

1. Shop drawing information shall be newly prepared and submitted with graphic information at accurate scale. The name of manufacturer or supplier (firm name) shall be indicated. Dimensions shall be shown and clearly noted which are based on field measurement; materials and products that are included in the Work shall be identified; revision shall be identified. Compliance with standards and notation of coordination requirements with other work shall be indicated. Variations from Contract Documents or previous submittals shall be highlighted, encircled or otherwise indicated.
2. The following information shall be included on each drawing or page:
  - a. Submittal date and revision dates.
  - b. Project name, division number and descriptions.
  - c. Detailed specifications section number and page number.
  - d. Identification of equipment, product or material.
  - e. Name of CONTRACTOR and Subcontractor.
  - f. Name of Supplier and Manufacturer.
  - g. Relation to adjacent structure or material.
  - h. Field dimensions, clearly identified.
  - i. Standards or Industry Specification references.
  - j. Identification of deviations from the Contract Documents.
  - k. CONTRACTOR's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
  - l. Physical location and location relative to other connected or attached material at which the equipment or materials are to be installed.
3. An 8-inch by 3-inch blank space shall be provided for CONTRACTOR and ENGINEER stamps.
4. Three blue line or black line prints or two reverse sepia reproducible and 1 blue or black line print shall be submitted. One reproducible or one print will be returned.
5. Materials, products or systems shall not be installed until copy of applicable product data showing only approved information is in possession of installer. One set of product data (for each submittal) shall be maintained at Project site. Five additional copies shall be marked with the date of approval and forwarded to the ENGINEER for use in field and for OWNER'S records.

J. Product Data

1. Required product data shall be collected into a single submittal for each element of work or system. Where product data has been printed to



include information on several similar products, some of which are not required for use on Project or are not included in submittal, copies shall be marked to clearly show such information is not applicable.

2. Where product data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, data shall be submitted as a Shop Drawing and not as product data.
3. Submittal is for information and record, and to determine that products, materials, and systems comply with Contract Documents. Submittal shall be final when returned by ENGINEER marked "Approved".
4. Four submittal copies, in addition to the number the Contractor requires returned, including those required for RECORD DRAWINGS, shall be submitted to the Engineer.
5. Materials, products or systems shall not be installed until copy of applicable product data showing only approval information is in possession of installer. One set of product data (for each submittal) shall be maintained at Project site, available for reference by ENGINEER and others.

K. Samples

1. Where possible, samples shall be physically identical with proposed materials or products to be incorporated into the Work. Where variations in color, pattern or texture are inherent in material or product represented by sample, multiple units (not less than 3 units) shall be submitted showing approximate limits of variations.
2. A full set of optional samples shall be provided where ENGINEER's selection required. Samples shall be prepared to match ENGINEER's selection where so indicated.
3. Each sample shall include generic description, source or product name and manufacturer, limitations, and compliance with standards.
4. Samples for ENGINEER's visual review and final check of coordination of these characteristics with other related elements of work shall be of general generic kind, color, pattern, and texture.
5. At CONTRACTOR's option, and depending upon nature of anticipated response from ENGINEER, initial submittal of samples may be either preliminary or final submittal.

A preliminary submittal, consisting of a single set of samples, is required where specifications indicate ENGINEER's selection of color, pattern, texture or similar characteristics from manufacturer's range of standard choices is necessary. Preliminary submittals will be reviewed and returned with ENGINEER's "Action" marking.

Three sets of samples shall be submitted in final submittal, one set will be returned.

6. The returned final set of samples shall be maintained at Project site, in suitable condition and available for quality control comparisons throughout course of performing work.

Returned samples intended or permitted to be incorporated in the Work are indicated in Specification sections, and shall be in undamaged condition at time of use.

- L. Mock-ups and similar samples specified in Specification sections are recognized as special type of samples. Requirements for sample submittal shall be complied with to greatest extent possible. Transmittal forms shall be processed to provide record of activity.

M. Miscellaneous Submittals

1. Inspection and Test Reports

- a. Each inspection and test report shall be classified as either "Shop Drawings" or "product data", depending on whether report is specially prepared for Project or standard publication of workmanship control testing at point of production. Inspection and test reports shall be processed accordingly.

2. Guarantees, Warranties, Maintenance Agreements, and Workmanship Bonds

- a. Refer to Specification sections and section Guarantees and Warranties for specific requirements. Submittal is final when returned by ENGINEER marked "Approved" or "Approved as Noted".
- b. In addition to copies desired for CONTRACTOR's use, 2 executed copies shall be furnished. Two additional copies shall be provided where required for maintenance data.

3. Certifications

- a. Refer to Specification sections for specific requirements on submittal of certifications. Seven copies shall be submitted. Certifications are submitted for review of conformance with specified requirements and information. Submittal shall be final when returned by ENGINEER marked "Approved".
- b. Where certifications are specified, the information submitted for approval shall incorporate certification information. When a certification can be made prior to manufacture, the certification shall be included with initial submittal information. When certification is possible only after manufacture, the initial submittal information shall include a statement of intent to furnish the certification after equipment approval and manufacture.

Certifications involving inspections and/or tests shall be complete with all test data presented in a neat, descriptive format, with all test data, applicable dates, times, and persons responsible.

4. Tools

- a. Extra and overrun stock, maintenance tools and devices, keys, and similar physical units shall be submitted.
- b. Special tools are considered to be those tools which, because of their limited use, are not normally available but which are necessary for maintenance of particular equipment.
- c. For each type of equipment provided under this CONTRACT, a complete set of all special tools shall be furnished including grease guns and other lubricating devices, which may be needed for the adjustment, operation, maintenance, and disassembly of such equipment. Tools shall be of high grade, smooth forged alloy tool steel. Grease guns shall be of the lever type.
- d. One or more neat and substantial steel wall cases or cabinets shall be furnished and erected with flat key locks and clips or hooks to hold each special tool in a convenient arrangement.

N. Contractor's Stamp

1. Prior to submittal, the Contractor shall review the submittal material and shall affix his stamp of approval, with comments as applicable, signed by a responsible representative, to each appropriate submittal item. In the case of Subcontractor's submittals, both the Sub-contractor and the General Contractor shall review and stamp the submittal. Submittals which are not approved or approved-as-noted by the Contractor shall not be submitted to the Engineer. The Contractor shall not give an approved-as-noted status to submittals having incompleteness or major corrective notations as this will only delay the ultimate approval process.
  2. The receipt of submittal information from the Contractor will be construed as the Contractor's assurance that he has reviewed the submittal information and attests to the submittal's accuracy and conformance to the requirements of the contract documents. Submitted information shall be complete and in sufficient detail to demonstrate compliance with all requirement of the contract documents, including fitting in the space provided and meeting all salient features of the specifications.
- O. Submittal information must be particularly detailed in every respect. Product data shall present information to demonstrate the complete nature of the product, including dimensions, wiring diagrams, operating information, and the like. Shop drawings shall be extremely detailed and shall include all appropriate dimensions, fabrication details, component bill of material, information relative to mounting, detailed wiring, finish, and the like. Wiring diagrams shall include both schematic and point-to point representations, complete with references to

circuiting as indicated on the Contract Drawings as well as terminal points of component devices.

- P. Unless required elsewhere, submittals shall be distributed to subcontractors, suppliers, governing authorities, and others as necessary for proper performance of work.
- Q. Except for submittals for record and similar purposes, where action and return on submittals are required or requested, ENGINEER will review each submittal, mark with appropriate action, and return. Where submittal must be held for coordination, ENGINEER will also advise CONTRACTOR without delay. ENGINEER will stamp each submittal with uniform, self-explanatory action stamp, appropriately marked with submittal action.
- R. Where submittals are marked "Approved", Work covered by submittal may proceed PROVIDED IT COMPLIES WITH CONTRACT DOCUMENTS. Acceptance of Work will depend upon that compliance.
- S. When submittals are marked "Approved as Noted" or "Approved Subject to Corrections Marked", Work covered by submittal may proceed provided it complies with both ENGINEER's notations or corrections on submittal and with Contract Documents. Acceptance of Work will depend on that compliance. Re-submittal is not required.
- T. When submittals are marked "Examined and Returned for Correction or disapproved", Work covered by submittal shall not proceed. Work covered by submittal shall not be used at Project site or elsewhere where Work is in progress. The submittal shall be revised or a new submittal shall be prepared in accordance with ENGINEER's notations in accordance with Re-submittal Preparation procedures specified in this section. The submittal shall be resubmitted without delay and repeated if necessary to obtain different action marking.
- U. Any need for more than one resubmission, or any other delay in ENGINEER's review of submittals, will not entitle CONTRACTOR to extension of the Contract Time.
- V. Coordination
  - 1. Preparation and processing of submittals shall be coordinated with performance of the work, other submittals and related activities such as substitution requests, testing, purchasing, fabrication, delivery, and similar activities that require sequential activity.
  - 2. Submission of different units of interrelated work shall be coordinated so that one submittal will not be delayed by ENGINEER's need to review a related submittal. ENGINEER may withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

W. Unless otherwise indicated, guarantees as specified herein shall be included with the submittal information of all applicable equipment and materials. Incompleteness, inaccuracy, or lack of coordination shall be grounds for rejection. The Contractor shall clearly understand no equipment or material shall be installed prior to approval and that any equipment or material installed prior to approval is subject to removal from the right-of-way solely at the Contractor's expense.

X. Re-submittal Preparation

1. Re-submittal Preparation shall comply with the requirements described in subsection 1.6, Submittal, of this section. In addition, it shall be identified on the transmittal form that the submittal is a resubmission.
2. Any corrections or changes in submittals required by ENGINEER's notations shall be made on returned submittal.
3. On the transmittal or on a separate page attached to CONTRACTOR's resubmission transmittal, all notations or questions indicated by ENGINEER on ENGINEER's transmittal form shall be answered or acknowledged in writing. Each response shall be identified by question or notation number established by ENGINEER. If CONTRACTOR does not respond to each notation or question, resubmission will be returned without action by ENGINEER until CONTRACTOR provides a written response to all ENGINEER's notations or questions.

Y. Variations or revisions from previously reviewed submittal, other than those called for by ENGINEER, shall be identified on transmittal form.

1.6 GUARANTEES

- A. All equipment shall be furnished complete with the manufacturer's standard trade guarantee or warranty, applicable to the Illinois Department of Transportation, from the date of final acceptance. Such guarantee shall accompany submittal ship drawings and product data.
- B. Prior to final payment, the original and one copy of all bonds, warranties, guarantees, and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the one year correction period shall be delivered to the OWNER.

1.7 OPERATION AND MAINTENANCE MANUALS

- A. Four copies of an Operation and Maintenance Manual shall be furnished to the ENGINEER for all equipment and associated control systems furnished and installed.
- B. Prior to the Work Reaching 50 Percent Completion, one copy of the manual shall be submitted to the ENGINEER for approval with all specified material. The

approval copies shall be submitted with the partial payment request for the specified completion. Within 30 days after the ENGINEER's approval of the two-copy submittal, the remaining 3 copies of the manual shall be furnished to the ENGINEER. Space shall be provided in the manual for additional material. Any missing material for the manual shall be submitted prior to requesting certification of substantial completion.

- C. Each copy of the manual shall consist of the following and shall be prepared and arranged as follows:
1. A section of an equipment data summary (see sample form at end of section) for each item of equipment.
  2. A section of an equipment preventive maintenance data summary (see sample form at end of section) for each item of equipment.
  3. A section of the equipment manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts.
  4. List of electrical relay settings and control and alarm contact settings.
  5. Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.
  6. One valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. All valves in same piping systems shall be grouped together in the schedule. A sample of the valve numbering system shall be obtained from the ENGINEER.
  7. All O&M Manual material shall be on 8-1/2 inch by 11 inch commercially printed or typed forms or an acceptable alternative format.
- D. Each manual shall be organized into sections paralleling the equipment specifications. Each section shall be identified using heavy section dividers with reinforced holes and numbered plastic index tabs. The data shall be compiled in high-quality heavy-weight, hard cover binders with piano style metal hinges or in an alternate approved format. Large drawings and other materials which would be opened or removed for reading shall be provided with heavy clear plastic pouches within the binders. The number of binders shall be as required to hold all required material without over-filling. Various sections, as appropriate shall have suitable dividers. All volumes shall be labeled. All loose data shall be punched for binding. Composition and printing shall be arranged so that punching does not obliterate any data. The project title, and manual title, as furnished and approved by the ENGINEER shall be printed on the cover and binding edge of each manual.
- E. All operating and maintenance material that comes bound by the equipment manufacturer shall be left in its original bound state. The appropriate sections of

the CONTRACTOR's O&M manual shall be cross-referenced to the manufacturers' bound manuals.

END OF SECTION 01 01 01

## **SECTION 03 30 00 – CAST-IN-PLACE CONCRETE**

### **PART 1 – GENERAL**

#### **1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

#### **1.02 SUMMARY**

- A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Foundation walls.
  - 3. Slabs-on-grade.
- B. Related Sections include the following:
  - 1. Earthwork for drainage fill under slabs-on-grade.
  - 2. Excavating, Backfilling and Compacting for Structures.
  - 3. Underground Electrical Ducts and Handholes.
  - 4. Cement Concrete Pavement for concrete pavement and walks.
  - 5. Joint Sealants for isolation joints.

#### **1.01 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

#### **1.02 SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.



- D. Samples: For vapor retarder.
- E. Welding certificates.
- F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates.
- G. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.
  - 4. Steel reinforcement and accessories.
  - 5. Fiber reinforcement.
  - 6. Waterstops.
  - 7. Curing compounds.
  - 8. Floor and slab treatments.
  - 9. Bonding agents.
  - 10. Adhesives.
  - 11. Vapor retarders.
  - 12. Semirigid joint filler.
  - 13. Joint-filler strips.
  - 14. Repair materials.
- H. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.
- I. Field quality-control test and inspection reports.
- J. Minutes of preinstallation conference.

1.03 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to the National Ready Mixed Concrete Association's (NRMCA's) "Certification of Ready Mixed Concrete Production Facilities."

- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
  2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete"
  2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
    - a. Contractor's superintendent.
    - b. Independent testing agency responsible for concrete design mixtures.
    - c. Ready-mix concrete manufacturer.
    - d. Concrete subcontractor.

#### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
1. Avoid damaging coatings on steel reinforcement.
  2. Repair damaged epoxy coatings on steel reinforcement according to ASTM D2963/D2963M.

## PART 2 - PRODUCTS

### 2.01 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
  2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
  3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

### 2.02 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, epoxy coated, with less than 2 percent damaged coating in each 12-inch bar length.
- C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.
- D. Plain-Steel Wire: ASTM A 82, as drawn.
- E. Deformed-Steel Wire: ASTM A 496.
- F. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A, Type 1 coated, plain-steel wire, with less than 2 percent damaged coating in each 12-inch wire length.

- G. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.
- H. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.
- I. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from galvanized steel wire into flat sheets.
- J. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, plain steel.

### 2.03 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
  - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
  - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

### 2.04 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I, gray.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S, coarse aggregate or better, graded. Provide aggregates from a single source.
  - 1. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M.

### 2.05 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

#### 2.06 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
  1. Profile: Flat, dumbbell with center bulb.
- B. Self-Expanding Strip Waterstops: Manufactured rectangular or trapezoidal strip, sodium bentonite or other hydrophilic polymers for adhesive bonding to concrete, only on horizontal joints.

#### 2.07 VAPOR RETARDERS

- A. Plastic Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

#### 2.08 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film-forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

#### 2.09 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.10 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. This paragraph applied to all concrete other than footings.
  2. Fly Ash: 25 percent.
  3. Combined Fly Ash and Pozzolan: 25 percent.
  4. Ground Granulated Blast-Furnace Slag: 50 percent.
  5. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
  6. Silica Fume: 10 percent.
  7. Combined Fly Ash, Pozzolans, and Silica Fume: 35 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
  8. Combined Fly Ash or Pozzolans, Ground Granulated Blast-Furnace Slag, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings, foundation walls, slabs-on-grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: 4000 psi at 28 days.
  2. Maximum Water-Cementitious Materials Ratio: 0.45.
  3. Air Content: 5-1/2 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
  4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

## 2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
  - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.01 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
  - 1. Install keyways, reglets, recesses, and the like, for easy removal.
  - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.

- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

### 3.02 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
  - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
  - 3. Install dovetail anchor slots in concrete structures as indicated.

### 3.03 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.
  - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
  - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.



3.04 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
  - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.05 VAPOR RETARDERS

- A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.

3.06 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
  - 1. Weld reinforcing bars according to AWS D1.4, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

- F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

### 3.07 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  2. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
  3. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
  4. Locate vertical joints in walls beside piers integral with walls, near corners, and in concealed locations where possible.
  5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
  2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 7 Section "Joint Sealants," are indicated.
  3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.08 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install only in horizontal construction joints and as indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

### 3.09 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  2. Maintain reinforcement in position on chairs during concrete placement.
  3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  4. Slope surfaces uniformly to drains where required.
  5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.10 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of

seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces a) exposed to public view, b) to receive a rubbed finish, or c) to be covered with a coating or covering material applied directly to concrete such as waterproofing, dampproofing, veneer plaster or painting.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

### 3.11 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
1. Apply scratch finish to surfaces to receive concrete floor toppings, to receive mortar setting beds for bonded cementitious floor finishes.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
1. Apply float finish to surfaces to receive trowel finish, to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
  2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

3. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-foot-long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/4 inch
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
  1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.
- F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
  1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

### 3.12 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Scream, tamp, and trowel-finish concrete surfaces.

### 3.13 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.
  - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24

hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth,



- uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
  6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
  7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

### 3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Contractor shall engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
  2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
  3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
  6. Compression Test Specimens: ASTM C 31/C 31M.
    - a. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
  7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
  8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
  9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
  10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
  11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
  12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
  13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
  14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- C. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

PART 4 – MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 03 30 00

**SECTION 03 30 02 – CAST-IN-PLACE LIGHT POLE FOUNDATIONS AND CABINET PADS**

**PART 1 - GENERAL**

**1.01 DESCRIPTION OF WORK:**

This Work shall consist of constructing cast-in place reinforced concrete foundations for light poles, electrical cabinet pads, and Voice of Metra cabinet pads at the locations shown in the plans or as directed by the Engineer. This work shall include subgrade preparation; furnishing and preparing subbase granular material, Type B; furnishing, installing and removal of formwork; regrading; furnishing and installing of reinforcement; furnishing and placing concrete, Class SI, and protective coat; furnishing and installing ground rod and grounding wires; furnishing and installing PVC schedule 40 conduits; furnishing and installing rigid galvanized steel conduits; trench backfill; bedding; electrical identification; and all labor, tools, and equipment necessary to complete the work as specified, including clean-up and restoration of the location.

**1.02 REFERENCES:**

Except as modified herein, the Work shall conform to the applicable portions of the following Sections/Articles:

- A. IDOT Standard Specifications: Sections 201, 301, 311, 420, 424, 508, 801, 810, 812, 819, 825, 836, 873, 1001, 1003, 1004, 1020, 1022, 1023, 1024
- B. NEMA TC-3
- C. NEMA 4X

**1.03 STANDARDS**

- A. Electrical Foundation Details

**1.04 SPECIAL REQUIREMENTS:**

- A. Conduct site clearing operations to ensure minimum interference with railway, roads, streets, walks and/or adjacent facilities. Do not close traveled ways without written permission from authorities having jurisdiction.
- B. Provide protection to prevent damage to existing structures, track, roadway, sidewalk and/or other improvements on or adjacent to the job site. Restore any damaged improvement to its original condition as acceptable to parties having jurisdiction, with no additional compensation due the Contractor.

**1.05 SUBMITTALS:**

- A. The Contractor shall submit manufacturer's catalogues and/or Shop Drawings for Metra's approval for the following items:
  - 1. Reinforcement Bars.

2. Protective Coat.
- B. Cast-in-Place Concrete: The Contractor shall submit the following:
1. The proposed concrete mix design(s) for review and approval by the Engineer. All mix designs shall be IDOT mix designs approved for the ready-mix supplier.
  2. Manufacturer's Data: Furnish copies of the manufacturer's specifications for the admixtures, bonding agent, patching and surfacing compound, non-slip material, form oil, joint fillers and vapor barrier, including methods of application and installation.
- C. The Contractor shall submit to the Engineer a certificate from the supplier indicating the grade of steel being furnished to the job.
- D. Ground Rod:
1. Field-testing organization certificate, signed by the Contractor, certifying that the organization performing field tests complies with the requirements specified in Quality Assurance below.
  2. Report of field tests and observations certified by the testing organization.

1.06 QUALITY ASSURANCE:

- A. Concrete Formwork: The Work shall be performed in accordance with the applicable portions of Article 420.06 of the IDOT Standard Specifications and the following requirements.
1. Qualifications of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of materials installed, the referenced standards and the requirements of this Work, who shall direct all Work performed under this section.
  2. Codes and Standards: Unless otherwise shown or specified, design, construct, erect, maintain and remove forms and related structures for cast-in-place concrete work in compliance with American Concrete Institute Standards ACI 347, "Recommended Practice for Concrete Formwork" and AREA, Chapter 8.
  3. Allowable Tolerances: Except as specified in this section herein, construct formwork to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 347. Before concrete placement, check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems. During concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed work will be within specified tolerances.

4. The Contractor shall submit to the Engineer his proposed installation. The Contractor shall make modifications, if required, to his procedure to the satisfaction of the Engineer, but it is understood that the Engineer's approval shall not relieve the Contractor from his sole responsibility for obtaining satisfactory results.

B. Cast-in-Place Concrete:

1. All work included in this section shall be performed in accordance with applicable portions of Sections 420, 503, 508, 1020, 1021, 1022, 1023, 1051, and 1058 of the IDOT Standard Specifications.
2. Correction of Defective Work: All concrete work which does not conform to the requirements of the Contract Documents, including strength, tolerances, and finishing, shall be corrected as directed by the Engineer at the Contractor's expense. The Contractor shall be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

C. Grounding:

1. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
  - a. Listing and Labeling Agency Qualifications: A "Nationally recognized Testing a. Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
2. Field-Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.
3. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code" (NEC).
4. UL Standard: Comply with UL 467, "Grounding and Bonding Equipment."

## PART 2 - PRODUCTS

### 2.01 BORROW:

Borrow material shall be provided by the Contractor, as required, from a borrow site approved by Metra. It shall meet the requirements of Section 204 of the Standard Specifications.

2.02 GRANULAR SUBBASE:

Granular subbase material shall meet the requirements of Article 1004.04 of IDOT Standard Specifications, Type B, gradation CA 6.

2.03 TRENCH AND BACKFILL:

- A. Bedding material and trench backfill shall have an FA 6 gradation conforming to Article 1003.04 of the Standard Specifications, except wet bottom boiler slag as defined in Article 1003.01 will not be permitted.
- B. Underground cable marking tape shall meet the requirements of Article 1085.23 of IDOT Standard Specifications.

2.04 PVC CONDUITS, RIGID GALVANIZED STEEL CONDUITS, AND FITTINGS:

Conduits and fittings shall meet the requirements of Article 1088.01 of IDOT Standard Specifications.

2.05 FORMWORK:

- A. Form Materials: Form concrete surfaces with plywood, lumber, metal, or other acceptable material. Provide lumber that is dressed on at least two edges and one side for tight fit. Forms shall provide a 3/4" chamfer on all concrete edges.
- B. Form Coating: Provide commercial formulation, form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compound.

2.06 CONCRETE MATERIALS:

Concrete materials shall meet the requirements of Section 1020 of IDOT Standard Specifications. The concrete shall be Class SI and meet the following requirements:

- A. Portland Cement: ASTM C150, domestic brand, Type I, normal Portland Cement; Type III for high-early strength Portland Cement as per the requirements of Section 1001 of IDOT Standard Specifications. The same brand of Portland Cement shall be used for exposed concrete throughout the job unless a change is approved by the Engineer. Air entraining cement is not acceptable.
- B. High-early strength concrete may be used subject to Engineer's approval. All provisions of the specifications shall apply except that the 7 day compressive strength equal the 28 day strength required for normal concrete.
- C. Admixtures: Admixtures shall meet the requirements of Article 1020.05 and Section 1021 of IDOT Standard Specifications.
- D. Water-Reducing Admixture: As per the requirements of Article 1021.03 of IDOT Standard Specifications.

- E. Air-Entraining Admixture: Use air-entraining admixtures in all concrete, as per the requirements of Article 1021.02 of IDOT Standard Specifications. Add air entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having an air content of not less than 5% nor more than 8% of the volume of the concrete.
- F. Fly Ash: Shall not be used.
- G. Calcium Chloride: Shall not be used.
- H. Bonding Agent: Epoxy type: "Resiweld Concrete Bonding R7650 Adhesives" (H.B. Fuller Co.), "PR-930" (Products Research Co.), "Epoweld 812" (Coast Pro-Seal & Manufacturing Co.), "Sta-Crete T1": (Sta-Crete Inc.). Use Bonding Agent where patching is allowed for certain concrete, subject to the Engineer's approval. Apply in accordance with the manufacturer's printed instructions.
- I. Patching and Surfacing Compound: Epoxy Type: "PR-940 Patching and Surfacing Compound" (Products Research Co.) "Chemcrete" (Protex-A-Cote, Inc.), "Resiweld 7640 Series" with sand aggregate (H.B. Fuller Co.), "Sta-Crete 12" with sand aggregate (Sika Chemical Corp.). Use where patching compound is allowed for certain concrete work, subject to the Engineer's approval. Apply in accordance with the manufacturer's printed instructions. Patching and surfacing compound for use on "exposed" concrete surfaces shall be equal in color and texture to the basic concrete structure, as approved by the Engineer.
- J. Grout: Shall meet the requirements of Section 1024 of IDOT Standard Specifications.
- K. Concrete Curing Materials: Burlap curing blankets, waterproof paper blankets, white polyethylene sheeting, and burlap-polyethylene blanket shall meet the requirements of Section 1022 of IDOT Standard Specifications.
- L. Curing and Finishing Materials:
  - 1. Liquid Membrane-Forming Compounds for Curing Concrete: Fed. Spec. TT 800A, Type I Styrene Acrylate or Type II Chlorinated Rubber; non-pigmented; "Kure-NSeal" (Sonneborn Div. of Contech Inc.), "Dekote T130" (W.R. Grace & Co.) or "CR-26" (W.R. Meadows, Inc.).
  - 2. Curing compounds shall be guaranteed not to affect the bond, adhesion or effectiveness of damp-proofing, or surface treatments.
- M. Ready Mix Concrete:
  - 1. All ready-mixed concrete shall comply with Article 1020.11 of IDOT Standard Specifications
  - 2. The ready-mixed concrete producer shall submit duplicate delivery tickets, one for the Contractor and one for the Engineer, with each load of concrete delivered to the site.



3. Delivery tickets shall provide the following information:

- a. Date
- b. Name of ready-mix concrete plant
- c. Contractor
- d. Job Location
- e. Type of cement (Standard or H.E.S.)
- f. Cement content in bags per cubic yard of concrete
- g. Truck number
- h. Time dispatched, and time unloaded
- i. Amount of concrete in load in cubic yards
- j. Admixtures in concrete, if any

N. Cast-In-Place Provisions: Sleeves and anchor bolts which are cast in concrete shall be AASHTO M-183 (A 36) steel and shall be galvanized in accordance with Article 1006.08 of IDOT Standard Specifications.

2.07 REINFORCEMENT BARS:

- A. Reinforcement bars shall be epoxy coated, deformed bars, Grade 60 conforming to Article 1006.10 (b) of IDOT Standard Specifications.
- B. Tie wire shall be black annealed wire, 16 gauge or heavier if necessary for providing cage rigidity. Where the tie wire is in contact with epoxy-coated bars, the tie wire shall be epoxy coated.
- C. Reinforcement bars support shall meet the requirements of Article 420.10 of IDOT Standard Specifications.

2.08 PROTECTIVE COAT:

Shall meet the requirements of Section 1023 of IDOT Standard Specifications.

2.09 GROUNDING:

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  1. Bashlin Industries, Inc.
  2. General Machine Products Co., Inc.
  3. O-Z/Gedney Co.

4. Thomas & Betts Corp.
- B. Grounding and Bonding Products:
1. Products: Type, sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications shall govern.
  2. Conductor Materials: Copper.
- C. Wire and Cable Conductors:
1. General: Comply with Division 26 Section "Wires and Cables." Conform to NEC Table 8, Chapter 9, except as otherwise indicated, for conductor properties, including stranding.
  2. Equipment Grounding Conductor: Green insulated.
  3. Grounding Electrode Conductor: Stranded cable.
  4. Bare Copper Conductors: Conform to the following:
    - a. Solid Conductors: ASTM B-3.
    - b. Assembly of Stranded Conductors: ASTM B-8.
    - c. Tinned Conductors: ASTM B-33.
- D. Connector Products:
1. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
  2. Aluminum-To-Copper Connections: Bimetallic type, conforming to UL 96, "Lighting Protection Components," or UL 467.
- E. Grounding Electrodes:
1. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic-grade copper outer sheath, molten welded to core. Size: 3/4 inch diameter and 10 feet long.
  2. Plate Electrodes: Copper plates, minimum 0.10 inch thick, size as indicated.

PART 3 - EXECUTION

3.01 GENERAL:

- A. The Contractor shall construct the light pole foundation as per Section 836 of IDOT Standard Specifications, except as modified herein. The tolerance for horizontal placement of the foundation shall be 1/4 of an inch. The tolerance for elevation of the foundation is 1/8 of an inch. The tolerance for placement of anchor bolts is 1/16 of an inch.
- B. The Contractor shall construct the electrical cabinet pad and Voice of Metra cabinet pad as per Section 825 of the IDOT Standard Specifications.
- C. The ground rod shall be copper-clad steel as per the requirements of Article 1087.01 of IDOT Standard Specifications.

3.02 SITE CLEARING:

Remove all trees, shrubs, grass and other vegetation interfering with proposed construction. Removal includes digging out stumps and roots.

3.03 EARTHWORK:

- A. Before any material is placed for construction of embankments, topsoil within the limits of clearing and grubbing shall be excavated and stockpiled on site for subsequent placement on finished embankment. Placement of embankment may proceed upon acceptance of a proof-rolling test. The equipment used for the proof-rolling shall be approved by the Engineer.
- B. Embankment shall be compacted in accordance with the requirements of Article 205.06 of the Standard Specifications. Vertical tolerance shall be 1 inch.
- C. All material shall be disposed of in accordance with Article 202.03 of the IDOT Standard Specifications at the Contractor's expense. Metra shall be informed of the disposal site and shall be given a copy of necessary permit(s). If the disposal site is on private property, Metra shall be given a copy of written permission from the property owner allowing the disposal.
- D. The Contractor shall support, maintain, and protect all utility lines to remain in service.
- E. When necessary, due to weather conditions, the Contractor shall remove snow and ice from the work area to the satisfaction of the Engineer.
- F. Prior to placement of granular sub-base material, the Contractor will coordinate for Metra's engineer to inspect earthwork performed.
- G. Prior to excavating greater than the estimated amounts (within 10%), the Contractor shall notify Metra's engineer, in writing. Failure to do so will result in additional excavation being paid for by the Contractor, with no additional compensation due.

- H. The Contractor shall control dust on the site by spraying water or by other means satisfactory to the Engineer.

3.04 GRANULAR SUBBASE:

The granular subbase shall be constructed as per Article 311 of the IDOT Standard Specifications.

3.05 TRENCH AND BACKFILL:

Trench and backfill shall be constructed as per Section 819 of IDOT Standard Specifications.

- A. Trenches shall be excavated in the locations and to the widths and depths shown on the Plans.
- B. Backfilling shall be done in accordance with Article 550.07 of the Standard Specifications, except as modified in this section. Methods 2 and 3 shall not be permitted.
- C. Trenches shall not be backfilled until tests and inspections have been made. Care shall be used in back-filling and compacting to avoid damage or displacement of conduit runs.
- D. All trenches and excavations shall be backfilled as soon as possible after tests and inspections have been satisfactorily completed. Backfill materials and compaction procedures shall be approved by the Engineer. In backfilling, any compressible or destructible rubbish and refuse shall be removed from the excavated space before backfilling is started, except that sheeting and bracing shall be left in place or removed as the Work progresses as specified or directed by the Engineer.
- E. Where multiple cables for lines are installed in a common trench or concrete envelope and do not exceed an overall width of 16 inches, install a single line marker.
- F. If the Contractor and/or Engineer find that the materials encountered at the elevations specified are unstable and not suitable or in case it is found desirable or necessary to go an additional depth, the excavation shall be carried to such additional depth as directed by the Engineer.
- G. Each lift of Trench Backfill shall be within 2% of optimum moisture content before the succeeding lift is placed. Backfilling and compaction shall be done in a manner to avoid damaging top or side pressures on the conduit runs. Each lift of Trench Backfill shall be a maximum of 12" before compaction. Compaction shall be to 95% of the Standard Proctor Density.
- H. Any depression which may develop in backfilled areas from settlement within one year after the Work is fully completed and accepted shall be the responsibility of the Contractor. The Contractor shall provide as needed, at his own expense,

additional backfill material, platform repairs or replacement, and shall perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved by the Engineer.

- I. All material and backfilling operations shall be subjected to testing by the Engineer with the assistance of the Contractor.

### 3.06 PVC CONDUITS, RIGID GALVANIZED STEEL CONDUITS, AND FITTINGS:

Conduits and fittings shall be installed as specified in Section 810 of IDOT Standard Specifications. The work shall also meet the requirements of Section 801 and the following:

- A. Prevent foreign matter from entering conduits by using temporary closure protection.
- B. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- C. All conduits are to contain fish tape for future pulls. Use No. 14 AWG zinc coated steel or monofilament plastic line having not less than 200-lb. tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
- D. Conceal all conduits unless otherwise indicated. Install pipes at proper elevations.
- E. Upon completion of installation of conduits, inspect interiors of conduits, clear all blockages and remove burrs, dirt and construction debris.

### 3.07 CONCRETE FORMWORK:

- A. Design Of Work:
  1. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor and shall conform to "Recommended Practice for Concrete Formwork", ACI 347.
  2. Forms shall conform to shape, lines and dimensions shown on the Drawings. They shall be designed to safely resist the pressure and weight of the concrete, and shall be properly tied and braced or shored so as to maintain position and shape.
  3. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
  4. Temporary Openings: Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement and for placement of concrete. Brace temporary closures and set tightly to forms to prevent loss of concrete mortar. Locate temporary

openings on forms in as inconspicuous locations as possible, consistent with project requirements.

B. Construction Formwork:

1. General: Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar, and able to withstand internal pressure when filled with wet concrete.
2. Layout:
  - a. Form all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings.
  - b. Exercise particular care in the layout of forms to avoid necessity for cutting of concrete after forms have been removed.
  - c. Make proper provision for all openings, offsets, recesses, anchorage, blocking and other features of the Work as shown or required.
  - d. Carefully examine the Drawings and Specifications and consult with other trades as required, relative to provision for openings, anchor bolts and other items in the forms.
3. Tolerances: Construct all forms straight, true, plumb and square within a tolerance horizontally of 1/8 inch and a tolerance vertically of 1/8 inch.
4. Wetting: Keep forms sufficiently wetted to prevent joints opening up before concrete is placed.

C. Work Prior To Concrete Placement:

1. Form Coatings: Coat form contact surfaces with form-coating compound before reinforcement is placed. Do not allow excess form-coating material to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust stained steel formwork is not acceptable.
2. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is to be placed. Retighten forms immediately after placement as required to eliminate mortar leaks.
3. Edge Forms and Screed Strips: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

4. Once forms are set and at least 24 hours prior to the placement of concrete, the Contractor shall notify Metra's Engineer that the formwork is ready for final inspection.
- D. Removal of Formwork: Side forms not supporting vertical loads may be removed after cumulative curing at not less than 50EF for 24 hours after placing concrete, providing the concrete is sufficiently hard not to be damaged by form removal operations and providing that curing and protection operations are maintained.
- E. Reuse Forms: Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form-coating compound material to concrete contact surfaces as specified for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

### 3.08 CONCRETE PLACEMENT:

- A. Pre-placement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit the installation of their Work; cooperate with other trades in setting such work as required. Thoroughly wet wood forms immediately before placing concrete, as required where form coatings are not used. Coordinate the installation of joint materials with placement of forms and reinforcing steel.
- B. General Requirements: Comply with Section 424 and applicable portions of Section 420 of IDOT Standard Specifications.
- C. Temperature Control for Placement: Comply with Article 1020.14 of IDOT Standard Specifications.
- D. Concrete Curing and Protection: Concrete curing shall meet the requirements of Article 1020.13 of IDOT Standard Specifications.
- E. Concrete Finishing:
  1. Horizontal concrete surfaces shall be finished as per Article 424.06 of IDOT 1 Standard Specifications.
  2. Vertical concrete surfaces shall be finished smooth and even, and given a light brush finish while the concrete is still workable. The edges shall be rounded with approved finishing tools having the radii shown on the plans.

### 3.09 REINFORCEMENT BARS:

- A. The placement of reinforcement shall meet the requirements of Articles 420.09 and 420.10 of IDOT Standard Specifications.

- B. The reinforcement bars shall be securely tied to prevent displacement during the concreting operation.
- C. All reinforcing bars shall be placed with a tolerance of 1/2" to provide for adequate protective concrete cover, unless stated specifically on the Plans.
- D. Coordinate with Metra's Engineer at least 24 hours prior to placement of concrete to arrange for inspection of steel reinforcement.

### 3.10 PROTECTIVE COAT:

Shall be applied as per Article 420.21 of IDOT Standard Specifications and the following requirements:

- A. Inspection: Before commencing work, the surface shall be examined to determine that it is clean, dry and free of grease, oil or other surface contaminants which might be detrimental to proper and timely completion of work.
- B. Clean adjoining surfaces of smears, compound, or other soiling due to these operations, as work progresses. Restore, refinish or replace any adjacent surfaces or materials which are marred or damaged to the satisfaction of the Engineer.

### 3.11 GROUNDING:

- A. Application:
  - 1. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.
    - a. Use conduit as the equipment ground conductor where feasible and permitted by NEC for the following:
      - 1) Feeders and branch circuits except as otherwise indicated.
    - b. Install separate insulated equipment grounding conductors with circuit conductors for the following in addition to those locations where required by the Code:
      - 1) Feeders and branch circuits.
      - 2) Lighting circuits.
  - 2. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a grounding electrode as indicated in addition to separate equipment grounding conductor run with supply branch circuit.



B. Installation:

1. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.
2. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use 3/4-inch by 10-ft. ground rods except as otherwise indicated. Drive rods until tops are 6 inches below final grade except as otherwise indicated.
3. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

C. Connections:

1. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - a. Use electroplated or hot-tin-coated materials to assure high conductivity and make a. contact points closer in order of galvanic series.
  - b. Make connections with clean bare metal at points of contact.
2. Exothermic Welded Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
3. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
4. Moisture Protection: Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire area of the connection and seal against moisture penetration of the insulation and cable.

- D. Field Quality Control:
1. Independent Testing Organization: Arrange and pay for the services of a qualified independent electrical testing organization to perform tests described below.
  2. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System."
  3. Ground/resistance maximum values shall be as follows: Equipment rated 500 KVA and less: 10 Ohms
  4. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are directed that exceed those indicated the provisions of the Contract, covering changes will apply.
  5. Report: Prepare test reports, certified by the testing organization, of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- E. Cleaning and Adjusting: Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition.

#### PART 4 - MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 03 30 02

## **SECTION 03 30 03 – VIS SIGN POLE AND FOUNDATION**

### **PART 1 - GENERAL**

#### **1.01 DESCRIPTION OF WORK:**

This Work shall consist of constructing a cast-in place reinforced concrete foundation for VIS pole, furnishing and installing the pole and all necessary conduits and pull ropes as shown on the Drawings or directed by the Engineer. This work shall include furnishing, installing and removal of formwork; regrading as needed; furnishing and installing of reinforcement; furnishing and placing concrete, Class SI, and protective coat; furnishing and installing ground rod and grounding wires; furnishing and installing rigid galvanized steel conduits; furnishing and installing the pole, trench backfill and bedding, electrical identification, and furnishing all labor, tools, and equipment necessary to complete the work as specified, including clean-up and restoration of the location.

#### **1.02 REFERENCES:**

Except as modified herein, the Work shall conform to the applicable portions of the following Sections/Articles:

- A. IDOT Standard Specifications: Sections 201, 420, 424, 508, 801, 810, 812, 819, 825, 830, 836, 873, 1001, 1003, 1004, 1020, 1022, 1023, 1024, 1085.

#### **1.03 STANDARDS**

- A. VIS Pole and Foundation Drawing.

#### **1.04 SPECIAL REQUIREMENTS:**

- A. Conduct site clearing operations to ensure minimum interference with railway, roads, streets, walks and/or adjacent facilities. Do not close traveled ways without written permission from authorities having jurisdiction.
- B. Provide protection to prevent damage to existing structures, track, roadway, sidewalk and/or other improvements on or adjacent to the job site. Restore any damaged improvement to its original condition as acceptable to parties having jurisdiction, with no additional compensation due the Contractor.

#### **1.05 SUBMITTALS:**

- A. The Contractor shall submit manufacturer's catalogues and/or Shop Drawings for Metra's approval for the following items:
  - 1. Reinforcement Bars.
  - 2. Protective Coat.
  - 3. VIS Pole.

- B. Cast-in-Place Concrete: The Contractor shall submit the following:
  - 1. The proposed concrete mix design(s) for review and approval by the Engineer. All mix designs shall be IDOT mix designs approved for the ready-mix supplier.
  - 2. Manufacturer's Data: Furnish copies of the manufacturer's specifications for the admixtures, bonding agent, patching and surfacing compound, non-slip material, form oil, joint fillers and vapor barrier, including methods of application and installation.
- C. The Contractor shall submit to the Engineer a certificate from the supplier indicating the grade of steel being furnished to the job.
- D. Ground Rod:
  - 1. Field-testing organization certificate, signed by the Contractor, certifying that the organization performing field tests complies with the requirements specified in Quality Assurance below.
  - 2. Report of field tests and observations certified by the testing organization.

1.06 QUALITY ASSURANCE:

- A. Concrete Formwork: The Work shall be performed in accordance with the applicable portions of Article 420.06 of the IDOT Standard Specifications and the following requirements.
  - 1. Qualifications of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the Work and who shall be thoroughly familiar with the type of materials installed, the referenced standards and the requirements of this Work, who shall direct all Work performed under this section.
  - 2. Codes and Standards: Unless otherwise shown or specified, design, construct, erect, maintain and remove forms and related structures for cast-in-place concrete work in compliance with American Concrete Institute Standards ACI 347, "Recommended Practice for Concrete Formwork" and AREA, Chapter 8.
  - 3. Allowable Tolerances: Except as specified in this section herein, construct formwork to provide completed cast-in-place concrete surfaces complying with the tolerances specified in ACI 347. Before concrete placement, check the lines and levels of erected formwork. Make corrections and adjustments to ensure proper size and location of concrete members and stability of forming systems. During concrete placement, check formwork and related supports to ensure that forms are not displaced and that completed work will be within specified tolerances.
  - 4. The Contractor shall submit to the Engineer his proposed installation. The Contractor shall make modifications, if required, to his procedure to the

satisfaction of the Engineer, but it is understood that the Engineer's approval shall not relieve the Contractor from his sole responsibility for obtaining satisfactory results.

B. Cast-in-Place Concrete:

1. All work included in this section shall be performed in accordance with applicable portions of Sections 420, 503, 508, 1020, 1021, 1022, 1023, 1051, and 1058 of the IDOT Standard Specifications.
2. Correction of Defective Work: All concrete work which does not conform to the requirements of the Contract Documents, including strength, tolerances, and finishing, shall be corrected as directed by the Engineer at the Contractor's expense. The Contractor shall be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

C. Grounding:

1. Listing and Labeling: Provide products specified in this Section that are listed and labeled. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
  - a. Listing and Labeling Agency Qualifications: A "Nationally recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
2. Field-Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.
3. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code" (NEC).
4. UL Standard: Comply with UL 467, "Grounding and Bonding Equipment."

PART 2 - PRODUCTS

2.01 BORROW:

Borrow material shall be provided by the Contractor, as required, from a borrow site approved by Metra. It shall meet the requirements of Section 204 of the Standard Specifications.

2.02 TRENCH AND BACKFILL:

- A. Bedding material and trench backfill shall have an FA 6 gradation conforming to Article 1003.04 of the Standard Specifications, except wet bottom boiler slag as defined in Article 1003.01 will not be permitted.

- B. Underground cable marking tape shall meet the requirements of Article 1085.23 of IDOT Standard Specifications.

2.03 RIGID GALVANIZED STEEL CONDUITS AND FITTINGS:

Rigid galvanized steel conduits and fittings shall meet the requirements of Article 1085.15 of IDOT Standard Specifications.

2.04 FORMWORK:

- A. Form Materials: Form concrete surfaces with plywood, lumber, metal, or other acceptable material. Provide lumber that is dressed on at least two edges and one side for tight fit. Forms shall provide a 3/4" chamfer on all concrete edges.
- B. Form Coating: Provide commercial formulation, form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compound.

2.05 CONCRETE MATERIALS:

Concrete materials shall meet the requirements of Section 1020 of IDOT Standard Specifications. The concrete shall be Class SI and meet the following requirements:

- A. Portland Cement: ASTM C150, domestic brand, Type I, normal Portland Cement; Type III for high-early strength Portland Cement as per the requirements of Section 1001 of IDOT Standard Specifications. The same brand of Portland Cement shall be used for exposed concrete throughout the job unless a change is approved by the Engineer. Air entraining cement is not acceptable.
- B. High-early strength concrete may be used subject to Engineer's approval. All provisions of the specifications shall apply except that the 7 day compressive strength equal the 28 day strength required for normal concrete.
- C. Admixtures: Admixtures shall meet the requirements of Article 1020.05 and Section 1021 of IDOT Standard Specifications.
- D. Water-Reducing Admixture: As per the requirements of Article 1021.03 of IDOT Standard Specifications.
- E. Air-Entraining Admixture: Use air-entraining admixtures in all concrete, as per the requirements of Article 1021.02 of IDOT Standard Specifications. Add air entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having an air content of not less than 5% nor more than 8% of the volume of the concrete.
- F. Calcium Chloride: Shall not be used.

- H. Bonding Agent: Epoxy type: "Resiweld Concrete Bonding R7650 Adhesives" (H.B. Fuller Co.), "PR-930" (Products Research Co.), "Epoweld 812" (Coast Pro-Seal & Manufacturing Co.), "Sta-Crete T1": (Sta-Crete Inc.). Use Bonding Agent where patching is allowed for certain concrete, subject to the Engineer's approval. Apply in accordance with the manufacturer's printed instructions.
- I. Patching and Surfacing Compound: Epoxy Type: "PR-940 Patching and Surfacing Compound" (Products Research Co.) "Chemcrete" (Protex-A-Cote, Inc.), "Resiweld 7640 Series" with sand aggregate (H.B. Fuller Co.), "Sta-Crete 12" with sand aggregate (Sika Chemical Corp.). Use where patching compound is allowed for certain concrete work, subject to the Engineer's approval. Apply in accordance with the manufacturer's printed instructions. Patching and surfacing compound for use on "exposed" concrete surfaces shall be equal in color and texture to the basic concrete structure, as approved by the Engineer.
- J. Grout: Shall meet the requirements of Section 1024 of IDOT Standard Specifications.
- K. Concrete Curing Materials: Burlap curing blankets, waterproof paper blankets, white polyethylene sheeting, and burlap-polyethylene blanket shall meet the requirements of Section 1022 of IDOT Standard Specifications.
- L. Curing and Finishing Materials:
  - 1. Liquid Membrane-Forming Compounds for Curing Concrete: Fed. Spec. TT 800A, Type I Styrene Acrylate or Type II Chlorinated Rubber; non-pigmented; "Kure-N-Seal" (Sonneborn Div. of Contech Inc.), "Dekote T130" (W.R. Grace & Co.) or "CR-26" (W.R. Meadows, Inc.)
  - 2. Curing compounds shall be guaranteed not to affect the bond, adhesion or effectiveness of damp-proofing, or surface treatments.
- M. Ready Mix Concrete:
  - 1. All ready-mixed concrete shall comply with Article 1020.11 of IDOT Standard Specifications.
  - 2. The ready-mixed concrete producer shall submit duplicate delivery tickets, one for the Contractor and one for the Engineer, with each load of concrete delivered to the site.
  - 3. Delivery tickets shall provide the following information:
    - a. Date
    - b. Name of ready-mix concrete plant
    - c. Contractor
    - d. Job Location
    - e. Type of cement (Standard or H.E.S.)
    - f. Cement content in bags per cubic yard of concrete
    - g. Truck number

- h. Time dispatched, and time unloaded
- i. Amount of concrete in load in cubic yards
- j. Admixtures in concrete, if any

N. Cast-In-Place Provisions: Sleeves and anchor bolts which are cast in concrete shall be AASHTO M-183 (A-36) steel and shall be galvanized in accordance with Article 1006.08 of IDOT Standard Specifications.

2.06 REINFORCEMENT BARS:

- A. Reinforcement bars shall be epoxy coated, deformed bars, Grade 60 conforming to Article 1006.10 (b) of IDOT Standard Specifications.
- B. Tie wire shall be black annealed wire, 16 gauge or heavier if necessary for providing cage rigidity. Where the tie wire is in contact with epoxy-coated bars, the tie wire shall be epoxy coated.
- C. Reinforcement bars support shall meet the requirements of Article 420.10 of IDOT Standard Specifications.

2.07 PROTECTIVE COAT:

Shall meet the requirements of Section 1023 of IDOT Standard Specifications.

2.08 GROUNDING:

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - 1. Bashlin Industries, Inc.
  - 2. General Machine Products Co., Inc.
  - 3. O-Z/Gedney Co.
  - 4. Thomas & Betts Corp.
- B. Grounding and Bonding Products:
  - 1. Products: Type, sizes and ratings to comply with NEC. Where types, sizes, ratings, and quantities indicated are in excess of NEC requirements, the more stringent requirements and the greater size, rating, and quantity indications shall govern.
  - 2. Conductor Materials: Copper.
- C. Wire and Cable Conductors:
  - 1. General: Comply with Division 26 Section "Wires and Cables." Conform to NEC Table 8, Chapter 9, except as otherwise indicated, for conductor properties, including stranding.



2. Equipment Grounding Conductor: Green insulated.
  3. Grounding Electrode Conductor: Stranded cable.
  4. Bare Copper Conductors: Conform to the following:
    - a. Solid Conductors: ASTM B-3.
    - b. Assembly of Stranded Conductors: ASTM B-8.
    - c. Tinned Conductors: ASTM B-33.
- D. Connector Products:
1. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.
  2. Aluminum-To-Copper Connections: Bimetallic type, conforming to UL 96, "Lighting Protection Components," or UL 467.
- E. Grounding Electrodes:
1. Ground Rods: Copper-clad steel with high-strength steel core and electrolytic grade copper outer sheath, molten welded to core. Size: 3/4 inch diameter and 10 feet long.
  2. Plate Electrodes: Copper plates, minimum 0.10 inch thick, size as indicated.

#### 2.09 VIS POLE:

- A. The pole shall be 8" x 8" in cross section, 3/8" thick and 12" in height. A 7'-8" cantilever arm shall be welded at the top of the pole as shown on the Drawings.
- B. The material of the pole and mast arm shall be steel and shall be furnished with square type steel base as manufactured by Funk Forging Co. and as shown on the Drawings.
- C. The pole shall also be equipped with two 4" x 6" hand holes, one 3" x 5" handhole and one 4" x 4" opening as shown on the Drawings.
- D. A 1/2" diameter standard threaded nipple shall be provided atop the arm and two 2" diameter holes shall be provided as shown on the Drawings.

### PART 3 - EXECUTION

#### 3.01 GENERAL:

- A. The Contractor shall construct the LED pole foundation as per Section 836 of IDOT Standard Specifications, except as modified herein. The tolerance for horizontal placement of the foundation shall be 1/4 of an inch. The tolerance for

elevation of the foundations is 1/8 of an inch. The tolerance for placement of anchor bolts is 1/16 of an inch.

- B. The ground rod shall be copper-clad steel as per the requirements of Article 1087.01 of IDOT Standard Specifications.
- C. The pole shall be installed as per the requirements of the applicable portions of Section 830 of IDOT Standard Specifications.

### 3.02 SITE CLEARING:

Remove all trees, shrubs, grass and other vegetation interfering with proposed construction. Removal includes digging out stumps and roots.

### 3.03 EARTHWORK:

- A. Before any material is placed for construction of embankments, topsoil within the limits of clearing and grubbing shall be excavated and stockpiled on site for subsequent placement on finished embankment. Placement of embankment may proceed upon acceptance of a proof-rolling test. The equipment used for the proof-rolling shall be approved by the Engineer.
- B. Embankment shall be compacted in accordance with the requirements of Article 205.06 of the Standard Specifications. Vertical tolerance shall be 1 inch.
- C. All material shall be disposed of in accordance with Article 202.03 of the IDOT Standard Specifications at the Contractor's expense. Metra shall be informed of the disposal site and shall be given a copy of necessary permit(s). If the disposal site is on private property, Metra shall be given a copy of written permission from the property owner allowing the disposal.
- D. The Contractor shall support, maintain, and protect all utility lines to remain in service.
- E. When necessary, due to weather conditions, the Contractor shall remove snow and ice from the work area to the satisfaction of the Engineer.
- F. Prior to placement of granular sub-base material, the Contractor will coordinate for Metra's engineer to inspect earthwork performed.
- G. Prior to excavating greater than the estimated amounts (within 10%), the Contractor shall notify Metra's engineer, in writing. Failure to do so will result in additional excavation being paid for by the Contractor, with no additional compensation due.
- H. The Contractor shall control dust on the site by spraying water or by other means satisfactory to the Engineer.

3.04 TRENCH AND BACKFILL:

Trench and backfill shall be constructed as per Section 819 of IDOT Standard Specifications.

- A. Trenches shall be excavated in the locations and to the widths and depths shown on the Plans.
- B. Backfilling shall be done in accordance with Article 550.07 of the Standard Specifications, except as modified in this section. Methods 2 and 3 shall not be permitted.
- C. Trenches shall not be backfilled until tests and inspections have been made. Care shall be used in back-filling and compacting to avoid damage or displacement of conduit runs.
- D. All trenches and excavations shall be backfilled as soon as possible after tests and inspections have been satisfactorily completed. Backfill materials and compaction procedures shall be approved by the Engineer. In backfilling, any compressible or destructible rubbish and refuse shall be removed from the excavated space before backfilling is started, except that sheeting and bracing shall be left in place or removed as the Work progresses as specified or directed by the Engineer.
- E. Where multiple cables for lines are installed in a common trench or concrete envelope and do not exceed an overall width of 16 inches, install a single line marker.
- F. If the Contractor and/or Engineer find that the materials encountered at the elevations specified are unstable and not suitable or in case it is found desirable or necessary to go an additional depth, the excavation shall be carried to such additional depth as directed by the Engineer.
- G. Each lift of Trench Backfill shall be within 2% of optimum moisture content before the succeeding lift is placed. Backfilling and compaction shall be done in a manner to avoid damaging top or side pressures on the conduit runs. Each lift of Trench Backfill shall be a maximum of 12" before compaction. Compaction shall be to 95% of the Standard Proctor Density.
- H. Any depression which may develop in backfilled areas from settlement within one year after the Work is fully completed and accepted shall be the responsibility of the Contractor. The Contractor shall provide as needed, at his own expense, additional backfill material, platform repairs or replacement, and shall perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved by the Engineer.
- I. All material and backfilling operations shall be subjected to testing by the Engineer with the assistance of the Contractor.

3.05 RIGID GALVANIZED STEEL CONDUITS AND FITTINGS:

Rigid galvanized steel conduits and fittings shall be installed as specified in Section 810 of IDOT Standard Specifications. The work shall also meet the requirements of Section 801 and the following:

- A. Prevent foreign matter from entering conduits by using temporary closure protection.
- B. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- C. All conduits are to contain fish tape for future pulls. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb. tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
- D. Conceal all conduits unless otherwise indicated. Install pipes at proper elevations.
- E. Upon completion of installation of conduits, inspect interiors of pipes, clear all blockages and remove burrs, dirt and construction debris.

3.06 CONCRETE FORMWORK:

- A. Design Of Work:
  - 1. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor and shall conform to "Recommended Practice for Concrete Formwork", ACI 347.
  - 2. Forms shall conform to shape, lines and dimensions shown on the Drawings. They shall be designed to safely resist the pressure and weight of the concrete, and shall be properly tied and braced or shored so as to maintain position and shape.
  - 3. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
  - 4. Temporary Openings: Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement and for placement of concrete. Brace temporary closures and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms in as inconspicuous locations as possible, consistent with project requirements.

B. Construction Formwork:

1. General: Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar, and able to withstand internal pressure when filled with wet concrete.
2. Layout:
  - a. Form all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings.
  - b. Exercise particular care in the layout of forms to avoid necessity for cutting of concrete after forms have been removed.
  - c. Make proper provision for all openings, offsets, recesses, anchorage, blocking and other features of the Work as shown or required.
  - d. Carefully examine the Drawings and Specifications and consult with other trades as required, relative to provision for openings, anchor bolts and other items in the forms.
3. Tolerances: Construct all forms straight, true, plumb and square within a tolerance horizontally of 1/8 inch and a tolerance vertically of 1/8 inch.
4. Wetting: Keep forms sufficiently wetted to prevent joints opening up before concrete is placed.

C. Work Prior To Concrete Placement:

1. Form Coatings: Coat form contact surfaces with form-coating compound before reinforcement is placed. Do not allow excess form-coating material to accumulate in the forms or to come into contact with surfaces which will be bonded to fresh concrete. Apply in compliance with manufacturer's instructions. Coat steel forms with a non-staining, rust-preventative form oil or otherwise protect against rusting. Rust stained steel formwork is not acceptable.
2. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is to be placed. Retighten forms immediately after placement as required to eliminate mortar leaks.
3. Edge Forms and Screed Strips: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface. Provide and secure units to support types of screeds required.

4. Once forms are set and at least 24 hours prior to the placement of concrete, the Contractor shall notify Metra's Engineer that the formwork is ready for final inspection.
- D. Removal of Formwork: Side forms not supporting vertical loads may be removed after cumulative curing at not less than 50°F for 24 hours after placing concrete, providing the concrete is sufficiently hard not to be damaged by form removal operations and providing that curing and protection operations are maintained.
- E. Reuse Forms: Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form-coating compound material to concrete contact surfaces as specified for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.

### 3.07 CONCRETE PLACEMENT:

- A. Pre-placement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit the installation of their Work; cooperate with other trades in setting such work as required. Thoroughly wet wood forms immediately before placing concrete, as required where form coatings are not used. Coordinate the installation of joint materials with placement of forms and reinforcing steel.
- B. General Requirements: Comply with Section 424 and applicable portions of Section 420 of IDOT Standard Specifications.
- C. Temperature Control for Placement: Comply with Article 1020.14 of IDOT Standard Specifications.
- D. Concrete Curing and Protection: Concrete curing shall meet the requirements of Article 1020.13 of IDOT Standard Specifications.
- E. Concrete Finishing:
  1. Horizontal concrete surfaces shall be finished as per Article 424.06 of IDOT Standard Specifications.
  2. Vertical concrete surfaces shall be finished smooth and even, and given a light brush finish while the concrete is still workable. The edges shall be rounded with approved finishing tools having the radii shown on the plans.

### 3.08 REINFORCEMENT BARS:

- A. The placement of reinforcement shall meet the requirements of Articles 420.09 and 420.10 of IDOT Standard Specifications.

- B. The reinforcement bars shall be securely tied to prevent displacement during the concreting operation.
- C. All reinforcing bars shall be placed with a tolerance of 1/2" to provide for adequate protective concrete cover, unless stated specifically on the Plans.
- D. Coordinate with Metra's Engineer at least 24 hours prior to placement of concrete to arrange for inspection of steel reinforcement.

3.09 PROTECTIVE COAT:

Shall be applied as per Article 420.21 of IDOT Standard Specifications and the following requirements:

- A. Inspection: Before commencing work, the surface shall be examined to determine that it is clean, dry and free of grease, oil or other surface contaminants which might be detrimental to proper and timely completion of work.
- B. Clean adjoining surfaces of smears, compound, or other soiling due to these operations, as work progresses. Restore, refinish or replace any adjacent surfaces or materials which are marred or damaged to the satisfaction of the Engineer.

3.10 GROUNDING:

A. Application:

- 1. Equipment Grounding Conductor Application: Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except where larger sizes or more conductors are indicated.
  - a. Use conduit as the equipment ground conductor where feasible and permitted by NEC for the following:
    - 1) Feeders and branch circuits except as otherwise indicated.
  - b. Install separate insulated equipment grounding conductors with circuit conductors for the following in addition to those locations where required by the Code:
    - 1) Feeders and branch circuits.
    - 2) Lighting circuits.
- 2. Metal Poles Supporting Outdoor Lighting Fixtures: Ground pole to a grounding electrode as indicated in addition to separate equipment grounding conductor run with supply branch circuit.

B. Installation:

1. General: Ground electrical systems and equipment in accordance with NEC requirements except where the Drawings or Specifications exceed NEC requirements.
2. Ground Rods: Locate a minimum of one-rod length from each other and at least the same distance from any other grounding electrode. Interconnect ground rods with bare conductors buried at least 24 inches below grade. Connect bare-cable ground conductors to ground rods by means of exothermic welds except as otherwise indicated. Make these connections without damaging the copper coating or exposing the steel. Use 3/4-inch by 10-ft. ground rods except as otherwise indicated. Drive rods until tops are 6 inches below final grade except as otherwise indicated.
3. Route grounding conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.

C. Connections:

1. General: Make connections in such a manner as to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
  - a. Use electroplated or hot-tin-coated materials to assure high conductivity and make contact points closer in order of galvanic series.
  - b. Make connections with clean bare metal at points of contact.
2. Exothermic Welded Connections: Use for connections to structural steel and for underground connections except those at test wells. Install at connections to ground rods and plate electrodes. Comply with manufacturer's written recommendations. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.
3. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with torque tightening values specified in UL 486A and UL 486B.
4. Moisture Protection: Where insulated ground conductors are connected to ground rods or ground buses, insulate the entire



area of the connection and seal against moisture penetration of the insulation and cable.

D. Field Quality Control:

1. Independent Testing Organization: Arrange and pay for the services of a qualified independent electrical testing organization to perform tests described below.
2. Tests: Subject the completed grounding system to a megger test at each location where a maximum ground resistance level is specified, at service disconnect enclosure ground terminal, and at ground test wells. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the 2-point method in accordance with Section 9.03 of IEEE 81, "Guide for Measuring Earth Resistivity, Ground Impedance and Earth Surface Potentials of a Grounding System."
3. Ground/resistance maximum values shall be as follows:  
Equipment rated 500 KVA and less: 10 Ohms
4. Deficiencies: Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values. Where measures are directed that exceed those indicated the provisions of the Contract, covering changes will apply.
5. Report: Prepare test reports, certified by the testing organization, of the ground resistance at each test location. Include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

- E. Cleaning and Adjusting: Restore surface features at areas disturbed by excavation and reestablish original grades except as otherwise indicated. Where sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other Work to their original condition.

PART 4 - MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 03 30 03

## SECTION 04 08 10 – UNIT MASONRY ASSEMBLIES

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
1. Concrete masonry units.
  2. Face brick.
  3. Stone trim units.
  4. Mortar and grout.
  5. Reinforcing steel.
  6. Masonry joint reinforcement.
  7. Ties and anchors.
  8. Embedded flashing.
  9. Miscellaneous masonry accessories.
- B. Related Sections include the following:
1. Division 7 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
  2. Dovetail slots for masonry anchors, installed under Division 3 Section "Cast-in-Place Concrete."
  3. Anchor sections of adjustable masonry anchors for connecting to structural frame, installed under Division 5 Section "Structural Steel."
- C. Products installed, but not furnished, under this Section include the following:
1. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
  2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 7 Section "Sheet Metal Flashing and Trim."
  3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section Steel Doors and Frames and Balanced Doors.

#### 1.2 DEFINITIONS

- A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 SUBMITTALS

- A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
- B. Shop Drawings: Show fabrication and installation details for the following:
  - 1. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
  - 2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.
  - 3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Initial Selection: For the following:
  - 1. Unit masonry Samples in small-scale form showing the full range of colors and textures available for each different exposed masonry unit required.
  - 2. Colored mortar Samples showing the full range of colors available.
- D. Samples for Verification: For the following:
  - 1. Full-size units for each different exposed masonry unit required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
  - 2. Colored mortar Samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project.
  - 3. Stone trim samples not less than 12 inches in length, showing the full range of colors and textures expected in the finished construction.
  - 4. Accessories embedded in the masonry.
- E. Material Test Reports: From a qualified testing agency indicating and interpreting test results of the following for compliance with requirements indicated:
  - 1. Each type of masonry unit required.
    - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
    - b. Include test results, measurements, and calculations establishing net-area compressive strength of masonry units.
  - 2. Mortar complying with property requirements of ASTM C 270.
  - 3. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.
- F. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:

1. Each type of masonry unit required.
    - a. Include size-variation data for brick, verifying that actual range of sizes falls within specified tolerances.
  2. Each cement product required for mortar and grout, including name of manufacturer, brand, type, and weight slips at time of delivery.
  3. Each material and grade indicated for reinforcing bars.
  4. Each type and size of joint reinforcement.
  5. Each type and size of anchor, tie, and metal accessory.
- G. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Payment for these services will be made by Owner. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
1. Clay Masonry Unit Test: For each clay masonry unit indicated, per ASTM C 67.
  2. Concrete Masonry Unit Test: For each concrete masonry unit indicated, per ASTM C 140.
- E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- F. Sample Panels: Before installing unit masonry, build sample panels, using materials indicated for the completed Work, to verify selections made under sample Submittals and to demonstrate aesthetic effects. Build sample panels for each type of exposed unit masonry assembly in sizes approximately 48 inches long by 48 inches high by full thickness.

1. Locate panels in the locations indicated or, if not indicated, as directed by Architect.
2. Clean exposed faces of panels with masonry cleaner indicated.
3. Protect approved sample panels from the elements with weather-resistant membrane.
4. Maintain sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
  - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels, unless such deviations are specifically approved by Architect in writing.
6. Demolish and remove sample panels when directed.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.6 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
  2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by coverings spread on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required.
1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

## PART 2 PRODUCTS

### 2.1 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows:
1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
  2. Provide square-edged units for outside corners, unless indicated as bullnose.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
  2. Weight Classification: Normal weight.
  3. Provide Type I, moisture-controlled units.
  4. Size (Width): Manufactured to the following dimensions:
    - a. 4 inches nominal; 3-5/8 inches actual.

- b. 6 inches nominal; 5 5/8 inches actual
  - c. 8 inches nominal; 7-5/8 inches actual.
5. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

## 2.2 BRICK

- A. General: Provide shapes indicated and as follows for each form of brick required:
- 1. Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
- B. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
- 1. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  - 2. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C. Face Brick: ASTM C 216, Grade SW at exposure to exterior weathering and NW for interior exposure or common brick., Type FBS, and as follows:
- 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4400 psi.
  - 2. Initial Rate of Absorption: Less than 20 g/30 sq. in. per minute when tested per ASTM C 67.
  - 3. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
  - 4. Size: Manufactured to the following actual dimensions:
    - a. Engineer Modular: 3-5/8 inches wide by 2 3/4 inches high by 7 5/8 inches long.
  - 5. Application: Use where brick is exposed to view, unless otherwise indicated.
  - 6. Color and Texture: Och's Brick, Harvard.

## 2.3 STONE TRIM UNITS

- A. Limestone: Indiana oolitic limestone as quarried in Lawrence, Monroe, and Owen counties, Indiana; complying with ASTM C 568, Category II (medium density); and matching standards of the Indiana Limestone Institute of America's "Indiana Limestone Handbook" for the following:
- 1. Grade: Standard.
  - 2. Color: Buff
  - 3. Finish: Plucked.

- B. Cut stone accurately to shape and dimensions indicated, with exposed faces dressed true, and with beds and joints at right angles to face; comply with fabricating tolerances specified by the Indiana Limestone Institute of America.

#### 2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207. Portland cement shall not have an alkali content of more than 0.1% when tested according to ASTM C 114.
  - 1. For colored-aggregate mortar, use natural color or white cement as necessary to produce required mortar color.
- C. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
  - 1. White-Mortar Aggregates: Natural white sand or ground white stone.
  - 2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- D. Aggregate for Grout: ASTM C 404.
  - 1. Colored Portland Cement-Lime Mix:
    - a. Eaglebond; Blue Circle Cement.
    - b. Color Mortar Blend; Glen-Gery Corporation.
    - c. Rainbow Mortamix Custom Color Cement/Lime; Holnam, Inc.
    - d. Centurion Colorbond PL; Lafarge Corporation.
    - e. Lehigh Custom Color Portland/Lime; Lehigh Portland Cement Co.
    - f. Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).
  - 2. Mortar Pigments: color of mortar to be one shade lighter than brick color.
    - a. True Tone Mortar Colors; Davis Colors.
    - b. Centurion Pigments; Lafarge Corporation.
    - c. SGS Mortar Colors; Solomon Grind-Chem Services, Inc.

#### 2.5 REINFORCING STEEL

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60.

#### 2.6 MASONRY JOINT REINFORCEMENT

- A. General: ASTM A 951 and as follows:
  - 1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
  - 2. Wire Size for Side Rods: W1.7 or 0.148-inch diameter.



3. Wire Size for Cross Rods: W1.7 or 0.148-inch diameter.
  4. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units where indicated.
- B. For multiwythe masonry, provide types as follows:
1. Ladder type with perpendicular cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width.
  2. Tab type with single pair of side rods spaced for embedment within each face shell of backup wythe and rectangular box-type cross ties spaced not more than 16 inches o.c. Size ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face.
  3. Adjustable (2-piece) type with single pair of side rods and cross ties spaced not more than 16 inches o.c. and with separate adjustable veneer ties engaging the cross ties. Cross ties are either U-shaped with eyes or rectangular. Space side rods for embedment within each face shell of backup wythe and size adjustable ties to extend at least halfway through outer wythe but with at least 5/8-inch cover on outside face.
    - a. Use where facing wythe is of different material than backup wythe.

## 2.7 TIES AND ANCHORS, GENERAL

- A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.
- B. Hot-Dip Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

## 2.8 BENT WIRE TIES

- A. General: Rectangular units with closed ends and not less than 4 inches wide. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
  1. Where wythes are of different materials, use adjustable ties composed of 2 parts; 1 with pintles, the other with eyes; with maximum misalignment of 1-1/4 inches.
- B. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.

## 2.9 ADJUSTABLE ANCHORS FOR CONNECTING TO WOOD FRAME

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire anchor section for welding to steel.
2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, hot-dip galvanized steel wire.

#### 2.10 ANCHORS FOR CONNECTING TO CONCRETE

- A. General: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section: Dovetail anchor section formed from 0.0625-inch- thick, stainless-steel sheet.
  2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.25-inch diameter, hot-dip galvanized steel wire.

#### 2.11 RIGID ANCHORS

- A. General: Fabricate from steel bars as follows:
1. 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins.
  2. Finish: Hot-dip galvanized to comply with ASTM A 153.

#### 2.12 MISCELLANEOUS ANCHORS

- A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron inserts of type and size indicated.
- B. Dovetail Slots: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.0336-inch, galvanized steel sheet.
- C. Anchor Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter and length indicated and in the following configurations:
1. Headed bolts.

#### 2.13 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Fabricate from the following metal complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim" and below:
1. Stainless Steel: 0.0156 inch thick.
  2. Fabricate through-wall metal flashing embedded in masonry from sheet metal indicated above and with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.

3. Fabricate metal expansion-joint strips from sheet metal indicated above, formed to shape indicated.
  4. Fabricate metal drip edges from sheet metal indicated above. Extend at least 3 inches into wall and 1/2 inch out from wall, with a hemmed outer edge bent down 30 degrees.
  5. Fabricate metal flashing terminations from sheet metal indicated above. Extend at least 3 inches into wall and out to exterior face of wall. At exterior face of wall, bend metal back on itself for 3/4 inch and then down into joint 3/8 inch to form a stop for retaining sealant backer rod.
- B. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.
- D. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- E. Products: Subject to compliance with requirements, provide one of the following:
1. Metal Flashing:
    - a. Cheney Flashing (Dovetail); Cheney Flashing Company, Inc.
    - b. Cheney Flashing (Sawtooth); Cheney Flashing Company, Inc.
    - c. Keystone 3-Way Interlocking Thruwall Flashing; Keystone Flashing Co.

#### 2.14 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.
- B. Control-Joint Gaskets: Material as indicated below, designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
1. Styrene-Butadiene-Rubber Compound: ASTM D 2000, Designation M2AA-805.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

#### 2.15 MASONRY CLEANERS

- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction

stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

## 2.16 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
- B. Mortar for Unit Masonry: Comply with ASTM C 270 BIA M1 Proportion Specification.
  - 1. For masonry below grade, in contact with earth, and where indicated, use Type M.
  - 2. For reinforced masonry and where indicated, use Type S.
  - 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
- C. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates combined with selected cementitious materials.
  - 1. Provide full range of sample colors for selection by Architect.
- D. Grout for Unit Masonry and Reinforced Brick Masonry: Comply with ASTM C 476.
  - 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
  - 2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.
- E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's directions.

## 2.17 SOURCE QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform source quality-control testing indicated below:
  - 1. Payment for these services will be made by Owner .Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.

- C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
  - 1. Verify that foundations are within tolerances specified.
  - 2. Verify that reinforcing dowels are properly placed.
  - 3. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

#### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
  - 1. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if the initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

#### 3.3 CONSTRUCTION TOLERANCES

- A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

- B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
- D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
- E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
- F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

#### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
  - 1. Common Bond with header course every 6<sup>th</sup> course
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.
- G. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above.

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid brick-size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- B. Set stone trim units in full bed of mortar with vertical joints slushed full. Fill dowel, anchor, and similar holes solid. Wet stone-joint surface thoroughly before setting; for soiled stone surfaces, clean bedding and exposed surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- D. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at exterior walls.

### 3.6 BONDING OF MULTIWYTHE MASONRY

- A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties as shown, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
- B. Use masonry joint reinforcement installed in horizontal mortar joints to bond wythes together.
- C. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.
  1. Provide continuity with masonry joint reinforcement at corners by using prefabricated "L" units as well as masonry bonding.
- D. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:
  1. Provide individual metal ties not more than 8 inches o.c.
  2. Provide continuity with masonry joint reinforcement by using prefabricated "T" units.
  3. Provide rigid metal anchors not more than 24 inches o.c.

### 3.7 MASONRY JOINT REINFORCEMENT

- A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  - 1. Space reinforcement not more than 16 inches o.c.
  - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.
    - a. Reinforcement above is in addition to continuous reinforcement.
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.8 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
  - 1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
  - 2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joints in unit masonry where indicated. Build-in related items as masonry progresses. Do not form a continuous span through movement joints unless provisions are made to prevent in-plane restraint of wall or partition movement.
- B. Form control joints in concrete masonry as follows:
  - 1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake joints in exposed faces.
- C. Form expansion joints in brick made from clay or shale as follows:



1. Build in joint fillers where indicated.
  2. Form open joint of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants." Keep joint free and clear of mortar.
- D. Build in horizontal, pressure-relieving joints where indicated; construct joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants."
1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry veneer and attached to structure behind masonry veneer.

### 3.10 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
  2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
  3. Provide either of above at Contractor's option or provide precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete."
- C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

### 3.11 FLASHING, WEEP HOLES, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
- C. Install flashing as follows:
1. At multiwythe masonry walls, including cavity walls, extend flashing from exterior face of outer wythe of masonry, through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within 1/2 inch of the

interior face of the wall in exposed masonry. Where interior surface of inner wythe is concealed by furring, carry flashing completely through inner wythe and turn flashing up approximately 2 inches, unless otherwise indicated.

2. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
  3. Extend sheet metal flashing 1/2 inch beyond face of masonry at exterior and turn flashing down to form a drip.
- D. Install weep holes in the head joints in exterior wythes of the first course of masonry immediately above embedded flashing and as follows:
1. Use plastic weep hole/vents to form weep holes.
  2. Use wicking material to form weep holes above flashing in brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
  3. Space weep holes 24 inches o.c.

### 3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
1. Construct formwork to conform to shape, line, and dimensions shown. Make it sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements of ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Comply with requirements of ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

### 3.13 FIELD QUALITY CONTROL

- A. Owner will engage a qualified independent testing agency to perform field quality-control testing indicated below.
1. Payment for these services will be made by Owner.
  2. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.

- B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
- C. Mortar properties will be tested per ASTM C 780.
- D. Grout will be sampled and tested for compressive strength per ASTM C 1019.
- E. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per ASTM C 1314, and as follows:
  - 1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

### 3.14 PARGING

- A. Parge predampened masonry walls, where indicated, with Type S or Type N mortar applied in 2 uniform coats to a total thickness of 3/4 inch. Scarify first parge coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect the parging until cured.

### 3.15 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
  - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
5. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.
7. Clean limestone units to comply with recommendations in the Indiana Limestone Institute of America's "Indiana Limestone Handbook."

PART 4 – MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 04 08 10

## **SECTION 04 20 00 - UNIT MASONRY**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:

1. Concrete masonry units.
2. Clay face brick.
3. Stone trim units.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry-joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.

- B. Products Installed but not Furnished under This Section:

1. Steel lintels in unit masonry.
2. Steel shelf angles for supporting unit masonry.
3. Cavity wall insulation.
4. Field applied CMU sealer.

- C. Related Requirements:

1. Section 044200 "Exterior Stone Cladding" for stone trim secured with stone anchors.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
4. Section 072726 "Fluid Applied Membrane Air Barrier" for air barrier membrane to be applied to cavity face of back wythes of cavity walls.

#### **1.3 DEFINITIONS**

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:
  - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
  - 2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
  - 3. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
  - 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
  - 1. CMUs.
  - 2. Clay face brick, in the form of straps of five or more bricks.
  - 3. Special brick shapes.
  - 4. Stone trim.
  - 5. mortar. Make Samples using same sand and mortar ingredients to be used on Project.
  - 6. Cavity vents.
  - 7. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
  - 1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
  - 1. Masonry units.
    - a. Include material test reports substantiating compliance with requirements.
    - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
    - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
    - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Integral water repellent used in CMUs.
  3. Cementitious materials. Include name of manufacturer, brand name, and type.
  4. Mortar admixtures.
  5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
  6. Grout mixes. Include description of type and proportions of ingredients.
  7. Reinforcing bars.
  8. Joint reinforcement.
  9. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
  2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to TMS 602/ACI 530.1/ASCE 6.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

## 1.6 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockup of typical wall area as shown on Drawings.
  2. Build mockups for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness, including face and backup wythes and accessories.
    - a. Include a sealant-filled joint at least 16 inches long in each mockup.
    - b. Include lower corner of window opening, framed with stone trim, at upper corner of exterior wall mockup. Make opening approximately 12 inches wide by 16 inches high.
    - c. Include through-wall flashing installed for a 24-inch length in corner of exterior wall mockup approximately 16 inches down from top of mockup, with a 12-inch length of flashing left exposed to view (omit masonry above half of flashing).
    - d. Include water-resistive barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

3. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
4. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
5. Protect accepted mockups from the elements with weather-resistant membrane.
6. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
  - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
  - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
7. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.8 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
  2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.



- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  2. Protect sills, ledges, and projections from mortar droppings.
  3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
  4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

## 1.9 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

### 2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
  1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

### 2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
  1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
  2. Provide bullnose units for outside corners unless otherwise indicated.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
  1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514/E 514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following:
      - 1) ACM Chemistries; RainBloc.
      - 2) BASF Construction Chemicals - Building Systems; Rheopel Plus.
      - 3) Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block.

C. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
5. Faces To Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.5 MASONRY LINTELS

- A. General: Provide one of the following:
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
  2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
  3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
  4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C 216.
1. Products: Subject to compliance with requirements, provide the following:
    - a. Brick Type I: Endicott Clay Products; Coppertone
    - b. Brick Type II: Endicott Clay Products; Medium Ironspot.
  2. Grade: SW.
  3. Type: FBX.
  4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.

5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): 3-5/8 inches wide by 3-5/8 inches high by 11-5/8 inches long.
7. Application: Use where brick is exposed unless otherwise indicated.
8. Color and Texture: As selected by Architect.

## 2.7 STONE TRIM UNITS

- A. Limestone: ASTM C 568/C 568M, Classification II Medium Density.
  1. Variety and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
    - a. Grade and Color: Standard, gray, according to grade and color classification established by ILI.
- B. Finish: Smooth.
  1. Finish for Tops of Sills Jamb Returns and Soffits of Lintels: Sand rubbed.
- C. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints at right angles to faces.

## 2.8 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
  1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Mortar Cement: ASTM C 1329/C 1329M.
  1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include the following:
    - a. Lafarge North America Inc.; Lafarge Mortar Cement.
- E. Aggregate for Mortar: ASTM C 144.
  1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

F. Aggregate for Grout: ASTM C 404.

G. For masonry below grade or in contact with earth, use Type Mixture intended for use with CMUs containing integral water repellent from same manufacturer.

1. Products: Subject to compliance with requirements, provide one of the following:
  - a. ACM Chemistries: RainBloc for Mortar.
  - b. BASF Corporation, Construction Chemicals: Rheopel Mortar Admixture.
  - c. Grace Construction Products, W. R. Grace & Co. - Conn.: Dry-Block Mortar Admixture.

H. Water: Potable.

## 2.9 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

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

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Exterior Walls: Hot-dip galvanized carbon steel.
3. Wire Size for Side Rods: 0.187-inch diameter.
4. Wire Size for Cross Rods: 0.187-inch diameter.
5. Wire Size for Veneer Ties: 0.187-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
7. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

D. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Ladder type with one side rod at each face shell of hollow masonry units more than 4 inches wide, plus one side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.
3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch and maximum vertical adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

- E. Masonry-Joint Reinforcement for Veneers Anchored with Seismic Masonry-Veneer Anchors: Single 0.187-inch- diameter, hot-dip galvanized carbon stainless-steel continuous wire.

## 2.10 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 641/A 641M, Class 1 coating.
  2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
  3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
  4. Galvanized-Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
  5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
  6. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
  7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
  8. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.
- C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch- thick steel sheet, galvanized after fabrication.
- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
  2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
  3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.
- E. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
  2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.

- F. Partition Top Anchors: 4 x 4 x 3/16 inch angle 8 inches long steel, hot-dip galvanized after fabrication.
- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
  - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.
- H. Adjustable Masonry-Veneer Anchors:
  - 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
  - 2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.105-inch-thick steel sheet, galvanized after fabrication.
  - 3. Fabricate wire ties from 0.187-inch-diameter, hot-dip galvanized-steel wire unless otherwise indicated.
  - 4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.

## 2.11 EMBEDDED FLASHING MATERIALS

- A. Flexible Flashing: Use one of the following unless otherwise indicated:
  - 1. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637/D 4637M, 0.040 inch thick.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
      - 2) Firestone Specialty Products; FlashGuard.
      - 3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.
      - 4) Hohmann & Barnard, Inc.; EPDM Flashing.
- B. Application: Unless otherwise indicated, use the following:
  - 1. Where flashing is indicated to receive counterflashing, use metal flashing.
  - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
  - 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing or flexible flashing with a metal drip edge.
  - 4. Where flashing is fully concealed, use flexible flashing.
- C. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- D. Termination Bars for Flexible Flashing: Stainless steel bars 0.075 inch by 1 inch.

2.12 MISCELLANEOUS MASONRY ACCESSORIES

- A. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- B. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).
- C. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:
  - 1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.
    - a. Products: Subject to compliance with requirements, provide one of the following:
      - 1) Advanced Building Products Inc.; Mortar Maze Cell Vent.
      - 2) Heckmann Building Products Inc.; No. 85 Cell Vent.
      - 3) Hohmann & Barnard, Inc.; QV Quadro-Vent.
      - 4) Wire-Bond; Cell Vent.
- D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Advanced Building Products Inc.; Mortar Break II.
    - b. Heckmann Building Products Inc.; Weep-Thru Mortar Deflector.
    - c. Hohmann & Barnard, Inc.; Mortar Trap.
    - d. Mortar Net USA, Ltd.; Mortar Net.
  - 2. Configuration: Provide one of the following:
    - a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.

2.13 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.



1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
  - a. Diedrich Technologies, Inc. ; a division of Sandell Construction Solutions.
  - b. EaCo Chem, Inc.
  - c. ProSoCo, Inc.

## 2.14 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
  1. Do not use calcium chloride in mortar or grout.
  2. Use or mortar cement mortar unless otherwise indicated.
  3. For exterior masonry, use mortar cement mortar.
  4. For reinforced masonry, use mortar cement mortar.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
  1. For masonry below grade or in contact with earth, use Type M.
  2. For reinforced masonry, use Type M.
  3. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
  4. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
  1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
  2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
  3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
  - 2. Verify that foundations are within tolerances specified.
  - 3. Verify that reinforcing dowels are properly placed.
  - 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

### 3.3 TOLERANCES

#### A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

#### B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

#### C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

### 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond ; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
  - 1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
  - 2. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
  - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

### 3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
1. Bed face shells in mortar and make head joints of depth equal to bed joints.
  2. Bed webs in mortar in all courses of piers, columns, and pilasters.
  3. Bed webs in mortar in grouted masonry, including starting course on footings.
  4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
  5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
  2. Allow cleaned surfaces to dry before setting.
  3. Wet joint surfaces thoroughly before applying mortar.
  4. Rake out mortar joints for pointing with sealant.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- F. Cut joints flush where indicated to receive waterproofing, cavity wall insulation, or air barriers unless otherwise indicated.

### 3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together as follows:
1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 2.67 sq. ft. of wall area spaced not to exceed 24 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
    - a. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) ties.

- b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) ties to allow for differential movement regardless of whether bed joints align.
2. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.
    - a. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement to allow for differential movement regardless of whether bed joints align.
- B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
  - C. Provide inspection openings by leaving out areas of brick, two bricks wide by four bricks high at approximately eight feet on center with saw tooth sides, fill in openings after inspection of flashing by Architect.
  - D. Request inspection of membrane flashing, by Architect's or Engineer's representative, prior to brick installation.
  - E. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
    1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

### 3.7 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
  1. Space reinforcement not more than 16 inches o.c.
  2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
  3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

### 3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
  3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

### 3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows:
1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout, and rake out joints in exposed faces for application of sealant.
- C. Form expansion joints in brick as follows:
1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

### 3.10 LINTELS

- A. Install steel lintels where indicated.
- B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

### 3.11 FLASHING, WEEP HOLES, AND CAVITY VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 4 inches, and through inner wythe to within 1/2 inch of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches on interior face.
  3. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 4 inches, and 1-1/2 inches into the inner wythe.
  4. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
  5. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
  6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
  7. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use specified weep/cavity vent products to form weep holes.
  2. Space weep holes 24 inches o.c. unless otherwise indicated.
  3. Space weep holes formed from 16 inches o.c.
- E. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- F. Install cavity vents in head joints in exterior wythes at spacing indicated. Use specified weep/cavity vent products to form cavity vents.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.
- G. At cavity walls, if flexible flashing is used, provide solid insulation blocking in the cavity to allow the flashing to be continuously adhered and supported. Seal all laps at joints in flashing with manufacturer approved adhesive.



3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
  - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
  - 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
  - 1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
  - 2. Limit height of vertical grout pours to not more than 60 inches.

3.13 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
- B. Inspections: Special inspections according to Level **B C** in TMS 402/ACI 530/ASCE 5.
  - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
  - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
  - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

### 3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  - 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
  - 4. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  - 5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
  - 6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
  - 7. Clean stone trim to comply with stone supplier's written instructions.

### 3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
  - 1. Crush masonry waste to less than 4 inches in each dimension.
  - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
  - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 04 20 00

## **SECTION 04 42 00 - EXTERIOR STONE CLADDING**

### **PART 4 - GENERAL**

#### **4.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **4.2 SUMMARY**

- A. Section Includes:
  - 1. Dimension stone panels set with individual anchors.
  - 2. Dimension stone trim units, including bands copings and sills .
- B. Related Requirements:
  - 1. Section 042000 "Unit Masonry" for installing inserts in unit masonry for anchoring dimension stone cladding and for stone trim in unit masonry walls.
  - 2. Section 079200 "Joint Sealants" for sealing joints in dimension stone cladding system with elastomeric sealants.

#### **4.3 DEFINITIONS**

- A. Definitions contained in ASTM C 119 apply to this Section.
- B. Dimension Stone Cladding Assembly: An exterior wall covering system consisting of dimension stone panels and trim together with anchors, fasteners, and sealants used to secure the stone to the building structure and to produce a weather-resistant covering.
- C. IBC: International Building Code.

#### **4.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

#### **4.5 ACTION SUBMITTALS**

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Shop Drawings: Show fabrication and installation details for dimension stone cladding assembly, including dimensions and profiles of stone units.

1. Show locations and details of joints both within dimension stone cladding assembly and between dimension stone cladding assembly and other construction.
  2. Include details of sealant joints mortar joints pointed with sealant.
  3. Show locations and details of anchors and backup structure.
  4. Show direction of veining, grain, or other directional pattern.
- C. Samples for Initial Selection: For joint materials involving color selection.
- D. Stone Samples for Verification: Sets for each variety, color, and finish of stone required; not less than 12 inches square.
1. Sets shall consist of at least four Samples, exhibiting extremes of the full range of color and other visual characteristics expected and will establish the standard by which stone will be judged.
- E. Sealant Samples for Verification: For each type and color of joint sealant required.
- F. Delegated-Design Submittal: For dimension stone cladding assembly.

#### 4.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer and testing agency.
- B. Material Test Reports:
1. Stone Test Reports: For each stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.
  2. Sealant Compatibility and Adhesion Test Report: From sealant manufacturer complying with requirements in Section 079200 "Joint Sealants" and indicating that sealants will not stain or damage stone. Include interpretation of test results and recommendations for primers and substrate preparation needed for adhesion.
- C. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

#### 4.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Dimension Stone Units: Furnish five finished stone panels for each finish and variety of stone specified.

#### 4.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate dimension stone cladding assemblies similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: A firm or individual experienced in installing dimension stone cladding assemblies similar in material, design, and extent to that indicated for this Project, whose work has a record of successful in-service performance.
- C. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockups of typical exterior wall area not less than 48 inches long by 48 inches high.
    - a. Include typical components, attachments to building structure, and methods of installation.
    - b. Include window opening with stone trim.
    - c. Include sealant-filled joint complying with requirements in Section 079200 "Joint Sealants."
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 4.9 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
  - 1. Lift stone with wide-belt slings; do not use wire rope or ropes that might cause staining. Move stone, if required, using dollies with cushioned wood supports.
  - 2. Store stone on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone. Ventilate under covers to prevent condensation.
- B. Mark stone units, on surface that will be concealed after installation, with designations used on Shop Drawings to identify individual stone units. Orient markings on vertical panels so that they are right side up when units are installed.

#### 4.10 FIELD CONDITIONS

- A. Protect dimension stone cladding during erection by doing the following:
  - 1. Cover tops of dimension stone cladding installation with nonstaining, waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold securely in place.
  - 2. Prevent staining of stone from mortar, grout, sealants, and other sources. Immediately remove such materials without damaging stone.
  - 3. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
  - 4. Protect sills, ledges, and projections from mortar and sealant droppings.
- B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace dimension stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.
- C. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.
- D. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F or when joint substrates are wet.

#### 4.11 COORDINATION

- A. Coordinate installation of inserts that are to be embedded in concrete or masonry, flashing reglets, and similar items to be used by dimension stone cladding Installer for anchoring, supporting, and flashing of dimension stone cladding assembly. Furnish setting drawings, templates, and directions for installing such items and deliver to Project site in time for installation.
- B. Time delivery and installation of dimension stone cladding to avoid extended on-site storage and to coordinate with work adjacent to dimension stone cladding.

#### 4.12 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

## PART 5 - PRODUCTS

### 5.1 MANUFACTURERS

- A. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from single quarry, whether specified in this Section or in another Section of the Specifications, with resources to provide materials of consistent quality in appearance and physical properties.
  - 1. For stone types that include same list of varieties and sources, provide same variety from same source for each.
  - 2. Make quarried blocks available for examination by Architect.
- B. Source Limitations for Other Materials: Obtain each type of stone accessory and other material from single manufacturer for each product.

### 5.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design dimension stone cladding assembly.
- B. General: Design stone anchors and anchoring systems according to ASTM C 1242.
  - 1. Stone anchors shall withstand not less than two times the weight of the stone cladding in both compression and tension.
- C. Structural Performance: Dimension stone cladding assembly shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Wind Loads: As indicated.
  - 2. Equipment Loads: Allow for loads due to window cleaning and maintenance equipment.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- E. Horizontal Building Movement (Interstory Drift): Allow for maximum horizontal building movement equal to quotient resulting from dividing floor-to-floor height at any floor by 400.
- F. Safety Factors for Stone: Design dimension stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:
  - 1. Safety Factor for Oolitic Limestone: 8.
  - 2. Safety Factor for Concentrated Stresses: 10.



- G. Provisions for Fabrication and Erection Tolerances: Allow for fabrication and erection tolerances of building's structural system. Structural-steel fabrication and erection tolerances are specified in Section 051200 "Structural Steel Framing."
- H. Provision for Deflection of Building Structure:
  - 1. Deflection Due to Weight of Dimension Stone Cladding Assembly: Allow for 1/4-inch vertical deflection in 20-foot span of structural members supporting dimension stone cladding assembly.
  - 2. Live Load Deflection: Allow for 1/4-inch vertical deflection, in 20-foot span of structural members supporting dimension stone cladding assembly, due to live loads imposed on building's structural frame after stone installation.
- I. Corrosion and Staining Control: Prevent galvanic and other forms of corrosion as well as staining by isolating metals and other materials from direct contact with incompatible materials. Materials shall not stain exposed surfaces of stone and joint materials.

### 5.3 LIMESTONE

- A. Material Standard: Comply with ASTM C 568.
  - 1. Classification: II Medium-Density .
- B. Description: Oolitic limestone.
- C. Varieties and Sources: Indiana limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
  - 1. Indiana Limestone Grade and Color: Standard, gray, according to grade and color classification established by ILI.
- D. Cut: Vein.
  - 1. Orientation of Veining: Vertical.
- E. Cut stone from one block or contiguous, matched blocks in which natural markings occur.
- F. Finish: Smooth finish , matching standard ILI finish.
- G. Thickness: Not less than 4 inches unless otherwise indicated.

### 5.4 ANCHORS AND FASTENERS

- A. Fabricate shelf angles for limestone from hot-dip galvanized steel, ASTM A 36/A 36M for materials and ASTM A 123/A 123M for galvanizing.

- B. Fabricate anchors, including shelf angles, from extruded aluminum, ASTM B 221, alloy and temper as required to support loads imposed without exceeding allowable design stresses, but not less than strength and durability properties of Alloy 6063-T6.

#### 5.5 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.
  - 1. Low-Alkali Cement: Portland cement for use with limestone shall contain not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime.
- D. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch and pointing mortar, 100 percent shall pass No. 16 sieve.
- E. Water: Potable.

#### 5.6 STONE ACCESSORIES

- A. Setting Shims: Strips of vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
- B. Concealed Sheet Metal Flashing: Fabricated from zinc-tin, alloy-coated stainless steel in thicknesses indicated, but not less than 0.0156 inch thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."
- C. Cellular Plastic Weep Hole/Vents: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, of length required to extend from exterior face of stone to cavity behind, in color selected from manufacturer's standard.
- D. Sealants for Joints in Dimension Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and do not stain stone:
  - 1. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

#### 5.7 STONE FABRICATION

- A. General: Fabricate stone units in sizes and shapes required to comply with requirements indicated.

1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."
- B. Control depth of stone and back check to maintain minimum clearance of 1 inch between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.
- C. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- D. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.
- E. Finish exposed faces and edges of stone, except sawed reveals, to comply with requirements indicated for finish and to match approved samples and mockups.
- F. Quirk-miter corners unless otherwise indicated; provide for cramp anchorage in top and bottom bed joints of corner pieces.
- G. Cut stone to produce uniform joints 3/8 inch wide and in locations indicated.
- H. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- I. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.
- J. Clean backs of stone to remove rust stains, iron particles, and stone dust.
- K. Inspect finished stone units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.
  1. Grade and mark stone for overall uniform appearance when assembled in place. Natural variations in appearance are acceptable if installed stone units match range of colors and other appearance characteristics represented in approved samples and mockups.

## PART 6 - EXECUTION

### 6.1 EXAMINATION

- A. Examine surfaces to receive dimension stone cladding and conditions under which dimension stone cladding will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of dimension stone cladding.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of dimension stone cladding.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 6.2 SETTING DIMENSION STONE CLADDING, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Coat limestone with dampproofing to extent indicated below:
  - 1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches above finish-grade elevations.
  - 2. Stone Extending Below Grade: Beds, joints, back surfaces, and face surfaces below grade.
  - 3. Allow dampproofing to cure before setting dampproofed stone. Do not damage or remove dampproofing while handling and setting stone.
- C. Execute dimension stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set.
  - 1. Use power saws with diamond blades to cut stone. Produce lines cut straight and true, with edges eased slightly to prevent snipping.
- D. Contiguous Work: Provide reveals, reglets, and openings as required to accommodate contiguous work.
- E. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure dimension stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.
- F. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
  - 1. Sealing expansion and other joints is specified in Section 079200 "Joint Sealants."
- G. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
- H. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.
  - 1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches. Use plastic weep hole/vents .

2. Place vents in cavity walls at tops of cavities, below shelf angles and flashing, and at intervals not exceeding 20 feet vertically. Locate vents in joints at intervals not exceeding 60 inches horizontally. Use plastic weep hole/vents.

### 6.3 SETTING DIMENSION STONE CLADDING WITH MORTAR

- A. Set dimension stone cladding with mortar and mechanical anchors unless otherwise indicated.
- B. Set stone in full bed of mortar with head joints filled unless otherwise indicated.
  1. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding. Hold buttons back from face of stone a distance at least equal to width of joint, but not less than depth of pointing materials.
  2. Do not set heavy units or projecting courses until mortar in courses below has hardened enough to resist being squeezed out of joint.
  3. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.
- C. Embed ends of sills in mortar; leave remainder of joint open until final pointing.
- D. Rake out mortar from sealant-pointed joints to depths required for sealant and sealant backing but not less than 1/2 inch. Rake joints to uniform depths with square bottoms and clean sides.
- E. Set the following dimension stone cladding with unfilled head joints for installing joint sealants:
  1. Sills.
  2. Belt and other projecting courses.

### 6.4 JOINT-SEALANT INSTALLATION

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

### 6.5 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch in 40 feet or more. For external corners, corners and jambs within 20 feet of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch in 40 feet or more.
- B. Variation from Level: For lintels, sills, water tables, parapets, horizontal bands, horizontal grooves, and other conspicuous lines, do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 3/8 inch maximum.

- C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet or 1/2 inch in 40 feet or more.
- D. Variation in Cross-Sectional Dimensions: For thickness of walls from dimensions indicated, do not exceed plus or minus 1/4 inch.
- E. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch or a quarter of nominal joint width, whichever is less. For joints within 60 inches of each other, do not vary more than 1/8 inch or a quarter of nominal joint width, whichever is less from one to the other.
- F. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch difference between planes of adjacent units.

#### 6.6 ADJUSTING AND CLEANING

- A. Remove and replace broken, chipped, stained, or otherwise damaged stone, defective joints, and dimension stone cladding that does not match approved samples and mockups. Damaged stone may be repaired if Architect approves methods and results.
- B. Replace damaged or defective work in a manner that results in dimension stone cladding's matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean dimension stone cladding as work progresses. Remove mortar fins and smears before tooling joints. Remove excess sealant and smears as sealant is installed.
- D. Final Cleaning: Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

#### MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 04 42 00

## SECTION 04 72 00 - CAST STONE MASONRY

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
  - 1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.
- B. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.
  - 1. Provide test reports based on testing within previous two years.

#### 1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute.
  - 1. Cast Stone shall be produced in a plant certified by the Cast Stone Institute.
  - 2. Cast stone manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required in accordance with the project schedule.
- B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- C. Mockups: Furnish cast stone for installation in mockups specified in Section 042000 "Unit Masonry."
- D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Build mockup of typical wall area as shown on Drawings.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work.
- B. Pack, handle, and ship cast stone units in suitable packs or pallets.
  - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
  - 2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.5 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.
  - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 CAST STONE MATERIALS

- A. General: Comply with ASTM C 1364 and the following:
- B. Portland Cement: ASTM C 150, Type I or Type III, containing not more than 0.60 percent total alkali when tested according to ASTM C 114. Provide natural color or white cement as required to produce cast stone color indicated.
- C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation and colors as needed to produce required cast stone textures and colors.
- D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation and colors as needed to produce required cast stone textures and colors.



- E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, free of carbon black, nonfading, and resistant to lime and other alkalis.
- F. Admixtures: Use only admixtures specified or approved in writing by Architect.
  - 1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
  - 2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
  - 3. Air-Entraining Admixture: ASTM C 260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
- G. Reinforcement: Deformed steel bars complying with ASTM A 615/A 615M, Grade 60. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.
  - 1. Epoxy Coating: ASTM A 775/A 775M.
  - 2. Galvanized Coating: ASTM A 767/A 767M.
- H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304.

## 2.2 CAST STONE UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Northfield Block Company; Franklin Stone; Rock Face and Smooth Face Texture as indicated in color 'Liberty Gray', or comparable product by one of the following:
  - 1. Superior Precast Products, Inc., Kalamazoo, Michigan.
  - 2. Royal Stone Inc. Williamstone, Michigan
  - 3. Architectural Castone Inc., West Chicago, IL
- B. Provide cast stone units complying with ASTM C 1364 using wet-cast method.
  - 1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
  - 1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
  - 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
  - 3. Provide drips on projecting elements unless otherwise indicated.

D. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

E. Color and Texture: Provide units with fine-grained texture and buff color resembling Indiana limestone.

2.3 MORTAR MATERIALS

A. Provide mortar materials that comply with Section 042000 "Unit Masonry."

B. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

C. Water: Potable.

2.4 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

B. Dowels: 1/2-inch- diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

2.5 MORTAR MIXES

A. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Mix to match Architect's sample.

- B. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

- 1. Application: Use colored aggregate mortar for exposed mortar joints.

## 2.6 SOURCE QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample and test cast stone units according to ASTM C 1364.

- 1. Include one test for resistance to freezing and thawing.

## PART 3 - EXECUTION

### 3.1 SETTING CAST STONE IN MORTAR

- A. Install cast stone units to comply with requirements in Section 042000 "Unit Masonry."
- B. Rake out joints for pointing with mortar to depths of not less than 3/4 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- C. Point vertical mortar joints by placing and compacting mortar in layers not greater than 3/8 inch. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- D. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
  - 1. Keep joints free of mortar and other rigid materials.
  - 2. Build in compressible foam-plastic joint fillers where indicated.
  - 3. Form joint of width indicated, but not less than 3/8 inch .
  - 4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
  - 5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

### 3.2 SETTING ANCHORED CAST STONE WITH SEALANT-FILLED JOINTS

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
  - 1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
  - 2. Shim and adjust anchors, supports, and accessories to set cast stone in locations indicated with uniform joints.

- B. Keep cavities open where unfilled space is indicated between back of cast stone units and backup wall; do not fill cavities with mortar or grout.
- C. Fill anchor holes with sealant.
  - 1. Where dowel holes occur at pressure-relieving joints, provide compressible material at ends of dowels.
- D. Set cast stone supported on clip or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths. Hold shims back from face of cast stone a distance at least equal to width of joint.
- E. Keep joints free of mortar and other rigid materials. Remove temporary shims and spacers from joints after anchors and supports are secured in place and cast stone units are anchored. Do not begin sealant installation until temporary shims and spacers are removed.
  - 1. Form open joint of width indicated, but not less than 3/8 inch.
- F. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
- G. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

### 3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet or 1/4 inch maximum.
- B. Variation from Level: Do not exceed 1/8 inch in 10 feet or 1/4 inch maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except where variation is due to warpage of units within tolerances specified.

### 3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
  2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
  3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
  4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
  5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
  6. Clean cast stone with proprietary acidic cleaner applied according to manufacturer's written instructions.

#### MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 04 72 00

## **SECTION 05 12 00 - STRUCTURAL STEEL**

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Structural steel.
  - 2. Grout.
- B. Related Sections include the following:
  - 1. Division 1 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.

#### 1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC's "Code of Standard Practice for Steel Buildings and Bridges," that support design loads.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of connections required by the Contract Documents to be completed by structural-steel fabricator to withstand LRFD loads indicated and comply with other information and restrictions indicated.
  - 1. Complete connections using schematic details indicated and AISC's "Manual of Steel Construction "Load and Resistance Factor Design P," Part 9.
  - 2. Engineering Responsibility: Fabricator's responsibilities include using a qualified professional engineer to prepare structural analysis data for structural-steel connections

## 1.5 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
  - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 2. Include embedment drawings.
  - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
  - 5. For structural-steel connections indicated to comply with design loads, include structural analysis data prepared by an Illinois registered structural engineer.
- C. Welding certificates.
- D. Qualification Data: For installer, fabricator, structural engineer.
- E. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:
  - 1. Structural steel including chemical and physical properties.
  - 2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
  - 3. Direct-tension indicators.
  - 4. Tension-control, high-strength bolt-nut-washer assemblies.
  - 5. Shear stud connectors.
  - 6. Shop primers.
  - 7. Non-shrink grout.
- F. Source quality-control test reports.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CASE.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category Sbd.
- C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel."
- D. Comply with applicable provisions of the following specifications and documents:

1. AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC's "Specification for Structural Steel Buildings"-
3. AISC's "Specification for the Design of Steel Hollow Structural Sections."
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from erosion and deterioration.
  1. Store fasteners in a protected place. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
  2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

## 1.8 COORDINATION

- A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

## PART 2 PRODUCTS

### 2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M or ASTM A 572/A 572M, Grade 50.
- B. Channels, Angles: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- E. Welding Electrodes: Comply with AWS requirements.

### 2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
  1. Finish: Plain



- B. Unheaded Anchor Rods: ASTM F 1554, Grade 36 .
  - 1. Configuration: Hooked.
  - 2. Nuts: ASTM A 563 hex carbon steel.
  - 3. Washers: ASTM F 436 hardened carbon steel.
  - 4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

## 2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, non asphaltic, rust-inhibiting primer.

## 2.4 GROUT

- A. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404, Size No. 2. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- B. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
- C. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

## 2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC's "Specification for Structural Steel Buildings"
  - 1. Camber structural-steel members where indicated.
  - 2. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.
  - 3. Mark and match-mark materials for field assembly.
  - 4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- C. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- D. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, Solvent Cleaning.

## 2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
  - 1. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  - 2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.
  - 3. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
    - a. Grind butt welds flush.
    - b. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

## 2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
  - 2. Surfaces to be field welded.
  - 3. Surfaces to be high-strength bolted with slip-critical connections.
  - 4. Surfaces to receive sprayed fire-resistive materials.
  - 5. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

## 2.8 SOURCE QUALITY CONTROL

- A. Owner may engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
  - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections may be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.
  - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

### 3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings"
- B. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
  2. Pretension anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.
  3. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
1. Level and plumb individual members of structure.
  2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

### 3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.
1. Comply with AISC's "Code of Standard Practice for Steel Buildings and Bridges" and "Specification for Structural Steel Buildings" for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
  2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
  3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

4. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances.
5. Grind butt welds flush.
  - a. Grind or fill exposed fillet welds to smooth profile. Dress exposed welds.

### 3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Shop-bolted connections may be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds may be visually inspected according to AWS D1.1.
  1. In addition to visual inspection, field welds may be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option:
    - a. Liquid Penetrant Inspection: ASTM E 165.
    - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
    - c. Ultrasonic Inspection: ASTM E 164.
    - d. Radiographic Inspection: ASTM E 94.
- D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

### 3.6 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.
  1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.
- C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 painting Sections.

PART 4 – MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 05 12 00

**SECTION 05 44 00 - COLD-FORMED METAL TRUSSES**

1. GENERAL

1. RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

2. SUMMARY

1. Section Includes:
  1. Cold-formed steel trusses for roofs.

3. PREINSTALLATION MEETINGS

1. Preinstallation Conference: Conduct conference at **Village Hall, Village of Maywood**.

4. ACTION SUBMITTALS

1. Product Data: For each type of product.
2. Shop Drawings:
  1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel trusses; fabrication; and fastening and anchorage details, including mechanical fasteners.
  2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
3. Delegated-Design Submittal: For cold-formed steel trusses.

5. INFORMATIONAL SUBMITTALS

1. Qualification Data: For testing agency.
2. Welding certificates.
3. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.
  1. Steel sheet.
  2. Expansion anchors.

3. Power-actuated anchors.
  4. Mechanical fasteners.
  5. Miscellaneous structural clips and accessories.
4. Field quality-control reports.

6. QUALITY ASSURANCE

1. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
2. Product Tests: Mill certificates or data from a qualified testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
3. Welding Qualifications: Qualify procedures and personnel according to the following:
  1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

7. DELIVERY, STORAGE, AND HANDLING

1. Protect cold-formed steel trusses from corrosion, deformation, and other damage during delivery, storage, and handling.

2. PRODUCTS

1. MANUFACTURERS

1. NuConSteel Denton, TX (640)-891-3050
2. Dietrich Industries, Hammond, IN (219) 931-6344

2. PERFORMANCE REQUIREMENTS

1. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
2. Structural Performance: Provide cold-formed steel trusses capable of withstanding design loads within limits and under conditions indicated.
  1. Design Loads: As shown on Plans
  2. Deflection Limits: Design trusses to withstand design loads without deflections greater than the following:



1. Floor Trusses: Vertical deflection of  $1/480$  for live loads and  $1/360$  for total loads of the span.
  2. Roof Trusses: Vertical deflection of  $1/360$  of the span.
  3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F
3. Cold-Formed Steel Framing Design Standards:
1. Floor and Roof Systems: Design according to AISI S210.
  2. Lateral Design: Design according to AISI S213.
  3. Roof Trusses: Design according to AISI S214.
4. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
3. COLD-FORMED STEEL TRUSS MATERIALS
1. Steel Sheet: ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of grade and coating weight as follows:
    1. Grade: ST33HST50HAs required by structural performance.
    2. Coating: G60, A60, AZ50.
4. ROOF TRUSSES
1. Roof Truss Members: Manufacturer's standard C-shaped steel sections.
    1. Connecting Flange Width: 1-5/8 inches, minimum at top and bottom chords connecting to sheathing or other directly fastened construction.
    2. Minimum Base-Metal Thickness: 0.0538 inch.
5. ACCESSORIES
1. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, structural grade, Type H, metallic coated, of same grade and coating weight used for truss members.
  2. Provide accessories of manufacturer's standard thickness and configuration unless otherwise indicated.

6. ANCHORS, CLIPS, AND FASTENERS

1. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
2. Anchor Bolts: ASTM F 1554, Grade 36 or Grade 55, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
3. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and Appendix D in ACI 318, greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
4. Power-Actuated Fasteners: Fastener system of type suitable for application, fabricated from corrosion-resistant materials, with capability to sustain, without failure, allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
5. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
  1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
6. Welding Electrodes: Comply with AWS standards.

7. MISCELLANEOUS MATERIALS

1. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
2. Shims: Load bearing, of high-density multimonomer plastic, nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

8. FABRICATION

1. Fabricate cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
  1. Fabricate trusses using jigs or templates.
  2. Cut truss members by sawing or shearing; do not torch cut.
  3. Fasten cold-formed steel truss members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator.
    1. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

4. Fasten other materials to cold-formed steel trusses by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
2. Reinforce, stiffen, and brace trusses to withstand handling, delivery, and erection stresses. Lift fabricated trusses to prevent damage or permanent distortion.
3. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
  2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch.

3. EXECUTION

1. EXAMINATION

1. Examine supporting substrates and abutting cold-formed steel trusses for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

2. PREPARATION

1. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.
2. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed steel trusses without reducing thickness of fire-resistive materials below that is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3. INSTALLATION

1. Install, brace, and brace cold-formed steel trusses according to AISI S200, AISI S214, AISI's "Code of Standard Practice for Cold-Formed Steel Structural Framing," and manufacturer's written instructions unless more stringent requirements are indicated.
2. Install cold-formed steel trusses and accessories plumb, square, and true to line, and with connections securely fastened.
  1. Fasten cold-formed steel trusses by welding or mechanical fasteners.

1. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  2. Locate mechanical fasteners and install according to Shop Drawings; comply with requirements for spacing, edge distances, and screw penetration.
  3. Install temporary bracing and supports. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
  4. Truss Spacing: 16 inches or 24 inches.
  5. Do not alter, cut, or remove framing members or connections of trusses.
  6. Erect trusses with plane of truss webs plumb and parallel to each other, align, and accurately position at spacings indicated.
  7. Erect trusses without damaging framing members or connections.
  8. Coordinate with wall framing to align webs of bottom chords and load-bearing studs or continuously reinforce track to transfer loads to structure. Anchor trusses securely at all bearing points.
  9. Install continuous bridging and permanently brace trusses as indicated on Shop Drawings and designed according to CFSEI's Tech Note 551e, "Design Guide: Permanent Bracing of Cold-Formed Steel Trusses."
  10. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
    1. Space individual trusses no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
4. FIELD QUALITY CONTROL
1. Special Inspections: Owner will engage a qualified special inspector to perform the special inspections:
  2. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
  3. Field and shop welds will be subject to testing and inspecting.
  4. Prepare test and inspection reports.

5. REPAIRS AND PROTECTION

1. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
2. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal trusses are without damage or deterioration at time of Substantial Completion.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 05 44 00

## SECTION 05 50 00 - METAL FABRICATIONS

### PART 7 - GENERAL

#### 7.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 7.2 SUMMARY

- A. Section Includes:
  - 1. Loose bearing and leveling plates for applications where they are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Loose steel lintels.
- C. Related Requirements:
  - 1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
  - 2. Section 051200 "Structural Steel Framing."

#### 7.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 7.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
  - 1. Loose steel lintels.

7.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

7.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

7.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

7.8 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 8 - PRODUCTS

8.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

8.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.
- D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.
- E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

### 8.3 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.



- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

#### 8.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

8.5 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize and prime loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

8.6 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

8.7 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
  - 1. Shop prime with universal shop primer unless primers specified in Section 099600 "High-Performance Coatings" are indicated.
- C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:
  - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
  - 4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

## PART 9 - EXECUTION

### 9.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

### 9.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 05 50 00

## SECTION 05 52 13 - PIPE AND TUBE RAILINGS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.02 SUMMARY

- A. This Section includes the following:
  - 1. Steel tube railings.
- B. Related Sections include the following:
  - 1. Division 3 Poured in Place Concrete.

#### 1.03 PERFORMANCE REQUIREMENTS

- A. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
  - 1. Steel: 72 percent of minimum yield strength.
- B. Structural Performance: Provide railings capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  - 1. Handrails:
    - a. Uniform load of 50 lbf/ ft. (0.73kN/m) applied in any direction.
    - b. Concentrated load of 200 lbf (0.89kN) applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 2. Top Rails of Guards:
    - a. Uniform load of 50 lbf/ ft. (0.73kN/m) applied in any direction
    - b. Concentrated load of 200 lbf (0.89kN) applied in any direction.
    - c. Uniform and concentrated loads need not be assumed to act concurrently.
  - 3. Infill of Guards:
    - a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq.m).
    - b. Uniform load of 25 lbf/sq. ft. (1.2kN/sq.m) applied horizontally.
    - c. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on

surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

#### 1.04 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of railing through one source from a single manufacturer.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."

#### 1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Provide allowance for trimming and fitting at site.

#### 1.07 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
1. Steel Tube Railings:
    - a. Pisor Industries, Inc.
    - b. Sharpe Products.
    - c. Wagner, R & B, Inc.; a division of the Wagner Companies.

### 2.02 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

### 2.03 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513, Type 5 (mandrel drawn).
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Castings: Either gray or malleable iron, unless otherwise indicated.
1. Gray Iron: ASTM A 48/A 48M, Class 30, unless another class is indicated or required by structural loads.
  2. Malleable Iron: ASTM A 47/A 47M.
- D. Welded-Wire Mesh: Square pattern, cold rolled, square welded 2-inch (50-mm) welded-wire mesh, made from .250" diameter wire complying with ASTM A 510 (ASTM A 510M).

### 2.04 FASTENERS

- A. General: Provide the following:
1. Steel Railings: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
  2. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated.
- D. Anchors: Provide cast-in-place anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

## 2.05 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Shop Primers: Provide primers that comply with Division 9 [Section 9960 "High-Performance Coatings."]
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- D. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
1. Water-Resistant Product: At exterior locations provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

## 2.06 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1mm), unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.



- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections, unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form changes in direction as follows:
  - 1. By radius bends of radius indicated.
- J. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6mm) or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work, unless otherwise indicated.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with steel plate forming bottom closure.
- P. Welded-Wire Mesh Infill Panels: Fabricate infill panels from welded-wire mesh. Make wire mesh and u-shaped edge channel frames from same metal as railings in which they are installed.
  - 1. Orient wire mesh with wires perpendicular and parallel to top rail.
  - 2. Panel edges to be finished smooth, of same metal as welded wire mesh.

2.07 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.08 STEEL AND IRON FINISHES

- A. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed railings:
  - 1. Exterior Railings (SSPC Zone 1B): SSPC-SP 10/NACE No. 2, "Near White Blast Cleaning."
- C. Apply shop primer to prepared surfaces of railings, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2mm in 1m).
  - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.02 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in Part 2 "Fabrication" Article whether welding is performed in the shop or in the field.

### 3.03 ANCHORING POSTS

- A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8 – inch (3-mm) build, sloped away from post.

### 3.04 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

### 3.05 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

## PART 4 - MEASUREMENT AND PAYMENT

### 4.01 METHOD OF MEASUREMENT:

No separate measurement shall be made for PIPE AND TUBE RAILINGS.

### 4.02 BASIS OF PAYMENT:

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 05 52 13

## SECTION 06 10 00 - ROUGH CARPENTRY

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
1. Framing with dimension lumber.
  2. Wood Preservative treated lumber.
  3. Wood blocking and nailers.
  4. Plywood backing panels.
- B. Related Sections include the following:
1. Division 6 Section "Sheathing."
  2. Division 6 Section "Metal-Plate-Connected Wood Trusses."

#### 1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
  2. NLGA: National Lumber Grades Authority.
  3. RIS: Redwood Inspection Service.
  4. SPIB: The Southern Pine Inspection Bureau.
  5. WCLIB: West Coast Lumber Inspection Bureau.
  6. WWPA: Western Wood Products Association.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
  2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
  3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
1. Expansion anchors.
  2. Metal framing anchors.

## 1.5 QUALITY ASSURANCE

- A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.
- B. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
1. Dimension lumber framing.
  2. Miscellaneous lumber.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

## PART 2      PRODUCTS

### 2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

## 2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWWPA C2 , except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWWPA C31 with inorganic boron (SBX).
  1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
  1. For exposed lumber indicated to receive a stained or natural finish mark end or back of each piece.
- D. Application: Treat items indicated on Drawings, and the following:
  1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
  2. Wood sills, sleepers, blocking, furring and similar concealed members in contact with masonry or concrete.
  3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
  4. Wood floor plates that are installed over concrete slabs-on-grade.

## 2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent
- B. Framing Other Than Interior Partitions: Any species of machine stress-rated dimension lumber with a grade of not less than 1650f-1.5E Framing Other Than Interior Partitions: Any species of machine stress-rated dimension lumber with a grade of not less than 1650f-1.5E
- C. Non-Load Bearing Interior Partitions: Any species of machine stress-rated dimension lumber with a grade of not less than 1650f-1.5E Framing Other Than

Interior Partitions: Any species of machine stress-rated dimension lumber with a grade of not less than 1650f-1.5E .First paragraph below is an example of a performance requirement that can be used instead of last two paragraphs above. If retaining, select one of two titles, then select or revise values and insert other properties to suit structural requirements of Project.

- D. Joists, Rafters, and Other Framing Not Listed Above: Any species of machine stress-rated dimension lumber with a grade of not less than 2100f-1.8E.

#### 2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
  2. Nailers.
  3. Cants.
  4. Furring.
  5. Grounds.
- B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber with 19 percent maximum moisture content of any species.
- C. For exposed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
1. Hem-fir or hem-fir (north), Select Merchantable or No. 1 Common grade; NLGA, WCLIB, or WWPA.
  2. Spruce-pine-fir (south) or spruce-pine-fir, Select Merchantable or No. 1 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. For concealed boards, provide lumber with 19 percent maximum moisture content and [any of ]the following species and grades:
1. Mixed southern pine, No. 3 grade; SPIB.
  2. Hem-fir or hem-fir (north), Standard or 3 Common grade; NLGA, WCLIB, or WWPA.
  3. Spruce-pine-fir (south) or spruce-pine-fir, Standard or 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
- E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, not less than 1/2-inch nominal thickness.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
  - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
  - 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
- B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
- C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.



- D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

### PART 3      EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, [grounds, ]and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Do not splice structural members between supports, unless otherwise indicated.
- E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
  - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- G. Comply with AWPAs M4 for applying field treatment to cut surfaces of preservative-treated lumber.
  - 1. Use inorganic boron for items that are continuously protected from liquid water.
  - 2. Use copper naphthenate for items not continuously protected from liquid water.
- H. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
  - 1. NES NER-272 for power-driven fasteners.
  - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
  - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

4. Table 602.3(1), "Fastener Schedule for Structural Members," and Table 602.3(2), "Alternate Attachments," in ICC's International One- and Two-Family Dwelling Code.

I. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

### 3.2 WOOD GROUND, SLEEPER, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

### 3.3 WALL AND PARTITION FRAMING INSTALLATION

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction, unless otherwise indicated.
  1. For interior partitions and walls, provide 2-by-4-inch nominal-size wood studs spaced 24 inches o.c., unless otherwise indicated.
  2. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs,
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

### 3.4 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
- B. Rafters: Notch to fit exterior wall plates and toe nail or use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge,

place directly opposite each other and nail to ridge member or use metal ridge hangers.

1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
  2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions, if any.

### 3.5 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

### PART 4 – MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 06 10 00

## SECTION 06 17 36 - METAL-PLATE-CONNECTED WOOD TRUSSES

### PART 1 GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
1. Wood roof trusses.
  2. Wood girder trusses.
  3. Wood truss ridge beam
  4. Wood truss bracing.
- B. Related Sections include the following:
1. Division 6 Section "Sheathing" for roof sheathing and subflooring.

#### 1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.
- B. TPI: Truss Plate Institute, Inc.
- C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
1. NeLMA: Northeastern Lumber Manufacturers' Association.
  2. NLGA: National Lumber Grades Authority.
  3. SPIB: The Southern Pine Inspection Bureau.
  4. WCLIB: West Coast Lumber Inspection Bureau.
  5. WWPA: Western Wood Products Association.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.

1. Design Loads: As indicated.
2. Maximum Deflection Under Design Loads:
  - a. Roof Trusses: Vertical deflection of 1/360 of span.

## 1.5 SUBMITTALS

- A. Shop Drawings: Prepared by or under the supervision of an Illinois Registered Structural Engineer. Show fabrication and installation details for trusses.
  1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
  2. Indicate sizes, stress grades, and species of lumber.
  3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
  4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
  5. Show splice details and bearing details.
  6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the Illinois Registered Structural Engineer responsible for their preparation.
- B. Product Certificates: For metal-plate-connected wood trusses, signed by officer of truss fabricating firm.
- C. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- D. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
  1. Metal-plate connectors.

## 1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
  1. Manufacturer's responsibilities include providing professional structural engineering services needed to assume engineering responsibility.
  2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by an Illinois Registered Structural Engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

- C. Source Limitations for Connector Plates: Obtain metal connector plates from a single manufacturer.
- D. Comply with applicable requirements and recommendations of the following publications:
  - 1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
  - 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
  - 3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
- E. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."
- F. Forest Certification: Provide metal-plate-connected wood trusses produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations of TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
  - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
  - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
  - 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

#### 1.8 COORDINATION

- A. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of trusses.

### PART 2 PRODUCTS

#### 2.1 DIMENSION LUMBER

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable

rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
  2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
  3. Provide dressed lumber, S4S.
  4. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."
- C. Grade and Species: Provide visually graded dimension lumber for truss chord and web members, of not less than the following grade and the following species:
1. Grade for Chord Members: No. 2.
  2. Grade for Web Members: No. 2.
  3. Species: Douglas fir-larch (north); NLGA.
- D. Grade and Species: Provide dimension lumber of any species for truss chord and web members, graded as follows and of the following minimum design values for size of member required according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement":
1. Grading Method: Visual or mechanical.
  2. Design Values: As indicated on Drawings.
- E. Minimum Chord Size For Roof Trusses: 2 by 6 inches nominal for both top and bottom chords.
- F. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 6 Section "Rough Carpentry"

## 2.2 METAL CONNECTOR PLATES

- A. General: Fabricate connector plates to comply with TPI 1.
- B. Hot-Dip Galvanized Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), Grade 33; G60 (Z180) coating designation; and not less than 0.036 inch coated thickness.

## 2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
  - 1. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

## 2.4 METAL TRUSS ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable products by one of the following:
  - 1. Simpson Strong-Tic Co., Inc.
- D. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.



## 2.5 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

## 2.6 FABRICATION

- A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.
- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
  - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.
- H. Securely connect each truss ply required for forming built-up girder trusses.
- I. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
- J. Install wood trusses within installation tolerances in TPI 1.
- K. Do not cut or remove truss members.
- L. Replace wood trusses that are damaged or do not meet requirements.
  - 1. Do not alter trusses in field.

### 3.2 REPAIRS AND PROTECTION

- A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

### PART 4 – MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 06 17 36

## **SECTION 06 20 00 - FINISH CARPENTRY**

### **PART 1      GENERAL**

#### **1.1      RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

#### **1.2      SUMMARY**

- A. This Section includes the following:
1. Exterior standing and running trim.
  2. Exterior beadboard soffits.
  3. Interior standing and running trim for field-painted finish
  4. Interior beadboard ceiling.
  5. Interior wood benches
- B. Related Sections include the following:
1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
  2. Division 9 Section "Painting" for priming and backpriming of finish carpentry.

#### **1.3      DEFINITIONS**

- A. Inspection agencies, and the abbreviations used to reference them, include the following:
1. NELMA - Northeastern Lumber Manufacturers Association.
  2. NHLA - National Hardwood Lumber Association.
  3. NLGA - National Lumber Grades Authority.
  4. RIS - Redwood Inspection Service.
  5. SCMA - Southern Cypress Manufacturers Association.
  6. SPIB - Southern Pine Inspection Bureau.
  7. WCLIB - West Coast Lumber Inspection Bureau.
  8. WWPA - Western Wood Products Association.

#### **1.4      SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Include construction details, material descriptions, dimensions of individual components and profiles, textures, and colors.
- B. Samples for Verification:

1. For each species and cut of lumber and panel products with nonfactory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. for lumber and 8 by 10 inches for panels.

#### 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer.
- B. Fire-Test-Response Characteristics: Where fire-retardant materials are indicated, provide materials with specified fire-test-response characteristics as determined by a testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency on surfaces of materials that will be concealed from view after installation.
- C. Forest Certification: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria":
  1. Exterior standing and running trim.
  2. Exterior soffits.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials against weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
- B. Deliver interior finish carpentry only when environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit work to be performed according to manufacturer's written instructions and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by the American Lumber Standards' Committee Board of Review.
  - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
  - 2. For exposed lumber, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by inspection agency.
- B. Softwood Plywood: DOC PS 1.
- C. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea-formaldehyde resin.

2.2 EXTERIOR STANDING AND RUNNING TRIM

- A. Lumber Trim for Painted Applications: Kiln-dried, finger-jointed or solid lumber with surfaced (smooth) face and of the following species and grade:
  - 1. Grade Prime or D finish hem-fir; NLGA, WCLIB, or WWPA.
  - 2. Grade Finish or 1 Common (Colonial) eastern white pine, eastern hemlock-balsam fir-tamarack, eastern spruce, or white woods; NELMA, NLGA, WCLIB, or WWPA.
  - 3. Grade 1 Common northern white cedar; NELMA or NLGA.
- B. Moldings: Made to patterns included in WMMPA WM 7. Wood moldings made from kiln-dried stock and graded under WMMPA WM 4.
  - 1. Moldings for Opaque Finish (Painted): P-grade eastern white, Idaho white, lodgepole, ponderosa, or sugar pine.
  - 2. Brick-Mold Pattern: WM 180, 1-1/4 by 2 inches.
  - 3. Drip-Cap Pattern: WM 197, 11/16 by 1-5/8 inches.
  - 4. Screen-Bead Pattern: WM 144, 1/4 by 3/4 inch.

2.3 EXTERIOR SOFFITS/INTERIOR BEADBOARD CEILING

- A. Beadboard Soffits: Exterior-type, Preservative treated hardwood plywood or water resistant FiberStrate Board.
  - 1. Sheet Products: Interior BeadBoard MDF Medium density fiberboard, straight edge sheet products:
    - Length:  
8 feet (2.44 m).
    - Width:  
48 inches (422 mm).

Thickness:  
1/2 inch (12.7 mm).  
Bead Configurations:  
2-1/2 inch (64 mm) center to center beads V-bead Profile.  
Finish:  
None.

2. Sheet Products: Exterior BeadBoard water resistant straight edge sheet products manufactured of Georgia Pacific's Fiberstrate water resistant material or approved equal:  
Length:  
8 feet (2.44 m).  
Width:  
48 inches (422 mm).  
Thickness: 1/2 inch (12.7 mm).  
Bead Configurations:  
2-1/2 inch (64 mm) center to center beads V-bead Profile.  
Finish:  
None.

#### 2.4 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws of the following materials, in sufficient length to penetrate minimum of 1-1/2 inches into substrate, unless otherwise recommended by manufacturer:
  1. Hot-dip galvanized steel.
  2. Prefinished aluminum in color to match stain, where face fastening of material to receive stain is unavoidable.
- B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.
  1. Where finish carpentry materials are exposed in areas of high humidity, provide fasteners and anchorages with hot-dip galvanized coating complying with ASTM A 153/A 153M.
  2. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Glue: Aliphatic- or phenolic-resin wood glue recommended by manufacturer for general carpentry use.
  1. Use wood glues that have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

#### 2.5 FABRICATION

- A. Wood Moisture Content: Comply with requirements of specified inspection agencies and with manufacturer's written recommendations for moisture content

of finish carpentry at relative humidity conditions existing during time of fabrication and in installation areas.

- B. Back out or kerf backs of the following members, except members with ends exposed in finished work:
  - 1. Exterior standing and running trim wider than 5 inches.
  - 2. Interior standing and running trim, except shoe and crown molds.
  - 3. Wood board paneling.
- C. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours, unless longer conditioning is recommended by manufacturer.
- C. Prime lumber for exterior applications to be painted, including both faces and edges. Cut to required lengths and prime ends. Comply with requirements in Division 9 Section "Painting."

#### 3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.

3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
4. Coordinate finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate finish carpentry.

### 3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
  1. Match color and grain pattern across joints.
  2. Install trim after gypsum board joint finishing operations are completed.
  3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.
  4. Fit exterior joints to exclude water. Apply flat grain lumber with bark side exposed to weather.

### 3.5 ADJUSTING

- A. Replace finish carpentry that is damaged or does not comply with requirements. Finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

### 3.6 CLEANING

- A. Clean finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

## PART 4 MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 06 20 00



## **SECTION 06 16 00 - SHEATHING**

### **PART 10 - GENERAL**

#### **10.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **10.2 SUMMARY**

- A. Section Includes:
  - 1. Roof sheathing.

#### **10.3 ACTION SUBMITTALS**

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
  - 1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
  - 2. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.

#### **10.4 INFORMATIONAL SUBMITTALS**

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Fire-retardant-treated plywood.

#### **10.5 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

10.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

10.7 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 11 - PRODUCTS

11.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

11.2 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- C. Factory mark panels to indicate compliance with applicable standard.

11.3 FIRE-RETARDANT-TREATED PLYWOOD

- A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
  2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
  3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.
- C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
- D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
- E. Application: Treat all plywood unless otherwise indicated.
1. Roof sheathing.

#### 11.4 ROOF SHEATHING

- A. Plywood Sheathing: Either DOC PS 1 or DOC PS 2, Exterior sheathing.
1. Span Rating: Not less than 24/0.

#### 11.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
1. For roof sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
  2. For roof sheathing, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

### PART 12 - EXECUTION

#### 12.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
  - 1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.
  - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
  - 3. ICC-ES evaluation report for fastener.
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

## 12.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
  - 1. Wall and Roof Sheathing:
    - a. Screw to cold-formed metal framing.
    - b. Space panels 1/8 inch apart at edges and ends.

## MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 06 16 00

**SECTION 07 21 00 - THERMAL INSULATION**

PART 13 - GENERAL

13.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

13.2 SUMMARY

- A. Section Includes:
  - 1. Spray-applied cellulosic insulation.

13.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

13.4 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

13.5 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 14 - PRODUCTS

Plymouth Foam, Inc

Roxul Inc

CertainTeed Corporation

PART 15 - EXECUTION

15.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

15.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

15.3 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing according to manufacturer's written instructions.

15.4 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 21 00

## **SECTION 07 27 26 - FLUID-APPLIED MEMBRANE AIR BARRIERS**

### **PART 16 - GENERAL**

#### **16.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **16.2 SUMMARY**

- A. Section Includes:
  - 1. Vapor-retarding, fluid-applied air barriers.
- B. Vapor-**permeable**, fluid-applied air barriers.

#### **16.3 DEFINITIONS**

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessories applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

#### **16.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

#### **16.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include manufacturer's written instructions for evaluating, preparing, and treating each substrate; technical data; dry film thickness; and tested physical and performance properties of products.

- B. Shop Drawings: For air-barrier assemblies.
  - 1. Show locations and extent of air-barrier materials, accessories, and assemblies specific to Project conditions.
  - 2. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
  - 3. Include details of interfaces with other materials that form part of air barrier.

#### 16.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
- D. Field quality-control reports.

#### 16.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.
  - 1. Build integrated mockups of exterior wall assembly , 150 sq. ft., incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
    - a. Coordinate construction of mockups to permit inspection and testing of air barrier before external insulation and cladding are installed.
    - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
    - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
  - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.



16.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

16.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended in writing by air-barrier manufacturer.
  - 1. Protect substrates from environmental conditions that affect air-barrier performance.
  - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

16.10 MEASUREMENT AND PAYMENT

- 1. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 17 - PRODUCTS

17.1 MATERIALS

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.
- B. VOC Content: 100 g/L or less.

17.2 PERFORMANCE REQUIREMENTS

- A. Air-Barrier Performance: Air-barrier assembly and seals with adjacent construction shall be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

17.3 HIGH-BUILD AIR BARRIERS, VAPOR RETARDING

- A. High-Build, Vapor-Retarding Air Barrier: Modified bituminous membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

1. Modified Bituminous Type:

- a. Products: Subject to compliance with requirements, provide one of the following:

- 1) Carlisle Coatings & Waterproofing Inc; Barriseal S.
- 2) Henry Company, Sealants Division; Air-Bloc 06 WB.
- 3) Hohmann & Barnard, Inc; Enviro-Barrier.
- 4) Tremco Incorporated; ExoAir 120.
- 5) W.R. Meadows, Inc; Air-Shield LM (All Season).

2. Physical and Performance Properties:

- a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
- b. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M, Desiccant Method.
- c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.
- d. Adhesion to Substrate: Minimum 30 lbf/sq. in. when tested according to ASTM D 4541.
- e. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- f. UV Resistance: Can be exposed to sunlight for 60 days according to manufacturer's written instructions.

17.4 HIGH-BUILD AIR BARRIERS, VAPOR PERMEABLE

- A. High-Build, Vapor-Permeable Air Barrier: **Modified bituminous or synthetic polymer** membrane with an installed dry film thickness, according to manufacturer's written instructions, of 35 mils or thicker over smooth, void-free substrates.

17.5 ACCESSORY MATERIALS

- A. Requirement: Provide primers, transition strips, termination strips, joint reinforcing fabric and strips, joint sealants, counterflashing strips, flashing sheets and metal termination bars, termination mastic, substrate patching materials, adhesives, tapes, foam sealants, lap sealants, and other accessory materials that are recommended in writing by air-barrier manufacturer to produce a complete air-barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

## PART 18 - EXECUTION

### 18.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
  - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
  - 2. Verify that substrates have cured and aged for minimum time recommended in writing by air-barrier manufacturer.
  - 3. Verify that substrates are visibly dry and free of moisture. Test concrete substrates for capillary moisture by plastic sheet method according to ASTM D 4263.
  - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 18.2 SURFACE PREPARATION

- A. Clean, prepare, treat, fill, and seal substrate and joints and cracks in substrate according to manufacturer's written instructions and details. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- E. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- F. Bridge isolation joints, expansion joints, and discontinuous wall-to-wall, deck-to-wall, and deck-to-deck joints with air-barrier accessory material that accommodates joint movement according to manufacturer's written instructions and details.

### 18.3 ACCESSORIES INSTALLATION

- A. Install accessory materials according to air-barrier manufacturer's written instructions and details to form a seal with adjacent construction and ensure continuity of air and water barrier.
  - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
  - 2. Install transition strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.

3. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
    - B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
    - C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
    - D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
    - E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
    - F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames, with not less than 1 inch of full contact.
      1. Transition Strip: Roll firmly to enhance adhesion.
    - G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.
    - H. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
    - I. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, transition strip.
    - J. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
    - K. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.
- 18.4 PRIMARY AIR-BARRIER MATERIAL INSTALLATION
- A. Apply air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions and details. Apply air-barrier material within manufacturer's recommended application temperature ranges.

1. Unless manufacturer recommends in writing against priming, apply primer to substrates at required rate and allow it to dry.
  2. Limit priming to areas that will be covered by air-barrier material on same day. Reprime areas exposed for more than 24 hours.
  3. Where multiple prime coats are needed to achieve required bond, allow adequate drying time between coats.
- B. High-Build Air Barriers: Apply continuous unbroken air-barrier material to substrates according to the following thickness. Apply air-barrier material in full contact around protrusions such as masonry ties.
1. Vapor-Retarding, High-Build Air Barrier: Total dry film thickness not less than 40 mils, applied in two equal coats.
- C. Do not cover air barrier until it has been tested and inspected by testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

#### 18.5 FIELD QUALITY CONTROL

- A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:
1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
  2. Air-barrier dry film thickness.
  3. Continuous structural support of air-barrier system has been provided.
  4. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
  5. Site conditions for application temperature and dryness of substrates have been maintained.
  6. Maximum exposure time of materials to UV deterioration has not been exceeded.
  7. Surfaces have been primed, if applicable.
  8. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
  9. Termination mastic has been applied on cut edges.
  10. Strips and transition strips have been firmly adhered to substrate.
  11. Compatible materials have been used.
  12. Transitions at changes in direction and structural support at gaps have been provided.
  13. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.

14. All penetrations have been sealed.

D. Tests: As determined by testing agency from among the following tests:

1. Air-Leakage-Volume Testing: Air-barrier assemblies will be tested for air-leakage rate according to ASTM E 783.
2. Adhesion Testing: Air-barrier assemblies will be tested for required adhesion to substrate according to ASTM D 4541 for each 600 sq. ft. of installed air barrier or part thereof.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
2. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

G. Prepare test and inspection reports.

#### 18.6 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as recommended in writing by manufacturer. If exposed to these conditions for longer than recommended, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed materials according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended in writing by manufacturer of affected construction.

C. Remove masking materials after installation.

#### MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 27 26

## SECTION 07 31 13 - ASPHALT SHINGLES

### PART 19 - GENERAL

#### 19.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 19.2 SUMMARY

- A. Section Includes:
  - 1. Asphalt shingles.
  - 2. Underlayment.
- B. Related Sections:
  - 1. Section 061600 "Sheathing" for roof sheathing.
  - 2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, counterflashings, flashings.
  - 3. Section 077200 "Roof Accessories" for ridge vents.

#### 19.3 DEFINITION

- A. Roofing Terminology: See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

#### 19.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For the following products, of sizes indicated, to verify color selected:
  - 1. Asphalt Shingle: Full size.
  - 2. Ridge and Hip Cap Shingles: Full size.
  - 3. Ridge Vent: 12-inch-long Sample.
  - 4. Self-Adhering Underlayment: 12 inches square.

#### 19.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.

- B. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.
- C. Warranties: Sample of special warranties.

19.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

19.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Asphalt Shingles: 200 sq. ft of each type, in unbroken bundles.

19.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain ridge and hip cap shingles from single source from single manufacturer.
- C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
  - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.
- D. Preinstallation Conference: Conduct conference at Project site.

19.9 DELIVERY, STORAGE, AND HANDLING

- A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.
  - 1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.
- B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.



19.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

19.11 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 20 - PRODUCTS

20.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
1. Basis-of-Design Product: Subject to compliance with requirements, provide GAF, Timberline Ultra HD or comparable product by one of the following:
    - a. CertainTeed Corporation.
    - b. GAF Materials Corporation.
    - c. Owens Corning.
    - d. TAMKO Roofing Products, Inc.
  2. Butt Edge: Straight cut.
  3. Strip Size: Manufacturer's standard.
  4. Algae Resistance: Granules treated to resist algae discoloration.
  5. Color and Blends: Charcoal.
- B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.

20.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 40-mil- thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Grace, W.R. & Co.; Ice and Water Shield or comparable product by one of the following:
  - a. Carlisle Coatings & Waterproofing, Inc.
  - b. Henry Company.
  - c. Johns Manville.
  - d. Owens Corning.

### 20.3 RIDGE VENTS

- A. Rigid Ridge Vent: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with nonwoven geotextile filter strips; for use under ridge shingles.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide GAF Materials Corporation; Cobra Vent product name or designation or comparable product by one of the following:
    - a. Air Vent, Inc.; a Gibraltar Industries company.
    - b. Cor-A-Vent, Inc.
    - c. Owens Corning.
    - d. Trimline Building Products.
  3. Minimum Net Free Area: 16.9 square inches per lineal foot.
  4. Width: 12 inches.
  5. Thickness: 1-1/2 inches.

### 20.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch- diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
  1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

## 20.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  - 1. Sheet Metal: Aluminum, mill finished.
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
  - 1. Apron Flashings: Fabricate with lower flange a minimum of 4 inches over and 4 inches beyond each side of downslope asphalt shingles and 6 inches up the vertical surface.
  - 2. Drip Edges: Fabricate in lengths not exceeding 10 feet with 2-inch roof-deck flange and 1-1/2-inch fascia flange with 3/8-inch drip at lower edge.

## PART 21 - EXECUTION

### 21.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
  - 1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
  - 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 21.2 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated on Drawings, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.

1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.

### 21.3 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

### 21.4 ASPHALT SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
- B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed with self-sealing strip face up at roof edge.
  1. Extend asphalt shingles 3/4 inch over fasciae at eaves and rakes.
  2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- E. Fasten asphalt shingle strips with a minimum of five roofing nails located according to manufacturer's written instructions.
  1. Where roof slope exceeds 20:12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
  2. Where roof slope is less than 4:12, seal asphalt shingles with asphalt roofing cement spots.
  3. When ambient temperature during installation is below 50 deg F , seal asphalt shingles with asphalt roofing cement spots.
- F. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.
- G. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 31 13

## **SECTION 07 46 46 - FIBER-CEMENT SIDING**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section includes fiber-cement soffit.
- B. Related Requirements:
  - 1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.

#### **1.3 COORDINATION**

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

#### **1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.

#### **1.5 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For fiber-cement soffit including related accessories.
- C. Samples for Verification: For each type, color, texture, and pattern required.
  - 1. 12-inch- long-by-actual-width Sample of soffit.
  - 2. 12-inch- long-by-actual-width Samples of trim and accessories.

#### **1.6 INFORMATIONAL SUBMITTALS**

- A. Product Certificates: For each type of fiber-cement soffit.

- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.
- C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Furnish full lengths of fiber-cement soffit including related accessories, in a quantity equal to 2 percent of amount installed.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.10 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT SOFFIT

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. CertainTeed Corporation.
  - b. James Hardie Building Products, Inc.
  - c. Nichiha Fiber Cement.
- B. Nominal Thickness: Not less than 5/16 inch.
- C. Pattern: 24-inch- wide sheets with smooth texture.
- D. Ventilation: Provide perforated and unperforated soffit where indicated in the Drawings.
- E. Factory Priming: Manufacturer's standard acrylic primer.

## 2.3 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
  1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.
- B. Flashing: Provide stainless-steel flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- C. Fasteners:
  1. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
  2. For fastening fiber cement, use hot-dip galvanized fasteners.
- D. Insect Screening for Soffit Vents: Aluminum, 18-by-16 mesh.
- E. Continuous Soffit Vents: Aluminum, hat-channel shape, with perforations; 2 inches wide and not less than 96 inches long.
  1. Net-Free Area: 8 sq. in./linear ft. .
  2. Finish: White paint .

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement soffit and related accessories.



- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

### 3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1. Do not install damaged components.
  - 2. Install fasteners no more than 24 inches o.c.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

### 3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

## MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 46 46

## **SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM**

### **PART 1 - GENERAL**

#### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **1.2 SUMMARY**

- A. Section Includes:
  - 1. Formed roof-drainage sheet metal fabrications.
  - 2. Formed steep-slope roof sheet metal fabrications.
  - 3. Formed equipment support flashing.
- B. Related Requirements:
  - 1. Section 073113 "Asphalt Shingles" for installation of sheet metal flashing and trim integral with roofing.
  - 2. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.

#### **1.3 COORDINATION**

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

#### **1.4 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
  - 3. Review requirements for insurance and certificates if applicable.
  - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.
- B. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
  2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
  3. Include identification of material, thickness, weight, and finish for each item and location in Project.
  4. Include details for forming, including profiles, shapes, seams, and dimensions.
  5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
  6. Include details of termination points and assemblies.
  7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
  8. Include details of roof-penetration flashing.
  9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
  10. Include details of special conditions.
  11. Include details of connections to adjoining work.
  12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches .
- C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.
- D. Samples for Verification: For each type of exposed finish.
1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
  2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
  3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
  4. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For fabricator.
- B. Product Certificates: For each type of coping and roof edge flashing that is FM Approvals approved.

- C. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- D. Sample Warranty: For special warranty.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

#### 1.8 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

#### 1.10 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
    - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
  2. Finish Warranty Period: 10 years from date of Substantial Completion.

1.11 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Code Compliance: Comply with IBC 2009. Specifically Chapter 15 Section 1504.5 Edge securement for low slope roofs. Design and install for wide loads in accordance with Chapter 16 and tested for resistance in accordance with ANSI/SPRI ES-1. Verification of compliance with ANSI/SPRI ES-1 from coping manufacturer will be required for Issuance of Certificate of Occupancy.
- C. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- D. FM Approvals Listing: Manufacture and install roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  - 1. Temperature Change: 120 deg F , ambient; 180 deg F , material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Aluminum Sheet: ASTM B 209 , alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.
  - 1. Exposed Coil-Coated Finish:

- a. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Color: As selected by Architect from manufacturer's full range.
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil .

### 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
  1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
    - b. Grace Construction Products, a unit of W. R. Grace & Co.-Conn.; Grace Ice and Water Shield HT.
    - c. Henry Company; Blueskin PE200 HT.
    - d. Owens Corning; WeatherLock Specialty Tile & Metal Underlayment.
  2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
  3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

### 2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
  1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

- c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- E. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

## 2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
  2. Obtain field measurements for accurate fit before shop fabrication.
  3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.

- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
- I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.
- J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.
- K. Do not use graphite pencils to mark metal surfaces.

## 2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch- long sections. Furnish flat-stock gutter brackets and flat-stock gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters. Shop fabricate interior and exterior corners.
  - 1. Gutter Profile: Style K according to cited sheet metal standard.
  - 2. Expansion Joints: Butt type with cover plate.
  - 3. Gutters with Girth 26 to 30 Inches : Fabricate from the following materials:
    - a. Aluminum: 0.063 inch thick.
    - b. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.
- B. Downspouts: Fabricate rectangular downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors .
  - 1. Fabricated Hanger Style: Fig 1-35B according to SMACNA's "Architectural Sheet Metal Manual."
  - 2. Fabricate from the following materials:
    - a. Aluminum-Zinc Alloy-Coated Steel: 0.022 inch thick.



C. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim,. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

## 2.7 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

A. Drip Edges: Fabricate from the following materials:

1. Stainless Steel: 0.016 inch thick.

B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

C. Flashing Receivers: Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

### 3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  5. Torch cutting of sheet metal flashing and trim is not permitted.
  6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.

- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
  - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F , set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F .
  - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

### 3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Join sections with riveted and soldered joints or joints sealed with sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
  - 1. Fasten gutter spacers to front and back of gutter.
  - 2. Anchor and loosely lock back edge of gutter to continuous cleat.
  - 3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
  - 4. Anchor gutter with straps spaced not more than 24 inches apart to roof deck, unless otherwise indicated, and loosely lock to front gutter bead.
  - 5. Install gutter with expansion joints at locations indicated, but not exceeding, 50 feet apart. Install expansion-joint caps.
- C. Downspouts: Join sections with 1-1/2-inch telescoping joints.
  - 1. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches o.c.
  - 2. Provide elbows at base of downspout to direct water away from building.
  - 3. Connect downspouts to underground drainage system.
- D. Conductor Heads: Anchor securely to wall, with elevation of conductor head rim at minimum of 1 inch below gutter discharge.

### 3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of snap-in installation and sealant or lead wedges and sealant unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

### 3.6 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

### 3.7 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 62 00

## **SECTION 07 84 13 - PENETRATION FIRESTOPPING**

### **PART 22 - GENERAL**

#### **22.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **22.2 SUMMARY**

- A. Section Includes:
  - 1. Penetrations in fire-resistance-rated walls.
  - 2. Penetrations in horizontal assemblies.
  - 3. Penetrations in smoke barriers.
- B. Related Sections:
  - 1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

#### **22.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
  - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

#### **22.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer. Provide FM 4991 or UL Accredited Certificate.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.
- D. Proof of Attendance: Written verification letter stating the name(s) of the companies, person(s) in attendance and date of the onite firestop training required by Quality Assurance article.

## 22.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
  - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
    - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    - b. Classification markings on penetration firestopping correspond to designations listed by the following:
      - 1) UL in its "Fire Resistance Directory."
- D. Pre-installation conference: Conduct a pre-installation firestop conference at the jobsite to coordinate firestop installation with other trades and to minimize installation conflicts. All firestop submittals, including UL systems and Engineering Judgments, if necessary, must have been submitted, reviewed and commented by the architect prior to the meeting. All relevant parties, including the architect and owner should be notified 72 hr prior to conference
- E. On-site training: Conduct on-site training at the direction of a manufacturer's direct representative, not a distributor or agent, to train contractor personnel in proper selection and installation procedures.
- F. Mock-up: Provide a mock-up of all typical firestop applications to show the quality of workmanship. Approved mock-ups may be left in place as part of the finished project and will constitute the standard for remaining work

22.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

22.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
- C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

22.8 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 23 - PRODUCTS

23.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Grace Construction Products.
  - 2. Hilti, Inc.
  - 3. Johns Manville.
  - 4. 3M Fire Protection Products.

23.2 PENETRATION FIRESTOPPING

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



- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Fire-resistance-rated walls include fire walls and fire partitions.
  2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
1. Horizontal assemblies include ceiling membranes of roof/ceiling assemblies.
  2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Sealants: 250 g/L.
  2. Sealant Primers for Nonporous Substrates: 250 g/L.
  3. Sealant Primers for Porous Substrates: 775 g/L.
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
1. Permanent forming/damming/backing materials, including the following:
    - a. Slag-wool-fiber or rock-wool-fiber insulation.
    - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    - c. Fire-rated form board.
    - d. Fillers for sealants.
  2. Temporary forming materials.
  3. Substrate primers.
  4. Collars.
  5. Steel sleeves.

### 23.3 FILL MATERIALS

- A. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- B. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- C. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- D. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- E. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
- F. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

### 23.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

## PART 24 - EXECUTION

### 24.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 24.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
  2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
  3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

### 24.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

### 24.4 IDENTIFICATION

- A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels, or similar manufacturer's approved pre-printed label:

1. Date of installation.
2. Firestop system number of manufacturer's EJ number
3. Installer's company name.
4. Firestop manufacturer's name.
5. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
6. Manufacturer's name.
7. Installer's name.

#### 24.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
- C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

#### 24.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

#### 24.7 PENETRATION FIRESTOPPING SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."
- C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 84 13

## **SECTION 07 84 46 - FIRE-RESISTIVE JOINT SYSTEMS**

### **PART 25 - GENERAL**

#### **25.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **25.2 SUMMARY**

- A. Section Includes:
  - 1. Joints in or between fire-resistance-rated constructions.
- B. Related Sections:
  - 1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

#### **25.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
  - 1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

#### **25.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified Installer.
- B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

## 25.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:
  - 1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
  - 2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:
    - a. Fire-resistive joint system products bear classification marking of qualified testing agency.
    - b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:
      - 1) UL in its "Fire Resistance Directory."
- D. Preinstallation Conference: Conduct conference at Project site.

## 25.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

## 25.7 COORDINATION

- A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

- C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.

## 25.8 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

## PART 26 - PRODUCTS

### 26.1 FIRE-RESISTIVE JOINT SYSTEMS

- A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
- B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:
  - 1. Joints include those installed in or between fire-resistance-rated roofs or roof/ceiling assemblies.
  - 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
  - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Grace Construction Products.
    - b. Hilti, Inc.
    - c. Johns Manville.
    - d. 3M Fire Protection Products.
    - e. Tremco, Inc.; Tremco Fire Protection Systems Group.
- C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- D. VOC Content: Fire-resistive joint system sealants shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Architectural Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.



- E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.

## PART 27 - EXECUTION

### 27.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 27.2 PREPARATION

- A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:
  - 1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
  - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

### 27.3 INSTALLATION

- A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
- C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
  2. Apply fill materials so they contact and adhere to substrates formed by joints.
  3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

#### 27.4 IDENTIFICATION

- A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove or penetrate joint system. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
1. The words "Warning - Fire-Resistive Joint System - Do Not Disturb. Notify Building Management of Any Damage."
  2. Contractor's name, address, and phone number.
  3. Designation of applicable testing agency.
  4. Date of installation.
  5. Manufacturer's name.
  6. Installer's name.

#### 27.5 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.
- C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

#### 27.6 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

- B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

27.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN or Category XHDG.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 84 46

## **SECTION 07 92 00 - JOINT SEALANTS**

### **PART 28 - GENERAL**

#### **28.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **28.2 SUMMARY**

- A. Section Includes:
  - 1. Nonstaining silicone joint sealants.

#### **28.3 ACTION SUBMITTALS**

- A. Product Data: For each joint-sealant product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
  - 1. Joint-sealant application, joint location, and designation.
  - 2. Joint-sealant formulation.
  - 3. Joint-sealant color.

#### **28.4 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For qualified testing agency.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

#### **28.5 QUALITY ASSURANCE**

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

- B. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

#### 28.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

#### 28.7 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

### PART 29 - PRODUCTS

#### 29.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Corning Corporation
    - b. Pecora Corporation
    - c. Sika Corporation
- B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following:
  - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
  - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
  - 3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

- C. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

## 29.2 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Construction Chemicals - Building Systems.
    - b. Construction Foam Products, a division of Nomaco, Inc.
    - c. Pecora Corporation.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

## 29.3 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 30 - EXECUTION

### 30.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 30.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
  1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
  2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
    - a. Concrete.
    - b. Masonry.
    - c. Unglazed surfaces of ceramic tile.
    - d. Exterior insulation and finish systems.
  3. Remove laitance and form-release agents from concrete.
  4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
    - a. Metal.
    - b. Glass.
    - c. Porcelain enamel.
    - d. Glazed surfaces of ceramic tile.

### 30.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  1. Do not leave gaps between ends of sealant backings.
  2. Do not stretch, twist, puncture, or tear sealant backings.
  3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
  - 1. Place sealants so they directly contact and fully wet joint substrates.
  - 2. Completely fill recesses in each joint configuration.
  - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
  - 1. Remove excess sealant from surfaces adjacent to joints.
  - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.
  - 4. Provide recessed joint configuration of recess depth and at locations indicated on Drawings according to Figure 8C in ASTM C 1193.
    - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

#### 30.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

#### 30.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

#### 30.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.
  - 1. Joint Locations:
    - a. Isolation and contraction joints in cast-in-place concrete slabs.



2. Joint Sealant: Urethane, M, P, 50, T, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Construction joints in cast-in-place concrete.
    - b. Control and expansion joints in unit masonry.
    - c. Joints in dimension stone cladding.
    - d. Joints between different materials listed above.
    - e. Perimeter joints between materials listed above and frames of doors, windows, and louvers.
    - f. Control and expansion joints in ceilings and other overhead surfaces.
  2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.
1. Joint Locations:
    - a. Isolation joints in cast-in-place concrete slabs.
  2. Joint Sealant: Urethane, S, P, 25, T, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
    - a. Control and expansion joints on exposed interior surfaces of exterior walls.
    - b. Vertical joints on exposed surfaces of unit masonry walls and partitions.
  2. Joint Sealant: Urethane, S, NS, 25, NT.
  3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

#### MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 07 92 00

**SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES**

PART 31 - GENERAL

31.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

31.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
  - 1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

31.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

31.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

31.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

31.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
  - 1. Elevations of each door type.

2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of anchorages, joints, field splices, and connections.
  7. Details of conduit and preparations for power, signal, and control systems.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification:
1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
  2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
    - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
    - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.
- E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

### 31.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

### 31.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

31.9 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 32 - PRODUCTS

32.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ceco Door; ASSA ABLOY.
  2. Curries Company; ASSA ABLOY.
  3. de La Fontaine Industries.
  4. Hollow Metal Inc.
  5. LaForce, Inc.
  6. North American Door Corp.
  7. Premier Products, Inc.
  8. Republic Doors and Frames.
  9. Security Metal Products Corp.
  10. Steelcraft; an Ingersoll-Rand company.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

32.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

32.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Hollow-Metal Doors and Frames: NAAMM-HMMA 860. .
1. Physical Performance: Level A according to SDI A250.4.
  2. Doors:

- a. Type: As indicated in the Door and Frame Schedule.
- b. Thickness: 1-3/4 inches
- c. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.032 inch.
- d. Edge Construction: Continuously welded with no visible seam.
- e. Core: Steel stiffened.

3. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch for frames that receive hollow-metal doors; minimum thickness of 0.042 inch for frames that receive hollow-core wood doors.
- b. Construction: Full profile welded.

32.4 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

32.5 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- H. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- J. Glazing: Comply with requirements in Section 088000 "Glazing."
- K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

### 32.6 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
  1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
  2. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
  3. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets.
  4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  4. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      - 1) Two anchors per jamb up to 60 inches high.
      - 2) Three anchors per jamb from 60 to 90 inches high.
      - 3) Four anchors per jamb from 90 to 120 inches high.
      - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
    - b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
  5. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
  6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
    - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
  7. Terminated Stops: Terminate stops 6 inches above finish floor with a 90-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
  2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

### 32.7 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
  1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

### 32.8 ACCESSORIES

- A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

## PART 33 - EXECUTION

### 33.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

### 33.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.



### 33.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
  - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.
    - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
    - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
  - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
  - 4. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
  - 5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
  - 6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
    - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
    - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
    - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
    - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
  2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
  3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

#### 33.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

#### MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 08 11 13

## **SECTION 08 31 13 - ACCESS DOORS AND FRAMES**

### **PART 34 - GENERAL**

#### **34.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **34.2 SUMMARY**

- 1. Section includes access doors and frames for walls and ceilings.

#### **34.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
  - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.
- C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.
- D. Coordination drawings, as an informational submittal, may be added if required for complex projects or for spaces where the layout of access doors and frames on ceilings is important to the design.

#### **34.4 MEASUREMENT AND PAYMENT**

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

### **PART 35 - PRODUCTS**

#### **35.1 PERFORMANCE REQUIREMENTS**

- 1. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

35.2 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges :
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Babcock-Davis.
  - b. JL Industries, Inc.; a division of the Activar Construction Products Group
  - c. Larsens Manufacturing Company.
- 2. .
- 3. Description: Face of door flush with frame, with exposed flange and concealed hinge.
- 4. Locations: Ceiling.
- 5. Door Size: 24 inches by 24 inches.
- 6. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage, factory primed.
- 7. Frame Material: Same material, thickness, and finish as door.
- 8. Latch and Lock: Cam latch, hex-head wrench operated .

Karp Associates, IncNystrom, IncLarsens Manufacturing Company

35.3 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Flush Access Doors with Exposed Flanges :
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Babcock-Davis.
    - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - c. Larsens Manufacturing Company.
  - 2. Metropolitan Door Industries Corp.
  - 3. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
  - 4. Locations: Ceiling.
  - 5. Door Size: 24 inches by 24 inches.
  - 6. Fire-Resistance Rating: Not less than 1 hour.
  - 7. Temperature-Rise Rating: 450 deg F **at the end of 30 minutes.**
  - 8. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch, 20 gage, factory primed.
  - 9. Frame Material: Same material, thickness, and finish as door.
  - 10. Latch and Lock: Self-latching door hardware, operated by key.

35.4 MATERIALS

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

- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- D. Frame Anchors: Same material as door face.
- E. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

### 35.5 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latch and Lock Hardware:
- E. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
  - 1. Keys: Furnish two keys per lock and key all locks alike.

### 35.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
  - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 36 - EXECUTION

36.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

36.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

36.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 08 31 13

**SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS**

PART 37 - GENERAL

37.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

37.2 SUMMARY

- A. Section Includes:
  - 1. Exterior storefront framing.
  - 2. Exterior and interior manual-swing entrance doors and door-frame units.

37.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

37.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.
  - 1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
  - 2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
    - a. Joinery, including concealed welds.
    - b. Anchorage.
    - c. Expansion provisions.
    - d. Glazing.
    - e. Flashing and drainage.
  - 3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples for Initial Selection: For units with factory-applied color finishes.

- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch lengths of full-size components and showing details of the following:
  - 1. Joinery, including concealed welds.
  - 2. Anchorage.
  - 3. Expansion provisions.
  - 4. Glazing.
  - 5. Flashing and drainage.
- F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.
- G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### 37.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.
- D. Source quality-control reports.
- E. Field quality-control reports.

### 37.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

### 37.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.



- B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.
  - 1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

### 37.8 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

## PART 38 - PRODUCTS

### 38.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.
- B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  - 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  - 2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- C. Structural Loads:
  - 1. Wind Loads: As indicated on Drawings.
  - 2. Other Design Loads: As indicated on Drawings.
- D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding  $1/175$  of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to  $3/4$  inch, whichever is less.
  2. Deflection Parallel to Glazing Plane: Limited to  $1/360$  of clear span or  $1/8$  inch, whichever is smaller.
    - a. Operable Units: Provide a minimum  $1/16$ -inch clearance between framing members and operable units.
  3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:
    - a. Perpendicular to Plane of Wall: No greater than  $1/240$  of clear span plus  $1/4$  inch for spans greater than 11 feet  $8-1/4$  inches or  $1/175$  times span, for spans less than 11 feet  $8-1/4$  inches.
- E. Structural: Test according to ASTM E 330 as follows:
1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
  3. Test Durations: As required by design wind velocity, but not less than 10 seconds.
- F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft..
  2. Entrance Doors:
    - a. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft..
- G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. .
- H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..

2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.38 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 35 as determined according to NFRC 500.

J. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
  - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
  - b. Low Exterior Ambient-Air Temperature: 0 deg F.
  - c. Interior Ambient-Air Temperature: 75 deg F.

### 38.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. EFCO Corporation.
2. Kawneer North America.
3. Pittco Architectural Metals, Inc.
4. Tubelite.
5. YKK AP America Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

### 38.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
  2. Glazing System: Retained mechanically with gaskets on four sides.
  3. Finish: Clear anodic finish .
  4. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    - a. Sheet and Plate: ASTM B 209.
    - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
    - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
    - d. Structural Profiles: ASTM B 308/B 308M.

#### 38.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
  2. Door Design: As indicated.
  3. Glazing Stops and Gaskets: Square , snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide nonremovable glazing stops on outside of door.

#### 38.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- B. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.
1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products complying with BHMA standard referenced.
  2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

3. Opening-Force Requirements:
  - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbfto set the door in motion[ and not more than 15 lbf to open the door to its minimum required width].
- C. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. Products are identified by using entrance door hardware designations as follows:
  1. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.
- D. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles, fabricated to full height of door and frame.
- E. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- F. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- G. Cylinders: BHMA A156.5, Grade 1.
  1. Keying: key system. Permanently inscribe each key with a visual key control number and include notation "DO NOT DUPLICATE".
- H. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- I. Operating Trim: BHMA A156.6.
- J. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- K. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- L. Weather Stripping: Manufacturer's standard replaceable components.
  1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
- M. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- N. Silencers: BHMA A156.16, Grade 1.

- O. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

### 38.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."

### 38.7 ACCESSORIES

- A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
  - 1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
  - 2. Reinforce members as required to receive fastener threads.
- B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
  - 1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.
- C. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

### 38.8 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing from exterior.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- D. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
- E. Storefront Framing: Fabricate components for assembly using shear-block system.

- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
  - 1. At exterior doors, provide compression weather stripping at fixed stops.
  - 2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
  - 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
  - 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.
- I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

#### 38.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

### PART 39 - EXECUTION

#### 39.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 39.2 INSTALLATION

- A. General:
  - 1. Comply with manufacturer's written instructions.
  - 2. Do not install damaged components.
  - 3. Fit joints to produce hairline joints free of burrs and distortion.
  - 4. Rigidly secure nonmovement joints.
  - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
  - 6. Seal perimeter and other joints watertight unless otherwise indicated.

- B. Metal Protection:
  - 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
  - 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- D. Install components plumb and true in alignment with established lines and grades.
- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
  - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
  - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

### 39.3 ERECTION TOLERANCES

- A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
  - 1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
  - 2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
  - 3. Alignment:
    - a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    - b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    - c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
  - 4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.



39.4 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 08 41 13

**SECTION 08 51 13 - ALUMINUM WINDOWS**

PART 40 - GENERAL

40.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

40.2 SUMMARY

- A. Section includes aluminum windows for exterior locations.
- B. Related Requirements:
  - 1. Section 084113 "Aluminum-Framed Entrances and Storefronts" for coordinating finish among aluminum fenestration units.

40.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
  - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
  - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
  - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

40.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: For aluminum windows.

- C. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- D. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

#### 40.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Sample Warranties: For manufacturer's warranties.

#### 40.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

#### 40.7 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

### PART 41 - PRODUCTS

#### 41.1 MANUFACTURERS

- A. Source Limitations: Obtain aluminum windows from single source from single manufacturer.

#### 41.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: AAMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
  1. Minimum Performance Class: CW .
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.32 Btu/sq. ft. x h x deg F .
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 45.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
  1. Temperature Change: 120 deg F ambient; 180 deg F material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than 30 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

#### 41.3 ALUMINUM WINDOWS

- A. Manufacturers: Subject to compliance with requirements provide products by the following:
  1. EFCO Corporation.
  2. Kawneer North America; an Alcoa company.
  3. YKK AP America Inc.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
  1. Fixed.
- C. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- D. Windborne-Debris-Impact-Resistant Laminated Glass: ASTM C 1172 with two plies of float glass.
- E. Float Glass: Fully tempered.
  1. Inner Ply: Clear.
  2. Interlayer: As required by performance requirements indicated.
  3. Outer Ply: Clear.
  4. Low-E Coating: Pyrolytic on second surface .
- F. Insulating-Glass Units: ASTM E 2190.
  1. Glass: ASTM C 1036, Type 1, Class 1, q3.
    - a. Tint: Clear.
    - b. Kind: Fully tempered .
  2. Lites: Two.
  3. Filling: Fill space between glass lites with air.
  4. Low-E Coating: Pyrolytic on second surface .
- G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
  1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
  1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

#### 41.4 ACCESSORIES

- A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

#### 41.5 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

- B. Glaze aluminum windows in the factory.
- C. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- D. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

#### 41.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

#### 41.7 ALUMINUM FINISHES

- A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- B. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

### PART 42 - EXECUTION

#### 42.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 42.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

## 42.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
  - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
  - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to AAMA 502.
  - 2. Air-Infiltration Testing:
    - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
    - b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
  - 3. Water-Resistance Testing:
    - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
    - b. Allowable Water Infiltration: No water penetration.
  - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
  - 5. Test Reports: Prepared according to AAMA 502.
- C. Windows will be considered defective if they do not pass tests and inspections.

- D. Prepare test and inspection reports.

#### 42.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
  - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

#### MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 08 51 13



**SECTION 08 71 11 - DOOR HARDWARE (DESCRIPTIVE SPECIFICATION)**

PART 43 - GENERAL

43.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

43.2 SUMMARY

A. Section Includes:

1. Mechanical door hardware for the following:
  - a. Swinging doors.
2. Cylinders for door hardware specified in other Sections.
3. Electrified door hardware.

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
2. Section 084113 "Aluminum-Framed Entrances and Storefronts" for entrance door hardware, except cylinders.

43.3 COORDINATION

- A. Floor-Recessed Door Hardware: Coordinate layout and installation with floor construction.
1. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

#### 43.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Conference participants shall include Installer's Architectural Hardware Consultant.
- B. Keying Conference: Conduct conference at Project site.
  - 1. Conference participants shall include Installer's Architectural Hardware Consultant and Owner.
  - 2. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to, the following:
    - a. Flow of traffic and degree of security required.
  - 3. Preliminary key system schematic diagram.
  - 4. Requirements for key control system.
  - 5. Requirements for access control.
  - 6. Address for delivery of keys.

#### 43.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- C. Shop Drawings: For electrified door hardware.
  - 1. Include diagrams for power, signal, and control wiring.
    - a. Include details of interface of electrified door hardware and building safety and security systems.
- D. Samples: For each exposed product in each finish specified, in manufacturer's standard size.
  - 1. Tag Samples with full product description to coordinate Samples with door hardware schedule.
- E. Samples for Initial Selection: For each type of exposed finish.
- F. Samples for Verification: For each type of exposed product, in each finish specified.

1. Sample Size: Full-size units or minimum 2-by-4-inch Samples for sheet and 4-inch long Samples for other products.
  - a. Full-size Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.
2. Tag Samples with full product description to coordinate Samples with door hardware schedule.
3. Door Hardware Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
  - b. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
  - c. Content: Include the following information:
    - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
    - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
    - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
    - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
    - 5) Fastenings and other installation information.
    - 6) Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
    - 7) Mounting locations for door hardware.
    - 8) List of related door devices specified in other Sections for each door and frame.
4. Keying Schedule: Prepared by or under the supervision of Installer's Architectural Hardware Consultant, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

#### 43.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.

- B. Product Certificates: For each type of electrified door hardware.
  - 1. Certify that door hardware for use on each type and size of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Field quality-control reports.

#### 43.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals.
- B. Schedules: Final door hardware and keying schedule.

#### 43.8 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Owner about door hardware and keying.
  - 1. Warehousing Facilities: In Project's vicinity.
  - 2. Scheduling Responsibility: Preparation of door hardware and keying schedule.
  - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as an Architectural Openings Consultant (AOC).

#### 43.9 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

- D. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

#### 43.10 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

### PART 44 - PRODUCTS

#### 44.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.
  - 1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

#### 44.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" the DOT's "ADA Standards for Transportation Facilities" the ABA standards of the Federal agency having jurisdiction and ICC A117.1.
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
  - 2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch **high**.

4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
5. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

#### 44.3 SCHEDULED DOOR HARDWARE

1. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.

B. Door hardware is scheduled in Part 3.

#### 44.4 HINGES

A. Hinges: BHMA A156.1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Hager Companies.
  - b. McKinney Products Company; an ASSA ABLOY Group company.
  - c. PBB, Inc.
  - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.

B. Quantity: Provide the following, unless otherwise indicated:

1. Two Hinges: For doors with heights up to 60 inches (1524 mm).
2. Three Hinges: For doors with heights 61 to 90 inches (1549 to 2286 mm).
3. Four Hinges: For doors with heights 91 to 120 inches (2311 to 3048 mm).
4. For doors with heights more than 120 inches (3048 mm), provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

C. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

D. Hinge Size: Unless otherwise indicated, provide the following:

1. Provide standard weight (.134" thick) 4-1/2" x 4-1/2" ball bearing hinges on all doors up to and including 3'-0" in width. Over 3'-0" in width provide extra heavy weight ball bearing hinges (.180" thick) 4-1/2" x 4-1/2".

E. Hinge Base Metal: Unless otherwise indicated, provide the following:

1. Exterior Hinges: Stainless steel, with stainless-steel pin.
2. Interior Hinges: Steel, with steel pin.
3. Hinges for Fire-Rated Assemblies: Steel, with steel pin.

F. Hinge Options:

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all hinges at exterior and outswinging corridor doors.
2. Corners: Square.

G. Electrified Functions for Hinges: Comply with the following:

1. Power Transfer: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle.
2. Monitoring: Concealed electrical monitoring switch.
3. Power Transfer and Monitoring: Concealed PTFE-jacketed wires, secured at each leaf and continuous through hinge knuckle, and with concealed electrical monitoring switch.

H. Fasteners: Comply with the following:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.

Bommer Industries, Inc CONTINUOUS HINGES

- A. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- thick, hinge leaves with minimum overall width of 4 inches; fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

Stanley Commercial Hardware; a division of Stanley Security Solutions Continuous, Gear-Type Hinges: Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Hager Companies.
  - b. McKinney Products Company; an ASSA ABLOY Group company.
  - c. Pemko Manufacturing Co.
  - d. Select Products Limited.
  - e. Zero International, Inc.
2. Hinges for Fire-Rated Assemblies: With steel fire pins to hold fire-rated doors in place if required by tested listing.
3. Mounting: Concealed leaf.

44.6 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.

- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
  - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
  - 2. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
  - 1. Description: As indicated in hardware sets.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
  - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  - 3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
  - 4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.
- F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Best Access Systems; Stanley Security Solutions, Inc.
    - b. SARGENT Manufacturing Company; ASSA ABLOY.

#### 44.7 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.36: Grade 1; with strike that suits frame.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Best Access Systems; Stanley Security Solutions, Inc.
    - b. Hager Companies.
    - c. SARGENT Manufacturing Company; ASSA ABLOY.
    - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.
  - 2. Backset: 2-3/4 inches.
  - 3. Material: Brass.
  - 4. Deadlatches: Deadlocking latchbolt operated by key either side.
  - 5. Deadlocks: Deadbolt operated by key either side.



44.8 ELECTRIC STRIKES

- A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Securitron Magnalock Corporation; an ASSA ABLOY Group company.
    - b. Stanley Commercial Hardware; a division of Stanley Security Solutions.
  - 2. Material: Stainless steel.
  - 3. Mounting: Mortised.
  - 4. Fire-Rated Door Assemblies: Use fail-secure electric strikes with fire-rated devices.
  - 5. Monitoring: Mechanical strike.
  - 6. Features: Open-back strike.

44.9 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. SARGENT Manufacturing Company; ASSA ABLOY.
    - b. Percision: Div. of Stanley Security Solutions, Inc.
    - c. Von Duprin; an Ingersoll Rand Company.
- B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- C. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- D. Exit Device Outside Trim: As indicated in hardware sets.
  - 1. Match design for lock trim unless otherwise indicated.
- E. Through-Bolt Fasteners: For exit devices and trim on metal doors.

44.10 DOOR ACCESS CONTROL SYSTEM

- A. The access system shall consist of magnetic locks, power supply with battery back up, timer, switched exit devices, keyswitch and all other necessary material for a completely operational system.
- B. The access system shall be fail secure, meaning all doors shall remain locked in the event of a power failure. However, doors shall be able to be opened from the inside without a key or access code at all times.

- C. The access system shall have seven day, twenty-four hour programmable operation that allows for setting multiple "on" (magnetic lock activated) and "off" (magnetic lock deactivated) time cycles.
- D. The system as described as follows shall be modular, designed specifically for access control functions and supplied by a single source installer.
  - 1. Magnetic Locks: Schlage Locknetics series 390. Surface mounted electromagnetic lock with 1600 lbs. holding force, adjustable mounting hardware, field selectable 12/24 VDC, UL listed with automatic delay relocking from 0 – 30 seconds.
  - 2. Power Supply: Schlage Model No. 505-EIR. Fused 12 VDC – maximum 1.5 amps, or 24 VDC – maximum 4 amps transformer operating from 120 volts; 60 HZ AC with 10 amp fire alarm relay, keyed cabinet and trickle discharge stand-by battery back-up with any additional keyed cabinets required for batteries. Battery back-up to provide power to system for eight hours upon loss of main power source.
  - 3. Timer: Schlage 6000 Series. Solid state, digital timer with seven day, twenty-four hour programming and on/off omitting time cycles.
  - 4. Exit Devices: Schlage model no. 693 smart bar. Exit device with single pole, double throw switch, corrosion resistant and hermetically. Switch to be rated 10 amp at 125 VAC.
  - 5. Key Switch: Schlage 650 Series Model No 653-04 WP SF626 –SPDT. Recessed single pole, double throw momentary contact switch operated by a 1 ¼" mortised cylinder. Switch to be rated 3 amps at 28 VDC (inductive load), 6 amps at 120 VAC (restrictive load). Provide stainless steel cover plate and security fasteners UL rated for exterior use. Four copies of the key are to be provided to the Owner.

#### 44.11 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver. Provide cylinder from same manufacturer of locking devices.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Best Access Systems; Stanley Security Solutions, Inc.
    - b. SARGENT Manufacturing Company; ASSA ABLOY.
- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
  - 1. Core Type: Removable.
  - 2. Number of Pins: Six.
  - 3. Lock Type: Mortise or Rim type.

- C. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.

#### 44.12 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, appendix. Provide one extra key blank for each lock.
  - 1. Master Key System: Change keys and a master key operate cylinders.
- B. Keys: Nickel silver.
  - 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
    - a. Notation: "DO NOT DUPLICATE."
  - 2. Quantity: In addition to one extra key blank for each lock, provide the following:
    - a. Cylinder Change Keys: Three (3).
    - b. Master Keys: Five (5).

#### 44.13 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; stainless steel unless otherwise indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hager Companies.
    - b. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
    - c. Trimco.
- B. Straight Door Pulls:
  - 1. Type: 3/4-inch constant-diameter pull.
  - 2. Mounting: Surface applied with concealed fasteners.
  - 3. Minimum Clearance: 1-1/2 inches from face of door.
  - 4. Overall Length: 9 inches.

#### 44.14 SURFACE CLOSERS

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

- a. LCN Closers; an Ingersoll-Rand Company.
- b. SARGENT Manufacturing Company; ASSA ABLOY.
- c. Stanley Commercial Hardware; a division of Stanley Security Solutions.

44.15 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16;
  1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Hager Companies.
    - b. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
    - c. Trimco.
- B. Dome-Type Floor Stop: Grade 1; with minimum 1-inch- high bumper for doors without threshold and 1-3/8-inch- high bumper for doors with threshold.

44.16 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hager Companies.
    - b. National Guard Products.
    - c. Pemko Manufacturing Co.
- B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg , as follows:
  1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
  2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
  3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.
- C. Rigid, Housed, Perimeter Gasketing: Silicone bulb gasket material held in place by housing; fastened to frame stop with screws.
- D. Door Sweeps: Neoprene gasket material held in place by flat housing or flange; surface mounted to face of door with screws.

44.17 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Hager Companies.
  - b. National Guard Products, Inc.
  - c. Pemko Manufacturing Co.
- B. Ramped Thresholds: Modular, interlocking, sloped, fluted-top metal assemblies with closed return ends; 1:12 slope.
  1. Top Surface: **Fluted** with slip-resistant abrasive.
  2. Base Metal: Aluminum.

#### 44.18 AUXILIARY DOOR HARDWARE

- A. Auxiliary Hardware: BHMA A156.16.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hager Companies.
    - b. Rockwood Manufacturing Company; an ASSA ABLOY Group company.
    - c. Trimco.
- B. Silencers for Metal Door Frames: Grade 1; neoprene or rubber; minimum diameter 1/2 inch; fabricated for drilled-in application to frame.

#### 44.19 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
  1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:
  - a. Wood or Machine Screws: For the following:
    - 1) Hinges mortised to doors or frames.
    - 2) Strike plates to frames.
    - 3) Closers to doors and frames.
  - b. Steel Through Bolts: For the following unless door blocking is provided:
    - 1) Surface hinges to doors.
    - 2) Closers to doors and frames.
    - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

#### 44.20 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

### PART 45 - EXECUTION

#### 45.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 45.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

#### 45.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated on Drawings unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
  - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Replace construction cores with permanent cores as directed by Owner.
  - 2. Furnish permanent cores to Owner for installation.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
  - 1. Do not notch perimeter gasketing to install other surface-applied hardware.

45.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
  - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

45.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

45.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

45.7 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

45.8 DEMONSTRATION

- A. Engage Installer to train Owner's maintenance personnel to adjust, operate, and maintain door hardware.



45.9 DOOR HARDWARE SCHEDULE

**SET 01**

3	EA	HINGES	AS SPECIFIED		652	HAGER
1	EA	CLASSROOM LOCK	45H R x 15H	626		BEST
1	EA	FLOOR STOP	FS436	626		IVES
1	EA	KICK PLATE	10" x 2" LDW	630		ROCKWOOD

**SET 02**

1	EA	CONT. HINGE	780-112HD		CLR	HAGER
1	EA	OFFSET PULL	BF158		630	ROCKWOOD
1	EA	CLOSER	4040XP EDA x 18 x 61		689	LCN
1	EA	OVERHEAD STOP	100	630		IVES
1	EA	DOOR ACCESS CONTROL	AS SPECIFIED			SCHLAGE

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 08 71 11

## SECTION 08 80 00 - GLAZING

### PART 46 - GENERAL

#### 46.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 46.2 SUMMARY

- A. Section includes:
  - 1. Glass for windows and storefront framing.
  - 2. Glazing sealants and accessories.

#### 46.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.

#### 46.4 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

#### 46.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Review temporary protection requirements for glazing during and after installation.

46.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- C. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

46.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturers of insulating-glass units with sputter-coated, low-E coatings.
- B. Product Certificates: For glass.
- C. Preconstruction adhesion and compatibility test report.

46.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by a coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

46.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

46.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

#### 46.11 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

### PART 47 - PRODUCTS

#### 47.1 MANUFACTURERS

- A. Basis-of-Design Glass Product: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:
  1. Oldcastle BuildingEnvelope.
  2. Pilkington North America IncPPG Industries, Inc.
  3. PPG Industries, Inc.
- B. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
- C. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

#### 47.2 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
  1. Design Wind Pressures: As indicated on Drawings.
  2. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
    - a. Wind Design Data: As indicated on Drawings.
    - b. Basic Wind Speed: 90 mph.
    - c. Importance Factor: 1.0.
    - d. Exposure Category: B.
  3. Design Snow Loads: As indicated on Drawings.

4. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.

#### 47.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
  1. GANA Publications: "Glazing Manual."
  2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
  3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
  4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
  1. Minimum Glass Thickness for Exterior Lites: 6 mm.
  2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- C. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

#### 47.4 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
  1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

#### 47.5 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
2. Spacer: Manufacturer's standard spacer material and construction.
3. Desiccant: Molecular sieve or silica gel, or a blend of both.

#### 47.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
  1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    - a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

### PART 48 - EXECUTION

#### 48.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
  1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
  2. Presence and functioning of weep systems.
  3. Minimum required face and edge clearances.
  4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 48.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

48.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
  - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

48.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

48.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.
- D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

48.6 INSULATING GLASS SCHEDULE

- A. Glass Type : Low-E-coated, clear insulating glass.
  - 1. Overall Unit Thickness: 1 inch.
  - 2. Minimum Thickness of Each Glass Lite: 6 mm Insert thickness designation.
  - 3. Outdoor Lite: Fully tempered float glass.
  - 4. Interspace Content: Air.
  - 5. Indoor Lite: Fully tempered float glass.
  - 6. Low-E Coating: Pyrolytic on second surface.
  - 7. Winter Nighttime U-Factor: 0.28 maximum.
  - 8. Summer Daytime U-Factor: 0.26 maximum.
  - 9. Visible Light Transmittance: 30 percent minimum.
  - 10. Solar Heat Gain Coefficient: 0.38 maximum.



MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 08 80 00

**SECTION 09 05 60 - MOISTURE MITIGATION FOR FLOORING**

PART 49 - GENERAL

49.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

49.2 SUMMARY

- A. This Section includes moisture mitigation for flooring.
- B. Related Sections include the following:
1. Division 01 Section "Quality Requirements" for testing procedures.
  2. Division 03 Section "Cast-in-Place Concrete" for concrete substrates.

49.3 PERFORMANCE REQUIREMENT

- A. General: Subject to Testing, provide moisture mitigation measures to ensure that concrete floor substrates meet or exceed the limits below for moisture, relative humidity and alkalinity, unless more stringent limits are required by each flooring manufacturers. Develop the means and methods that will effectively result in acceptable conditions of the substrates for the flooring installation to take place without delays in the project schedule and without additional costs to the Owner.
- B. Moisture Control Plan: Provide a plan describing steps required, if any, in order to achieve acceptable substrates. Provide step by step procedure, in the context of the overall Schedule, for the entire flooring installation from sub-grade preparation, vapor retarder placement, concrete placement, concrete curing, environmental conditions of the spaces, testing for moisture and pH, acceptability of substrates, mitigation required and coordination with each type of flooring installation procedures.
- C. Testing:
1. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
  2. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
  3. Verify condition of concrete floor slabs by performing the following tests
    - a. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
    - b. Perform anhydrous calcium chloride test per ASTM F 1869.
    - c. Perform relative humidity test using in situ probes, ASTM F 2170.

- d. At Contractor option, in lieu of the anhydrous calcium chloride test, perform moisture test using a Tramex meter.
- e. Test sample cores for presence of sealers or other bond breakers.
- f. Perform additional tests if required by the flooring manufacturers.
- g. Following mechanical preparation of the concrete surface, test the tensile strength of the concrete surface according to Test Method C1583. Tensile strength of the concrete surface must be at least 200 psi.

#### 49.4 ACTION SUBMITTALS

- A. Product Data: For each product required.
  1. Product Certificate: Signed by manufacturer certifying that products furnished comply with performance requirements.

#### 49.5 INFORMATION SUBMITTALS

- A. Moisture Control Plan.
- B. Qualification Data: For installer and manufacturer.
- C. Product Test Reports: Indicating compliance of products with requirements.
- D. Test Reports: For each moisture and pH test required by flooring manufacturers.
- E. Manufacturer's Certificates: provide written certificates, signed by mitigation products manufacturers certifying that the products are appropriate for applications indicated.

#### 49.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain products through one source from a single manufacturer.
- B. Manufacturer's Qualifications:
  1. Company specializing in manufacturing the products specified with minimum 5 years experience in materials of like design and application.
  2. Representative Projects: System manufacturer shall have installed specified systems in a minimum of 10 projects of similar scope and complexity over the past five years.
- C. Installer Qualifications: Approved by manufacturer to install specified products.
  1. Company specializing in applying specified system with minimum 5 years documented experience.
  2. Company approved by system materials manufacturer for specified warranty.
  3. Installing Foreman: Individual specializing in applying specified system with minimum 5 years documented experience.
- D. Preinstallation Conference: Conduct conference at Project site.

1. Include at least one representative from each of the following:
  - a. Owner.
  - b. Architect.
  - c. Engineer.
  - d. Floor Covering Manufacturer.
  - e. Adhesive Manufacturer.
  - f. Flooring Installation Contractor.
  - g. Flooring Consultant.
  - h. Moisture Mitigation Installer.
  - i. Moisture Mitigation Manufacturer.

49.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when conditions permit mitigation for flooring to be applied according to manufacturer's written instruction and warranty requirements.

49.8 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 50 - PRODUCTS

50.1 PRODUCTS, GENERAL

- 50.2 ASTM Moisture Mitigation Standard: Provide products that comply with ASTM F3010-13 for types, compositions, and other characteristics indicated.

50.3 MATERIALS

- A. Moisture Mitigation Systems: Provide manufacturer's standard moisture barrier system, including primers, if required by manufacturer.
  1. Products: Subject to compliance with requirements and acceptance by flooring manufacturer, provide one of the following:
    - a. Sikafloor EpoCem 81 MCS, by Sika Corporation
    - b. MC Moisture Control System by Ardex
    - c. Planiseal EMB by Mapei.
    - d. Koster Waterproofing Systems.

## PART 51 - EXECUTION

### 51.1 EXAMINATION

- A. Examine substrate and conditions for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the work.
  - 1. Prepare written report listing conditions deemed to be detrimental to performance of the work.
  - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes and primers.
  - 3. Begin moisture mitigation product application only after unsatisfactory conditions have been corrected.
  - 4. Application of moisture mitigation products indicates acceptance of surfaces and conditions.

### 51.2 PREPARATION

- A. Concrete substrates: Prepare in accordance with ASTM F710 and F3010-13.
  - 1. Verify that substrates are free of curing compounds, sealers and hardners.
  - 2. Remove substrate coating and other substances that are incompatible with moisture mitigation materials by bead or shot blast.
  - 3. Fill surface cracks, grooves, control joints and other non-moving joints with compatible products recommended by the mitigation system manufacturer.
  - 4. Do not fill or seal expansion joints, isolation joints or other moving joints. These joints shall be honored up through the moisture mitigation system.

### 51.3 INSTALLATION

- A. Install in accordance with ASTM F3010-13 and with manufacturer's written instructions for installing moisture mitigation.

### 51.4 FIELD QUALITY CONTROL

- A. Provide documentation that moisture mitigation system is installed according with manufacturer's instructions.
- B. Provide written documentation signed by Moisture Mitigation Manufacturer, Moisture Mitigation Installer, Flooring Manufacturer and Flooring Installation Contractor, stating that the Moisture Control Plan has been affected to the satisfaction of all the participants and that the stated moisture conditions have been achieved.

- C. Provide written documentation signed by the Flooring Manufacturer and the Flooring Installation Contractor that the mitigated flooring substrate is acceptable for installation of the flooring. Do not proceed with installation without such an acceptance.
- D. Protection: Protect the moisture mitigation system and the entire subfloor from traffic, dirt dust or other contaminates until final installation of flooring.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 09 05 60

## **SECTION 09 29 00 - GYPSUM BOARD**

### **PART 52 - GENERAL**

#### **52.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **52.2 SUMMARY**

- A. Section Includes:
  - 1. Interior gypsum board.

#### **52.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.
  - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.
- C. Samples for Initial Selection: For each type of trim accessory indicated.
- D. Samples for Verification: For the following products:
  - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

#### **52.4 DELIVERY, STORAGE AND HANDLING**

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

#### **52.5 FIELD CONDITIONS**

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
  - 1. e of moisture in substrates.wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

## 52.6 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

## PART 53 - PRODUCTS

### 53.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

### 53.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

### 53.3 INTERIOR GYPSUM BOARD

Resistant Gypsum Board: ASTM C 1396/C 1396M gypsum board, tested according to ASTM C 1629/C 1629M.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. American Gypsum.
  - b. CertainTeed Corporation.
  - c. Georgia-Pacific Building Products.
  - d. National Gypsum Company.
  - e. Temple-Inland Building Products by Georgia-Pacific
  - f. USG.
- 2. Core: 5/8 inch, Type X.



3. Surface Abrasion: ASTM C 1629/C 1629M, meets or exceeds Level 1 requirements.
4. Indentation: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
5. Soft-Body Impact: ASTM C 1629/C 1629M, meets or exceeds Level 2 requirements.
6. Long Edges: Tapered.
7. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

#### 53.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  1. Interior Gypsum Board: Paper.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
  1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  3. Fill Coat: For second coat, use setting-type, sandable topping compound.
  4. Finish Coat: For third coat, use setting-type, sandable topping compound.

#### 53.5 AUXILIARY MATERIALS

- A. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
  1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- B. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

### PART 54 - EXECUTION

#### 54.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

54.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
  - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

54.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  - 1. Abuse-Resistant Type: As indicated on Drawings.
- B. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

#### 54.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings.
- C. Interior Trim: Install in the following locations:
  1. LC-Bead: Use at exposed panel edges.
  2. U-Bead: Use at exposed panel edges.

#### 54.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  1. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
    - a. Primer and its application to surfaces are specified in Section 099600 "High-Performance Coatings."

#### 54.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 09 29 00

## **SECTION 09 67 23 - RESINOUS FLOORING**

### **PART 55 - GENERAL**

#### **55.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **55.2 SUMMARY**

- A. Section Includes:
  - 1. Industrial resinous flooring systems.
- B. Related Sections:
  - 1. Section 079200 "Joint Sealants" for sealants installed at joints in resinous flooring systems.

#### **55.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.
- B. Samples for Initial Selection: For each type of exposed finish required.
- C. Samples for Verification: For each resinous flooring system required, 6 inches square, applied to a rigid backing by Installer for this Project.
- D. Product Schedule: For resinous flooring. Use same designations indicated on Drawings.

#### **55.4 INFORMATIONAL SUBMITTALS**

- A. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.
- B. Material Certificates: For each resinous flooring component, from manufacturer.
- C. Material Test Reports: For each resinous flooring system.

#### **55.5 CLOSEOUT SUBMITTALS**

- A. Maintenance Data: For resinous flooring to include in maintenance manuals.

55.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.
  - 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Preinstallation Conference: Conduct conference at Project site.

55.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

55.8 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

55.9 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 56 - PRODUCTS

56.1 INDUSTRIAL RESINOUS FLOORING <ERF-1>

- A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, industrial-aggregate-filled, resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base.

B. System Characteristics:

1. Color and Pattern: Tnemec Series 222.
2. Wearing Surface: Textured for slip resistance.

C. Primer Coats:

1. Product: Tnemec Series 206, Sub-Flex EP.
2. Resin: Flexible Epoxy.
3. Formulation Description: 100 percent solids.
4. Application Method: Notched squeegee or trowel and porcupine or loop roller.
  - a. Number of Coats: One.
  - b. Coverage: 100 square feet per gallon.
5. Aggregates: .

D. Body Coats:

1. Product: Tnemec Series 222, Deco-Tread.
2. Resin: Modified Polyamine Epoxy.
3. Formulation Description: 100 percent solids.
4. Application Method: Troweled or screeded.
  - a. Number of Coats: Two.
  - b. Coverage of Coat No. 1: 200 square feet per gallon.
  - c. Coverage of Coat No. 2: 125 square feet per gallon.
5. Aggregates: Colored quartz (ceramic-coated silica).
  - a. Broadcast of Coat No. 1: Full fill at 24 pounds per 100 square feet.
  - b. Broadcast of Coat No. 2: Full fill at 24 pounds per 100 square feet.

E. Topcoat No. 1: Sealing or finish coats.

1. Product: Tnemec Series 284, Deco-Clear.
2. Resin: Modified Polyamine Epoxy.
3. Formulation Description: 100 percent solids.
4. Application Method: Brush, roller, squeegee, and trowel.
5. Type: Clear.
6. Finish: Gloss.
7. Number of Coats: One.
8. Coverage: 80 to 100 square feet per gallon.

F. Topcoat No. 2: Sealing or finish coats.

1. Product: Tnemec Series 247, Everthane.
2. Resin: Aliphatic Moisture Cured Urethane.
3. Formulation Description: 100 percent solids.
4. Type: Clear.
5. Finish: Gloss.
6. Number of Coats: One.

7. Coverage: 425 to 450 square feet per gallon.

G. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated:

1. Thickness: 110 to 125 mils.
2. Compressive Strength: 15,567 psi per ASTM C 579.
3. Tensile Strength: 2,600 psi per ASTM C 307.
4. Flexural Strength: 4,500 psi per ASTM C 580.
5. Flexural Modulus of Elasticity: 6.2 x 10 psi per ASTM C 580.
6. Coefficient of Thermal Expansion: 3.75 x 10<sup>5</sup> inch/inch/degree F per ASTM C 696.
7. Indentation: No indentation per MIL-D-3134.
8. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch permanent indentation per MIL-D-3134.
9. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch per MIL-D-3134.
10. Abrasion Resistance: 24 mg. maximum weight loss per ASTM D 4060.
11. Flammability: Self-extinguishing per ASTM D 635.
12. Hardness: 86 to 89, Shore D per ASTM D 2240.
13. Bond Strength: 400 psi (substrate fails) per ASTM D 4541 .

## 56.2 ACCESSORIES

A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

## PART 57 - EXECUTION

### 57.1 EXAMINATION

- A. Examine substrates and areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

### 57.2 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
  1. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.



- a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. of slab area in 24 hours.
  - b. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
  - c. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- B. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with installation only if pH readings are not less than 7.0 and not greater than 8.5.

### 57.3 PREPARATION

- A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for resinous flooring application.
- B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.
  1. Roughen concrete substrates as follows:
    - a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
    - b. Comply with ASTM C 811 requirements unless manufacturer's written instructions are more stringent.
  2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
- C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
- D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

### 57.4 APPLICATION

- A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- B. Apply reinforcing membrane to entire substrate surface.
- C. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and topcoating of cove base. Round internal and external corners.
1. Integral Cove Base: 4 inches high.
- D. Apply self-leveling slurry body coats in thickness indicated for flooring system.
1. Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.
- E. Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When cured, remove trowel marks and roughness using method recommended by manufacturer.
- F. Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat and to produce wearing surface indicated.
- G. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

#### 57.5 FIELD QUALITY CONTROL

- A. Material Sampling: Owner may at any time and any number of times during resinous flooring application require material samples for testing for compliance with requirements.
1. Owner will engage an independent testing agency to take samples of materials being used. Material samples will be taken, identified, sealed, and certified in presence of Contractor.
  2. Testing agency will test samples for compliance with requirements, using applicable referenced testing procedures or, if not referenced, using testing procedures listed in manufacturer's product data.
  3. If test results show applied materials do not comply with specified requirements, pay for testing, remove noncomplying materials, prepare surfaces coated with unacceptable materials, and reapply flooring materials to comply with requirements.

57.6 PROTECTION

- A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 09 67 23

## SECTION 09 96 00 - HIGH-PERFORMANCE COATINGS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:

- 1. Interior Substrates:
  - a. Concrete masonry units (CMUs).
  - b. Gypsum board.

#### 1.3 DEFINITIONS

- A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
  - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
  - 2. Indicate VOC content.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.
  - 1. Submit Samples on rigid backing, 8 inches square.
  - 2. Apply coats on Samples in steps to show each coat required for system.
  - 3. Label each coat of each Sample.
  - 4. Label each Sample for location and application area.

- D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

1.9 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Tnemec Company Inc.; Multi-Purpose Epoxy Series 48 or comparable product by one of the following:

1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company (The).
4. Tnemec Company, Inc.

## 2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
  1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
  3. Products shall be of same manufacturer for each coat in a coating system.
- C. VOC Content: For field applications[ that are inside the weatherproofing system], paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
  1. Flat Paints and Coatings: 50 g/L.
  2. Nonflat Paints and Coatings: 50 g/L.
  3. Primers, Sealers, and Undercoaters: 100 g/L.
  4. Rust-Preventive Coatings: 100 g/L.
  5. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
  6. Pretreatment Wash Primers: 420 g/L.
  7. Floor Coatings: 50 g/L.
  8. Shellacs, Clear: 730 g/L.
  9. Shellacs, Pigmented: 550 g/L.
- D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Colors: As selected by Architect from manufacturer's full range .

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Concrete: 12 percent.
  - 2. Fiber-Cement Board: 12 percent.
  - 3. Masonry (Clay and CMUs): 12 percent.
  - 4. Wood: 15 percent.
  - 5. Gypsum Board: 12 percent.
  - 6. Plaster: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Plaster Substrates: Verify that plaster is fully cured.
- E. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- F. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
- D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content, alkalinity of surfaces, or alkalinity of mortar joints exceeds that permitted in manufacturer's written instructions.
  - 1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi at 6 to 12 inches.

### 3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
  - 1. Use applicators and techniques suited for coating and substrate indicated.
  - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
  - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

### 3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

### 3.5 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. CMU Substrates:
  - 1. Epoxy System MPI INT 4.2F:
    - a. Block Filler: Block filler, epoxy, MPI #116.
    - b. Intermediate Coat: Epoxy, matching topcoat.



- c. Topcoat: Epoxy, gloss, MPI #77.
- B. Gypsum Board Substrates:
- 1. Epoxy System MPI INT 9.2E:
    - a. Prime Coat: Primer sealer, latex, interior, MPI #50.
    - b. Intermediate Coat: Epoxy, matching topcoat.
    - c. Topcoat: Epoxy, gloss, MPI #77.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 09 96 00

## **SECTION 10 44 13 - FIRE PROTECTION CABINETS**

### **PART 58 - GENERAL**

#### **58.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **58.2 SUMMARY**

- A. Section Includes:
  - 1. Fire-protection cabinets for the following:
    - a. Portable fire extinguishers.
- B. Related Requirements:
  - 1. Section 104416 "Fire Extinguishers."

#### **58.3 PREINSTALLATION CONFERENCE**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire-protection cabinets including, but not limited to, the following:
    - a. Schedules and coordination requirements.

#### **58.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
  - 1. Show location of knockouts for hose valves.
- B. Shop Drawings: For fire-protection cabinets. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
- D. Samples for Initial Selection: For each type of exposed finish required.

- E. Samples for Verification: For each type of exposed finish required, prepared on Samples 6 by 6 inches square.
- F. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

58.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

58.6 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

58.7 SEQUENCING

- A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

58.8 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 59 - PRODUCTS

59.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.
- B. 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.

59.2 SECURITY FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. JL Industries, Inc.; a division of the Activar Construction Products Group.

- b. Larsens Manufacturing Company.
  - c. Potter Roemer LLC.
- B. Cabinet Construction: 1-hour fire rated .
- 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls lined with minimum 5/8-inch- thick fire-barrier material.
- C. Cabinet Material: 0.078-inch- thick stainless-steel sheet.
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
- 1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
- E. Cabinet Trim Material: Stainless-steel sheet .
- F. Door Material: 0.078-inch- thick stainless-steel sheet.
- G. Door Style: Solid opaque panel with frame.
- H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated, and as follows:
- 1. Recessed door pull.
  - 2. Continuous Hinge: Same material and finish as trim, permitting door to open 180 degrees.
  - 3. Mechanical Snaplatch: Automatic snaplatch when closed; latchbolt retracted by five-tumbler paracentric cylinder; keyed one side.
    - a. Lockbolt: 1 inch high by 7/16 inch thick; 5/16-inch throw.
- I. Accessories:
- 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to security fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
  - 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.
    - a. Identify fire extinguisher in security fire-protection cabinet with the words "FIRE EXTINGUISHER."
      - 1) Location: Applied to cabinet door.
      - 2) Application Process: Pressure-sensitive vinyl letters.
      - 3) Lettering Color: Red.
      - 4) Orientation: Vertical.
  - 3. Keys: Three per door lock.

J. Materials:

1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
2. Stainless Steel: ASTM A 666, Type 304.
3. Finish: No. 4 directional satin finish.

59.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
1. Weld joints and grind smooth.
  2. Provide factory-drilled mounting holes.
  3. Prepare doors and frames to receive locks.
  4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
1. Fabricate door frames of one-piece construction with edges flanged.
  2. Miter and weld perimeter door frames.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

59.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 60 - EXECUTION

60.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

60.2 PREPARATION

- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.

60.3 INSTALLATION

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
  - 1. Fire-Protection Cabinets: 48 inches above finished floor to top of fire extinguisher operating hardware and handle.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
  - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
  - 2. Provide inside latch and lock for break-glass panels.
  - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
  - 4. Fire-Rated Cabinets:
    - a. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
    - b. Seal through penetrations with firestopping sealant as specified in Section 078413 "Penetration Firestopping."
- C. Identification: Apply vinyl lettering at locations indicated.

60.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 10 44 13

## **SECTION 10 44 16 - FIRE EXTINGUISHERS**

### **PART 61 - GENERAL**

#### **61.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

#### **61.2 SUMMARY**

- A. Section includes portable, hand-carried fire extinguishers.
- B. Related Requirements:
  - 1. Section 104413 "Fire Protection Cabinets."

#### **61.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
    - a. Schedules and coordination requirements.

#### **61.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher.
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

#### **61.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

#### **61.6 COORDINATION**

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.



61.7 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 62 - PRODUCTS

62.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  - 1. Provide fire extinguishers approved, listed, and labeled by FM Global.

62.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet indicated.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
    - b. Larsens Manufacturing Company.
    - c. Potter Roemer LLC.
  - 2. Valves: Manufacturer's standard.
  - 3. Handles and Levers: Manufacturer's standard.
  - 4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.
- B. Multipurpose Dry-Chemical Type in Steel Container : UL-rated 3-A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

PART 63 - EXECUTION

63.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
  - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

63.2 INSTALLATION

- A. General: Install fire extinguishers in locations indicated and in compliance with requirements of authorities having jurisdiction.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 10 44 16

**SECTION 12 48 13 - ENTRANCE FLOOR MATS AND FRAMES**

PART 64 - GENERAL

64.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

64.2 SUMMARY

- A. Section Includes:
  - 1. Roll-up rail mats.
  - 2. Recessed frames.

64.3 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive floor mats and frames.

64.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.
- B. Shop Drawings:
  - 1. Items penetrating floor mats and frames, including door control devices.
  - 2. Divisions between mat sections.
  - 3. Perimeter floor moldings.
- C. Samples: For the following products, in manufacturer's standard sizes:
  - 1. Tread Rail: Sample of each type and color.
  - 2. Frame Members: Sample of each type and color.

64.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

64.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

64.7 MEASUREMENT AND PAYMENT

- A. The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

PART 65 - PRODUCTS

65.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Structural Performance: Provide roll-up rail mats and frames capable of withstanding the following loads and stresses within limits and under conditions indicated:
  - 1. Uniform floor load of 300 lbf/sq. ft..
  - 2. Wheel load of 350 lb per wheel.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1.

65.2 ROLL-UP RAIL MATS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. American Floor Products Company, Inc.
  - 2. Arden Architectural Specialties, Inc.
  - 3. Balco, Inc.
  - 4. J. L. Industries, Inc.
  - 5. Mats Inc.
  - 6. Pawling Corporation; Architectural Products Division.
- B. Roll-up, Aluminum-Rail Hinged Mats: Extruded-aluminum tread rails 2 inches wide by 3/8 inch thick, sitting on continuous vinyl cushions.
  - 1. Tread Inserts: Ribbed-design-surface, resilient vinyl.
  - 2. Colors, Textures, and Patterns of Inserts: As selected by Architect from full range of industry colors.
  - 3. Rail Color: Mill finish.
  - 4. Mat Size: As indicated.

65.3 FRAMES

- A. Recessed Frames: Manufacturer's standard extrusion.
  - 1. Extruded Aluminum: ASTM B 221, Alloy 6061-T6 or Alloy 6063-T5, T6, or T52.
    - a. Color: Mill finish.

65.4 FABRICATION

- A. Floor Mats: Shop fabricate units to greatest extent possible in sizes indicated. Unless otherwise indicated, provide single unit for each mat installation; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints.
- B. Recessed Frames: As indicated, for permanent recessed installation, complete with corner pins or reinforcement and anchorage devices.
  - 1. Fabricate edge-frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.
- C. Coat concealed surfaces of aluminum frames that contact cementitious material with manufacturer's standard protective coating.

65.5 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 66 - EXECUTION

66.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

66.2 INSTALLATION

- A. Install recessed mat frames to comply with manufacturer's written instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate tops of mat surfaces with bottoms of doors that swing across mats to provide clearance between door and mat.
1. Install necessary shims, spacers, and anchorages for proper location, and secure attachment of frames.
  2. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

66.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for BUILDING which shall be payment in full for the work described herein.

END OF SECTION 12 48 13

**SECTION 22 01 00 – GENERAL PROVISIONS FOR MECHANICAL WORK**

**PART 1- GENERAL**

**1.01 SCOPE**

- A. This Section describes the general provisions for the Work to be performed under Division 22, Mechanical, of this Contract as well as Division 26, Electrical, where applicable. The Contractor shall comply with these general provisions and shall perform all Work in accordance with the Specifications contained in this Section, as supplemented by Specifications in related Sections, and as shown on the Drawings. Related electrical work shall be performed in accordance with the applicable provisions of Division 26.
- B. The following specifies the minimum general requirements for the furnishing, installation and testing of the materials and equipment specified under Division 22, Mechanical. Additional details of items furnished and installation and testing procedures are specified under individual Sections of the Specifications.
- C. The Contractor shall provide all necessary coordination between the suppliers of the specified equipment so as to provide a well-designed and satisfactory operating facility to the Owner. The Contractor is advised that these Specifications are not intended to cover every and all details of the Work. In case(s) where details related to the specified Work are not covered by these Specifications, it shall be the responsibility of the Contractor to include and execute such coordination and Work at no additional cost to the Owner.

**1.02 QUALITY ASSURANCE**

**A. Acceptable Manufacturers and Equipment Suppliers.**

Acceptable manufacturers for various items of equipment are specified in respective Sections of these Contract Documents. For convenience of designation in the Contract Documents, certain equipment, articles, materials, and processes are designated by manufacturer trade name or catalog name and number. The Contractor may offer material or processes which are equal to that so indicated or specified at the time of Bid. Such offers must be in accordance with the hereinafter specified requirements. The burden of proof as to comparative quality and suitability of alternatives shall be upon the Contractor. Specified items are preferred. After acceptance of Bid, no substitutions will be allowed, except as stated in the Bid. (Exception: Where Specifications indicate "No Substitutions Allowed" the Contractor shall provide the designated manufacturers equipment without exception.)

**B. Applicable Standards**

Systems as installed by the Contractor shall be in accordance with all applicable Specifications included in these Contract Documents and shall conform to State, Federal and/or Local codes and regulations. Any conflicts between Drawings or Specifications or applicable codes regulations and/or authorities having

jurisdiction, shall be brought immediately to the Owner's attention. In such cases, the more stringent requirements or design practices shall govern and shall be complied with, without any extra cost to the Owner.

C. Field Verification

The Contractor shall verify field conditions, measurements and dimensions so as to assure that all items of equipment shall fit properly and be suitable for the field conditions.

1.03 SUBMITTALS

A. General

The Contractor shall comply with the requirements specified in Supplementary Conditions, and as specified herein.

B. Materials

1. The Contractor shall submit lists of material, equipment, apparatus, and accessories intended for use.
2. The Contractor shall include with all submittals all physical and performance data, including materials, manufacturer's names, model numbers, weights, sizes, capacities, temperatures, pressures, flow rates, performance curves, electrical ratings, finishes, colors, dimensions, accessories, and all other data required to completely describe the equipment and to indicate compliance with the Specifications.

C. Shop Drawings and Testing Procedures

1. The Contractor shall submit for review dimensioned outline shop drawings showing the general arrangement of the equipment to be furnished, in accordance with the specified submittal schedule, and/or as otherwise specified herein.
2. Before proceeding with the manufacture of the equipment, the Contractor shall submit for review general assembly shop drawings, subassembly shop drawings, detail shop drawings, calculations, design data, catalog cuts and similar engineering documents required to demonstrate fully that all parts will conform to the provisions and intent of the Specifications and to the requirements of their installation, operation, and maintenance. These shop drawings shall show all necessary dimensions and fabrication details, including the design of welded and bolted joint connections, tolerances of fits and clearances, and all field joints and subassemblies in which the Contractor proposes to ship the equipment. Design criteria, calculations, and detailed specifications, shall be submitted for the design of all major components and for other features or details when requested.



3. All submittals by the Contractor shall be certified by the respective equipment manufacturer.
4. The Contractor shall submit complete full-line wiring diagrams covering all equipment furnished. The Contractor shall furnish shop drawings of switch developments for all instrument and control switches and internal connection diagrams for all instruments, relays, regulators, etc. The ENGINEER will return one print of each wiring diagram on which will be marked the wire notations and cable numbers for outgoing circuits where this information is not otherwise available to the Contractor. The Contractor shall add this information to his shop drawings. Adequate space shall be allowed on the wiring diagrams to accomplish this.
5. Shop drawings shall include electrical devices, accessories and wiring furnished as component parts of mechanical equipment and shall show arrangement and dimensions.
6. The Contractor shall prepare and submit shop drawings for all work areas, indicating solutions to space problems and coordination with requirements in other Sections. These shop drawings, as a requirement of this Division, shall indicate superimposed items of all Divisions and Sections involved in congested areas, including, but not limited to, piping, structural work, electrical work and ceiling work.
7. Protocol of all shop and field testing procedures shall be submitted. In addition, and prior to conducting testing activities at the site, the Contractor shall prepare a test program, showing the sequence of work required for specified tests. This program shall be in the form of a plan drawing to the extent practical and shall be exclusive of all other plans and schedules required under this Contract. This program shall be supplemental by sketches, text, bar diagrams, showing the sequence of work required for testing.

D. Operating and Maintenance Manuals

1. Upon completion of the Work, the Contractor shall furnish to the Owner six (6) complete sets of operating instructions, maintenance instructions, parts lists, and all other bulletins and brochures pertinent to the operation and maintenance of the mechanical equipment and systems provided.
2. The operating and maintenance manuals shall be bound in durable binders, labeled to correspond with all mechanical systems shown or specified, and indexed into sections such as, but not limited to, the following:
  - a) A chart tabulating all types of pipe and pipe fittings, valves and piping specialties installed in each system.
  - b) Manufacturer's brochures, including names, addresses and telephone numbers, for all items installed in each system. Identify items by item number shown on the Contract Documents.

Reference the manufacturer's part or model number and the system in which it is installed.

- c) All major equipment such as pumps, valves, compressors and related equipment, including shop drawings.
- d) Lubrication charts for equipment requiring lubrication, listing each item of equipment, proper lubricant and dates lubricated, and a lubrication schedule.
- e) List of consumable items, parts, and supplies, with applicable price lists.

E. Certificates

At the completion of the construction, the Contractor shall submit, to the ENGINEER for review, written certification that all mechanical systems have been tested, and that the installation and performance of these systems conform to the requirements of the Specifications.

PART 2- PRODUCTS

2.01 GENERAL

A. Standard Products

The equipment furnished shall be standard products in production by reputable companies regularly engaged in the manufacture of high-quality equipment of the type specified. Similar equipment shall have been in satisfactory and successful operation for a period of at least two years. All parts of the specified equipment shall be so designed as to be especially adapted for the service required and shall be proportioned, enclosed, or guarded as to have ample and liberal strength and stability to withstand, without damage, the stresses to which they may be subjected during erection or operation. The component parts of duplicate items shall be fabricated on a principle of interchangeability to facilitate ready replacement.

B. Materials

All materials incorporated in the equipment shall be new and of first-class quality, free from injurious defects and imperfections, and of the classifications and grades designated. Materials not specifically designated herein shall be subject to the review of the ENGINEER and shall be suitable for the purpose intended.

2.02 RATINGS

The sizes, ratings, capacities, and performance characteristics of various specified items of equipment and devices are based on currently available standard products, which are available through United States manufacturers and/or suppliers. In no case shall the size, rating, capacity or performance characteristic be less than that specified unless approved in writing by the

Owner. Ratings and performance characteristics, where applicable, of various devices and items of equipment are specified in respective Sections of these Specifications. All electrical components of mechanical equipment shall be UL rated.

2.03 DETAILS OF CONSTRUCTION

A. Nameplates

Each item of manufactured equipment furnished under the Specifications shall have a permanent nameplate affixed thereto in a readily visible place, showing the serial number, the name and address of the manufacturer, rated capacity, speed, electrical characteristics, and other pertinent data, as applicable and as specified herein after. Nameplates of distributing agents alone will not be acceptable.

B. Samples

The Contractor shall furnish to the ENGINEER for review, when requested or required by the Specifications, samples of all materials and finishes to be used in the execution of the Work. Such samples shall be submitted before the Work is commenced and in ample time to permit examination thereof. All materials furnished and finishes applied shall be fully equal to the reviewed samples found to be acceptable.

C. Loose Parts

All loose parts, spare parts, fasteners, anchor bolts and other non-attached pieces shall be properly tagged. A loose parts list shall accompany the equipment to identify loose parts.

D. Lifting Provisions

Equipment shall be equipped with adequate provisions for lifting, such as, lifting lugs, threaded holes for removable eyebolts, holes for sling passage, etc. to facilitate initial placement and future moving. All items such as, but not limited to, lifting beams, slings and other devices necessary for handling during placement and/or removal of the equipment shall be provided by the Contractor and shall remain the property of the Owner.

E. Anchor Bolts

Anchor bolts, nuts and washers shall be adequate for the intended use. Each anchor bolt shall be furnished with all required flat washers, lock washers and nuts. Anchor bolts shall be furnished by the Contractor as a part of each piece of equipment.

F. Spare Parts

(As specified in subsequent Sections of these Specifications.)

G. Guards

All rotating equipment such as but not limited to belt and chain drives, exposed gearing and shafting and flywheels, clutches, fan blades, stub shafts, couplings, etc. shall be completely guarded from all directions. Guards shall enclose the top, bottom ends, front and back of the drive assembly to prevent access to the danger zone during equipment operation. All guards shall be checked for proper running clearances and adjusted as required.

2.04 RELATED ELECTRICAL FEATURES OF MECHANICAL EQUIPMENT

A. General

Electrical equipment shall conform to NEC, UL, ANSI, and NEMA Standards. The installed equipment shall conform to ANSI-C1, "National Electrical Code", considering the atmospheric and climatic conditions and the elevation at the project site.

B. Motors

Motors shall be as specified in subsequent Sections of these Specifications.

C. Disconnecting Switches

(As specified in subsequent Sections of these Specifications.)

D. (Not Used)

E. Wiring and Conduit

Wiring of the control panels and component parts shall be in accordance with the applicable requirements of these specifications.

PART 3- EXECUTION

3.01 FABRICATION AND WORKMANSHIP

A. General

Like parts and spare parts shall be interchangeable wherever possible. Surface finish of machined parts shall be adequate for their functional requirements. Machining of fits on renewable parts shall be accurate and to specified dimensions so that replacements made to drawing sizes may be readily installed. All work shall be done by workers skilled in their various trades and completed in a thorough manner following the best modern practices.

During erection the Contractor shall take the necessary precautions to prevent foreign objects or dirt from entering piping or equipment. All openings in equipment shall remain closed and protected during installation until ready for make-up of pipe connections or matching of sectionalized equipment. Damaged covers shall be repaired or replaced immediately to protect the interior of piping or equipment against weather or other contamination.

B. Electric Welding

1. Minimum Weld Requirements

All welds shall be made continuous. The minimum size of fillet welds shall be 1/4 inch. All butt welds shall be full penetration welds welded from both sides.

2. Preparation of Base Material

Members to be joined by welding shall be cut to shape and size by mechanical means such as shearing, machining, grinding, or by gas or arc cutting, to suit the conditions. Design of welded joints and selection of weld filler metal shall allow thorough penetration and good fusion of the weld with the base metal. The edges of surfaces to be welded shall be sound metal free of visible defects, such as lamination or defects caused by cutting operations, and free from rust, oil, grease, and other foreign matter.

3. Weld Finish

Welds shall in general be treated so that they will display good appearance and a surface suitable for painting. Structure welds shall be ground and blended to avoid stress raisers. All welds which required nondestructive examinations shall be dressed by chipping and grinding as required for good interpretation by the selected weld examination methods.

4. Welding Qualifications

The qualification of welding procedures, welders, and welding operators for all welding including weld repairs, shall conform to the AWS D1.1, "Structural Welding Code". Contractor shall furnish the facilities, all equipment, materials and other articles required to perform qualification tests of his welders and welding operators. Certificates of welders' qualifications shall be submitted when requested.

5. Technique of Welding

The technique of welding, the appearance and quality of the welds, and the methods used in correcting defective work shall conform to the AWS D1.1, "Structural Welding Code". Special care shall be taken to avoid undercuts along the seams or warping of the structure. If undercuts appear along the welds, they shall be filled using a small diameter electrode of the same composition as the original electrode.

C. Fabrication of Structural Steel

1. If straightening is necessary, it shall be done by methods that will not injure the metal. Sharp kinks or bends will be cause for rejection of the

material. Shearing and cutting shall be carefully performed, and all portions of the Work which will be exposed to view after completion shall be neatly finished.

2. Design and fabrication of structural parts shall conform to the applicable provisions of the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings", of the AISC "Code of Standard Practice for Steel Buildings and Bridges".

D. Machine Work

1. General

All tolerances, allowances, and gauges for metal fits between plain (non-threaded) cylindrical parts shall conform to ANSI-B4.1, "Preferred Limits and Fits for Cylindrical Parts", for the class of fit as shown or otherwise required. Sufficient machining stock shall be allowed on parts to be machined to insure true surfaces of solid materials. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal and sliding surfaces shall be polished, and all surfaces shall be finished with sufficient smoothness and accuracy to insure proper operation when assembled. All drilled holes for bolts which are intended to match other drilled holes shall be accurately located and drilled from templates. No machining shall be done on working surfaces of "Lubrite" bushings or washers.

2. Finished Surfaces

All surfaces that are indicated on the Drawings or those that require machining for their intended function, or those that are usually machined according to good workshop practice shall be machined. Surface finish qualities shall be adequate for the intended use and shall be indicated on the Contractor's drawings and shall be in accordance with ANSI-B46.1, "Surface Texture". Compliance with specified surface will be determined by sense of feel and by visual inspection of the Work compared to standard roughness specimens, in accordance with the provisions of ANSI B46.1.

3. Unfinished Surfaces

So far as practicable, all Work shall be laid out to secure proper matching of adjoining unfinished surfaces. Where there is a large discrepancy between adjoining unfinished surfaces they shall be chipped and ground smooth, or machined, to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on the Drawings and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts may be filled in an approved manner. Corrosion resistant steel seal plates shall have all surfaces thoroughly cleaned and those in contact with seals shall have a smooth and even surface.

4. Pins and Pin Holes

Pin holes shall be bored true to gauges, smooth and straight, and at right angles to the axis of the member. The boring shall be done after the member is securely fastened in position.

5. Protection of Machined Surfaces

a. Machine-finished surfaces shall be thoroughly cleaned of foreign matter. Finished surfaces of large parts and other delicate surfaces shall be protected with wooden pads or other suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other means in keeping with good engineering practice.

b. Finished surfaces of ferrous metals to be in bolted contact shall be washed with a rust inhibitor and given one thin coat of white or blue lead and tung oil.

E. Lubrication

Solvents shall not be used on "Lubrite" bearings. Before assembly all bearing surfaces, journals, and grease and oil grooves shall be carefully cleaned and lubricated with an approved oil or grease. After assembly each lubricating system shall be flushed and filled with an approved lubricant in accordance with the equipment manufacturer's written recommendations. "Lubrite" bearings shall not be greased and shall be assembled dry according to the manufacturer's instructions.

3.02 FACTORY TEST AND INSPECTION

A. Test of Materials. All materials or parts used in the equipment shall be tested, unless otherwise directed, in conformity with applicable methods prescribed by the ASTM, or such other organization as may be specifically required, and in general accordance with the best commercial methods. When requested, tests shall be made in the presence of the ENGINEER. Stocked material may be used, provided evidence is furnished to the ENGINEER to show that such material meets the requirements specified herein, in which case tests on stocked materials may be waived.

B. Test Certificates. Certified material test reports shall be furnished in triplicate to the ENGINEER as soon as possible after the tests are made. The test certificate shall identify the component for which the material is to be used and shall contain all information necessary to verify compliance with the Specifications.

C. Shop Assembly and Tests. The shop assemblies and tests specified for the various items of equipment shall be conducted. The completed shop inspection forms shall be signed by the Contractor or his representative. Copies of all shop inspection records shall be furnished to the ENGINEER. No equipment shall be shipped from the manufacturer's shops until it has been inspected. Prior to the major shop assemblies and tests the Contractor shall submit an outline of the

procedures and test he plans to demonstrate fulfillment of the requirements specified. Where witnessing of shop testing is required by these Contract Documents, the Contractor shall give sufficient notification to the ENGINEER (as specified) so that such factory testing may be witnessed. Costs which may be incurred by the ENGINEER directly related to witnessing of shop tests (such as travel and lodging) will be the responsibility of the Owner. All other costs related to shop testing shall be considered incidental to the items of Work to which they pertain and shall be included in the lump sum price of the specified equipment.

3.03 INSTALLATION AND TESTING

- A. Receiving, Handling and Storage. The Contractor shall be responsible for the receiving, handling and storing of all materials and equipment required for the Work. Installation and maintenance instructions shall accompany all equipment delivered to site. All materials and equipment shall be stored to protect them from the weather and injury prior to installation. Damaged materials and equipment shall not be installed.
- B. Installation. The equipment shall be installed as shown on the Drawings and in accordance with the manufacturer's instructions and recommended best practices. All equipment shall be installed in a neat, accurate and workmanlike manner. Equipment shall be set level, true to line, at correct elevation and in proper orientation as shown on the Drawings. Equipment set on concrete foundations shall be properly grouted (with non-shrink grout) in such a manner to eliminate any voids which may be present under the base. Where shims are used and where shims are not removed after the grout sets, care shall be taken to totally cover any exposed surface areas which may result in a void. All necessary shims, grout, anchor bolts, and other items required for installation shall be furnished by the Contractor. In addition, certain anchor bolts when supplied by equipment suppliers shall be installed by the Contractor. The Contractor shall inspect all materials and equipment delivered to the site to assure compliance with the associated reviewed shop drawings. If the Contractor discovers any defect in material or equipment, he shall notify the ENGINEER immediately. Any Work performed by the Contractor after such discovery, until authorized in writing by the ENGINEER, will be done at the Contractor's risk and the cost of correcting such work shall be borne by the Contractor. In addition, any material or equipment installed by the Contractor prior to the completion of the ENGINEER's review, will be done at the Contractor's risk and the cost of correcting such work shall be borne by the Contractor. Where trenching, excavation, backfilling and/or concreting is required for the equipment installation the Contractor shall perform such activities in accordance with the applicable requirements of IDOT Standard Specifications.
- C. Adjustments/Alignment/Leveling. The Contractor shall perform all adjustment, fitting, cleaning and calibration of components to be incorporated into the Work to assure correct operation and workmanlike installation. As minimum requirements the Contractor shall provide/comply with the following:
1. Mild carbon steel leveling plates or smooth-troweled surfaces shall be provided at all anchor bolts in concrete bases as required for leveling.



2. All equipment, unless furnished with leveling screws or otherwise specified, shall be leveled with stainless steel shims at each anchor bolt, shim on both sides of each bolt, and at intermediate points as required to prevent distortion of the equipment. Shims shall have square cut edges, not trimmed or sheared, and shall be of varying thickness to minimize the number of shims required.
3. Rotating mechanical equipment shall be set, leveled, aligned, and inspected with precision tools such as steel straight edge, dial indicator, graduated levels, transit, etc. The alignment shall be accomplished prior to making-up any piping flange connections. After units have been aligned, the piping flange bolts shall be tightened. Sufficient alignment checks shall be made to verify that there is no load or strain on the installed equipment and that the drive shaft and the driven shaft are within the manufacturer's specified tolerances for alignment.
4. Electric motors shall be checked for correct direction of rotation prior to connection to driven equipment.

- D. Field Testing. All necessary piping, pipe closures, gates, meters, valves, and other test equipment required for testing shall be furnished by the Contractor. All items of equipment shall be operated, adjusted and tested for proper performance in accordance with the manufacturer's recommended test procedure, and as otherwise specified herein. Before final grouting of equipment is done, after alignment is completed, and before any final performance tests are made, the Contractor shall notify the ENGINEER so that such alignment may be inspected and tests may be witnessed by the ENGINEER.

The Contractor shall then test, operate and calibrate as necessary to demonstrate proper performance of the equipment in the presence of the ENGINEER. Should it become necessary for any items of equipment to be retested, the Contractor shall perform all necessary Work, including removal, repair or replacing, reinstallation and retesting of the defective equipment. The Contractor will not be reimbursed for the cost of such Work associated with the retesting of defective equipment, if the defect was due to the Contractor's negligence or lack of workmanship.

- E. Maintenance and Operation of Equipment and Materials. All equipment and appurtenances installed shall be provided with proper oil and lubricants by the Contractor before being placed in operation. All permanent equipment furnished under these Specifications shall be properly maintained and operated by the Contractor until the Work is accepted by the Owner.
- F. Field Check-Out and Start-Up Procedure. The Contractor shall complete all new Work to the maximum extent possible before making actual tie-in and final connection to existing systems. Tie-ins requiring cutting and patching shall be performed in accordance with applicable requirements, best recommended procedures and as specified herein. No tie-in shall be made until authorized by the Owner. The Contractor shall advise the Owner in sufficient time (minimum 24 hours) to arrange for proper coordination with Existing Systems and scheduled cut-ins and tie-ins.

3.04        PAINING

- A.        All equipment shall be shop-primed and painted as specified in subsequent Sections of these Specifications. All equipment shall be field-painted in accordance with subsequent Sections of these Specifications.
  
- B.        The Contractor shall be responsible for coordination of the compatibility between the manufacturer's standard finish and field-paint specified.

PART 4-        MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for PLUMBING EQUIPMENT, ACCESSORIES, AND RELATED SYSTEMS which shall be payment in full for the work described herein.

END OF SECTION 22 01 00

## **SECTION 22 01 10 – BASIC MECHANICAL MATERIALS AND METHODS**

### **PART 1- GENERAL**

#### **1.01 SCOPE**

A. Description of Work. This Section includes the following basic mechanical materials and methods to complement other Division 22 Sections.

1. Piping materials and installation instructions common to most piping systems.
2. Concrete equipment base construction requirements.
3. Equipment nameplate data requirements.
4. Non-shrink grout for equipment installations.
5. Field-fabricated metal equipment supports.
6. Installation requirements common to equipment specifications Sections.
7. Cutting and patching.
8. Touchup painting and finishing.

B. Related work includes Specification Sections of Divisions 22 and 26.

C. Definitions

1. Pipe, pipe fittings, and piping include tube, tube fittings, and tubing.
2. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pip and duct shafts, unheated spaces immediately below the roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
3. Exposed Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
4. Exposed Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
5. Concealed Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
6. Concealed Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

#### **1.02 QUALITY ASSURANCE**

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code—Steel."

- B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions of ASME B31 Series "Code for Pressure Piping."
  2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.
- C. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.03 SUBMITTALS

- A. General: Submit the following according to the conditions of the Supplemental Conditions.
- B. Shop drawings detailing fabrication and installation for metal and wood supports and anchorage for mechanical materials and equipment.
- C. Coordination drawings for access panel and door locations.
- D. Prepare coordination drawings according to Division 1 Section "Submittals" to a ¼ inch equals 1 foot (1:48) scale or larger. Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Show where sequence and coordination of installations are important to the efficient flow of Work. Include the following:
1. Proposed locations and piping, ductwork, equipment, and materials. Include the following:
    - a. Planned piping layout, including valve and specialty locations and valve stem movement.
    - b. Planned duct systems layout, including elbow radii and duct accessories.
    - c. Clearances for installing and maintaining insulation.
    - d. Clearances for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
    - e. Equipment service connections and support details.
    - f. Exterior wall and foundation penetrations.
    - g. Fire rated wall and floor penetrations.
    - h. Sizes and location of required concrete pads and bases.

2. Scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
  3. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
  4. Reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.
- E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and prevent entrance of dirt, debris, and moisture.
- B. Protect stored pipes and tubes from moisture and dirt. Elevate above grade. When stored inside, do not exceed structural capacity of the floor.
- C. Protect flanges, fittings, and piping specialties from moisture and dirt.
- D. Protect stored plastic pipes from direct sunlight. Support to prevent sagging and bending.

1.05 SEQUENCING AND SCHEDULING

- A. Coordinate mechanical equipment installation with other building components.
- B. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- C. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- D. Sequence, coordinate, and integrate, installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
- E. Coordinate connection of electrical services.
- F. Coordinate connection of mechanical systems with exterior underground utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors where mechanical items requiring access are concealed behind finished surfaces.

- H. Coordinate installation of identifying devices after completing covering and painting where devices are applied to surfaces. Install identifying devices prior to installing acoustical ceilings and similar concealment.

PART 2-      PRODUCTS

2.01          PIPE AND PIPE FITTINGS

- A. Refer to individual piping system specification Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 factory-threaded pipe and pipe fittings.

2.02          JOINING MATERIALS

- A. Refer to individual piping system specification Sections in Division 22 for special joining materials not listed below.
- B. Pipe Flange Gasket Materials: Suitable for the chemical and thermal conditions of the piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8 inch (3mm) maximum thickness, except where thickness or specific material is indicated.
    - a. Full-Face Type: For flat-face, Class 125 cast-iron and cast-bronze flanges.
    - b. Narrow-Face Type: For raised-face, Class 250 cast-iron and steel flanges.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, except where other material is indicated.
- D. Solder filler Metal: ASTM B 32, Alloy Sn95, tin (approximately 95 percent) and silver (approximately 5 percent), having 0.10 percent lead content.
- E. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Solvent Cements: Manufacturer's standard solvents complying with ASTM D 2564, Polyvinyl Chloride (PVC).

2.03          PIPING SPECIALTIES

- A. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type where required to conceal protruding fittings and sleeves.
  - 1. Inside Diameter: Closely fit around pipe, tube, and insulation.
  - 2. Outside Diameter: Completely cover opening.
  - 3. Cast Brass: One-piece, with set-screw.
    - a. Finish: Rough brass.

- b. Finish: Polished chrome plate.
4. Cast Brass: Split casting, with concealed hinge and set-screw.
    - a. Finish: Rough brass.
    - b. Finish: Polished chrome plate.
  5. Stamped Steel: One-piece, with set-screw and chrome-plated finish.
  6. Stamped Steel: One-piece, with concealed hinge, set-screw, and chrome-plated finish.
  7. Stamped Steel: Split plate, with concealed hinge, set-screw, and chrome-plated finish.
  8. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
  9. Stamped Steel: Split plate, with exposed-rivet hinge, set-screw, and chrome-plated finish.
  10. Cast-Iron Floor Plate: One-piece casting
- B. Dielectric Fittings: Assembly or fitting having insulating material isolating jointed dissimilar metals to prevent galvanic action and stop corrosion.
1. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld neck end types and matching piping system materials.
  2. Insulating Material: Suitable for system fluid, pressure, and temperature.
  3. Dielectric Unions: Factory-fabricated, union assembly for 250-psig (1725kPa) minimum working pressure at a 180 deg F (82 deg C) temperature.
  4. Dielectric Flanges: Factory-fabricated, companion-flange assembly for 150- or 300-psig (1035kPa or 2070kPa) minimum pressure to suite system pressures.
  5. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
    - a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig (1035kPa or 207kPa) minimum working pressure to suit system pressures.
  6. Dielectric Couplings: Galvanized-steel coupling, have inert and non-corrosive, thermoplastic lining, with threaded ends and 300-psig (2070kPa) minimum working pressure at 225 deg F (107 deg C) temperature.
  7. Dielectric Nipples: Electroplated steel nipple, having inert and non-corrosive thermoplastic lining with combination of plain, threaded or grooved types and 300-psig (2070kPa) working pressure at 225 deg F (107 deg C) temperature.

#### 2.04 IDENTIFYING DEVICES AND LABELS

- A. General: Manufacture's standard products of categories and types required for

each application as referenced in other Division 22 Sections. Where more than one type is specified for listed application, selection is Installer's option, but provide single selection for each product category.

- B. Equipment Nameplates: Metal nameplate with operational data engraved or stamped permanently fastened to equipment.
  - 1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and similar essential data.
  - 2. Location: An accessible and visible location.
- C. Stencils: Standard stencils, prepared for required applications with letter sizes conforming to recommendations of ASME A13.1 for piping and similar applications, but not less than 1-1/4-inch (30mm)-high letters for ductwork and not less than 3/4 inch (19mm) –high letters for access door signs and similar operational instructions.
  - 1. Material: Brass
  - 2. Stencil Paint: Standard exterior type stenciling enamel; black, except as otherwise indicated; either brushing grade or pressurized spray-can form and grade.
  - 3. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ASME A13.1 for colors.
- D. Snap-On Plastic Pipe Markers: Manufacture's standard preprinted, semi rigid snap-on, color-coded pipe markers, conforming to ASME A13.1.
- E. Pressure-Sensitive Pipe Markers: Manufacture's standard preprinted, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, conforming to ASME A13.1.
- F. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white (letter color) melamine subcore, except when other colors are indicated.
  - 1. Fabricate in sizes required for message.
  - 2. Engraved with engraver's standard letter style, of sizes and with wording to match equipment identification.
  - 3. Punch for mechanical fastening.
  - 4. Thickness: 1/16 inch (1.5 mm) for units up to 20 square inches (13,000 sq. mm) or 8 inches (200 mm) long; 1/8 inch (3 mm) for larger units.
  - 5. Fasteners: Self-tapping stainless-steel screws or contact-type permanent adhesive.
- G. Plastic Equipment Markers: Laminated-plastic, blue equipment markers.
  - 1. Nomenclature: Include following, matching terminology on schedules as closely as possible:



- a. Name and plan number.
  - b. Equipment service.
  - c. Design capacity.
  - d. Other design parameters such as pressure drop, entering and leaving conditions, and rpm.
2. Size: Approximately 4-1/2 by 6 inches
- H. Lettering and Graphics: Coordinate names, abbreviations, and other designations, and other designations used in mechanical identification, with corresponding designations indicated. Use numbers, lettering, and wording indicated for proper identification and operation/maintenance of mechanical systems and equipment.
1. Multiple Systems: Where multiple systems of same generic name are indicated, provide identification that indicates individual system number as well as service such as "Boiler No. 3," "Air Supply No. 1H," or "Standpipe F12."

2.05 GROUT

- A. Non-shrink, Nonmetallic Grout: ASTM C1107, Grade B.
1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  2. Design Mix: 5000-psi (34.50Mpa), 28-day compressive strength.
  3. Packaging: Premixed and factory-packaged.

PART 3- EXECUTION

3.01 PIPING SYSTEMS – COMMON REQUIREMENTS

- A. General: Install piping as described below, except where system Sections specify otherwise. Individual piping system specification Sections in Division 22 specify piping installation requirements unique to the piping system.
- B. General Locations and Arrangements: Drawings (plans, schematics and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, except where deviations to layout are approved on coordination drawings.
- C. Install piping at indicated slope.
- D. Install components having pressure rating equal to or greater than system operating pressure.

- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, except where indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1-inch (25mm) clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's printed instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
  - 1. Chrome-Plated Piping: Cast-brass, one-piece, with set-screw, and polished chrome-plated finish. Use split-casting escutcheons, where required, for existing piping.
  - 2. Uninsulated Piping Wall Escutcheons: Cast-brass or stamped-steel, with set-screw.
  - 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
  - 4. Insulated Piping: Cast-brass or stamped-steel, with concealed hinge, spring clips, and chrome-plated finish.
  - 5. Piping in Utility Areas: Cast-brass or stamped-steel, with set screw or spring clips.
- N. Sleeves are not required for core drilled holes.
- O. Fire Barrier Preparations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe preparations. Seal pipe penetrations with fire stopping sealant material. Fire stopping materials are specified in Division 7 Section.
- P. Verify final equipment locations for roughing in.
- Q. Refer to equipment specifications in other Sections for roughing-in requirements.
- R. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.
  - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of

- steel pipes.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
  3. Soldered Joints: Construct joints according to AWS "Soldering Manual", Chapter 22 "The Soldering of Pipe and Tube."
  4. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves, as follows:
    - a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    - b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
    - c. Align threads at point of assembly.
    - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
    - e. Damaged threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
  5. Welded Joints: Construct joints according to AWS D10.12 "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe." Using qualified processes and welding operators according to the "Quality Assurance" Article.
  6. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
  7. Plastic Pipe and Fitting Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following standards.
    - a. Comply with ASTM F 402 for safe handling of solvent-cement and primers.
    - b. Poly(Vinyl Chloride) (PVC) Non-Pressure Application: ASTM D 2855
- S. Piping Connections: Except as otherwise indicated, make piping connections as specified below.
1. Install unions in piping 2 inches (50mm) and smaller adjacent to each valve and at final connections to each piece of equipment having a 2 inch (50mm) or smaller threaded pipe connection.
  2. Install flanges in piping 2-1/2 inches (65mm) and larger adjacent to flanged valves and at final connection to each piece of equipment requiring flanged pipe connection.
  3. Water Piping Systems: Install dialectic coupling and nipple fittings to

connect piping materials of dissimilar metals.

### 3.02 EQUIPMENT INSTALLATION – COMMON REQUIREMENTS

- A. Install equipment to provide the maximum possible headroom where mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Works are shown only in diagrammatic form. Refer conflicts to the Engineer.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, except where otherwise indicated.
- D. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. Connect equipment for ease of disconnecting, with minimum of interference with other installations.
- E. Install equipment giving right-of-way to piping systems installed at a required slope.

### 3.03 LABELING AND IDENTIFYING

- A. Piping systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
  - 1. Stenciled Markers: Complying with ASME A13.1.
  - 2. Plastic Markers, with applicable systems. Install on pipe insulation segment where required for hot no insulated pipes.
  - 3. Locate pipe markers wherever piping is exposed in finished spaces, mechanical rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:
    - a. Near each valve and control device.
    - b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
    - c. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.
    - d. At access doors, manholes, and similar access points that permit view of concealed piping.
    - e. Near major equipment items and other points of origination and termination.
    - f. Spaced at a maximum of 50-foot (15m) intervals along each run. Reduce intervals to 25 feet (7.5m) in congested areas of piping and equipment.
    - g. On piping above removable acoustical ceilings, except omit intermediately spaced markers.
- B. Equipment: Install engraved plastic laminate sign or equipment marker on or near each major item of mechanical equipment.

1. Lettering Size: Minimum ¼ inch (CMM) – high lettering for name of unit where viewing distance is less than 2 feet (0.6m), ½ inch (3mm) – high for distances up to 6 feet (1.8m), and proportionately larger lettering for greater distances. Provide secondary lettering 2/3 to ¾ of size of principle lettering.
  2. Text of Signs: Provide text to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to name of identified unit.
- C. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

### 3.04 PAINING AND FINISHING

- A. Refer to Division 9 Section "Painting" for field painting requirements.
- B. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

### 3.05 CONCRETE BASES

- A. Construct concrete equipment bases of dimensions not less than 4 inches (100mm) larger than supported unit in both directions. Follow supported equipment manufacturer's setting templates for anchor bolt and tie locations. Use 3000-psi (20.70Mpa), 28-day compressive strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

### 3.06 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- B. Field Welding: Comply with AWS D1.1 "Structural Welding Code – Steel."

### 3.07 CUTTING AND PATCHING

- A. Cut, channel, chase and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by mechanics of the trades involved.
- B. Repair cut surfaces to match adjacent surfaces.

### 3.08 GROUTING

- A. Install nonmetallic non-shrink grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's printed instructions.
- B. Clean surfaces that will contact with grout.

- C. Provide forms for placement of grout, as required.
- D. Avoid air entrapment when placing grout.
- E. Place grout to completely fill equipment bases.
- F. Place grout on concrete bases to provide a smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout according to manufacturer's printed instructions.

PART 4-      MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for PLUMBING EQUIPMENT, ACCESSORIES, AND RELATED SYSTEMS which shall be payment in full for the work described herein.

END OF SECTION 22 01 10

## **SECTION 22 05 29 - HANGERS AND SUPPORTS**

### **PART 1- GENERAL**

#### **1.01 SCOPE**

- A. Description of Work. This Section includes hangers and supports for mechanical systems piping and equipment.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 5 Section "Structural Steel" for materials for attaching hangers and supports to building structure.
  - 2. Divisions 22 and 26 – Mechanical and Electrical Equipment Requiring Supports.
- C. Definitions: Terminology used in this Section is defined in MSS SP-90.

#### **1.02 QUALITY ASSURANCE**

- A. Qualify welding processes and welding operators according to AWS D1.1 "Structural Welding Code--Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- B. Qualify welding processes and welding operators according to ASME "Boiler and Pressure Vessel Code," Section IX, "Welding and Brazing Qualifications."
- C. Licensed Operators: Use operators that are licensed by powder-operated tool manufacturers to operate their tools and fasteners.

#### **1.03 SUBMITTALS**

- A. General: Submit the following according to the Supplemental Conditions.
- B. Product data for each type of hanger and support.
- C. Submit pipe hanger and support schedule showing manufacturer's Figure No., size, location, and features for each required pipe hanger and support.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Shop drawings for each type of hanger and support, indicating dimensions, weights, required clearances, and methods of component assembly.

PART 2-      PRODUCTS

2.01      MANUFACTURED UNITS

- A. Hangers, Supports, and Components: Factory-fabricated according to MSS SP-58.
1. Components include galvanized coatings where installed for piping and equipment that will not have a field-applied finish.
  2. Pipe attachments include nonmetallic coating for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Thermal-Hanger Shield Inserts: 100-psi (690kPa) average compressive strength, waterproofed calcium silicate, encased with sheet metal shield. Insert and shield cover entire circumference of pipe and are of length indicated by manufacturer for pipe size and thickness of insulation.
- C. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.
- D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used. Fasteners for fire protection systems include UL listing and FM approval.

2.02      MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- B. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel, hex-head, track bolts and nuts.
- C. Washers: ASTM F 844, steel, plain, flat washers.
- D. Grout: ASTM C 1107, Grade B, non-shrink, nonmetallic.
1. Characteristics include post-hardening, volume-adjusting, dry, hydraulic-cement-type grout that is non-staining, noncorrosive, non-gaseous and is recommended for both interior and exterior applications.
  2. Design Mix: 5000-psi (34.5MPa), 28-day compressive strength.
  3. Water: Potable.
  4. Packaging: Premixed and factory-packaged.



PART 3- EXECUTION

3.01 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in the Section specifying the equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping specification Sections.

3.02 HANGER AND SUPPORT INSTALLATION

- A. General: Comply with MSS SP-69 and SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Arrange for grouping of parallel runs of horizontal piping supported together on field-fabricated, heavy-duty trapeze hangers where possible.
- C. Install supports with maximum spacings complying with MSS SP-69.
- D. Where pipes of various sizes are supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
- E. Install building attachments within concrete or to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert to forms. Install reinforcing bars through openings at top of inserts.
- F. Install concrete inserts in new construction prior to placing concrete.
- G. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.
- H. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install according to fastener manufacturer's written instructions. Do not use in lightweight concrete slabs or in concrete slabs less than 4 inches (100 mm) thick.
- I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

- J. Heavy-Duty Steel Trapezes: Field-fabricate from ASTM A 36 steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- K. Install hangers and supports to allow controlled movement of piping systems, permit freedom of movement between pipe anchors, and facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- L. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ASME B31.9 "Building Services Piping" is not exceeded.
- N. Insulated Piping: Comply with the following installation requirements.
  - 1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ASME B31.9.
  - 2. Saddles: Install protection saddles MSS Type 39 where insulation without vapor barrier is indicated. Fill interior voids with segments of insulation that match adjoining pipe insulation.
  - 3. Shields: Install MSS Type 40, protective shields on cold piping with vapor barrier. Shields span an arc of 180 degrees (3.1 rad) and have dimensions in inches (mm) not less than the following:
 

NPS (Inches)	LENGTH (Inches)	THICKNESS (Inches)
1/4 to 3-1/2	12	0.048
4	12	0.060
  - 4. Insert Material: Length at least as long as the protective shield.
  - 5. Thermal-Hanger Shields: Install with insulation of same thickness as piping.

3.03 EQUIPMENT SUPPORTS

- A. Fabricate structural steel stands to suspend equipment from structure above or support equipment above floor.
- B. Grouting: Place grout under supports for equipment, and make a smooth bearing surface.

3.04 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for pipe and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for manual shielded metal-arc welding, appearance and quality of welds, methods used in correcting welding work, and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Finish welds at exposed connections so that no roughness shows after finishing, and so that contours of welded surfaces match adjacent contours.

3.05 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.06 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint and paint exposed areas immediately after erection of hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.07 FIELD QUALITY CONTROL

- A. Licensed Engineer's Report: Contractor shall prepare hanger and support installation report. Include seal and signature of Registered Engineer, licensed in jurisdiction where Project is located, certifying compliance with specifications.

PART 4-      MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for PLUMBING EQUIPMENT, ACCESSORIES, AND RELATED SYSTEMS which shall be payment in full for the work described herein.

END OF SECTION 22 05 29

## **SECTION 22 10 00 - PLUMBING PIPING**

### **PART 1- GENERAL**

#### **1.01 SCOPE**

- A. Description of Work: This Section includes plumbing piping systems to a point 5 feet outside the building, the installation of a new 1" type K copper water main and existing domestic water Box and corporation stop to connect the New building water service to the existing water main located in Lincoln Ave. including tapping the existing water main. The installation of a new 6" PVC sanitary sewer and structures to connect the new sanitary sewer service to the existing sanitary sewer in Algonquin Rd. including a new connection to the existing sanitary sewer as indicated on the drawings. Systems include the following:
1. Potable water service piping, valves, corporation stops, main connections and distribution, including cold-, tempered- and hot-water supply, hot-water circulation, and cold service water.
  2. Drainage and vent systems, including sanitary sewer pipe, structures, Grease Interceptor in vendor space and sewer main connections and drain lines.
- B. Related Sections: The following sections contain requirements that relate to this Section:
1. Other Sections as may be specified herein.

#### **1.02 QUALITY ASSURANCE & SYSTEM PERFORMANCE REQUIREMENTS**

- A. Comply with the provisions of ASME B31.9 "Building Services Piping" for materials, products, and installation.
- B. Comply with the provisions of the State of Illinois Plumbing Code.
- C. Comply with BOCA (ICC) Plumbing Code and Standard Specifications for Water and Sewer Main Construction in Illinois and all required Cook County Health department standards and construction requirements.
- D. Provide components and installation capable of producing piping systems with the following minimum working pressure ratings, except where indicated otherwise:
1. Water Distribution Systems, Below Ground: 150 psig.
  2. Water Distribution Systems, Above Ground: 125 psig.
  3. Soil, Waste, and Vent Systems: 10-foot head of water.

1.03 SUBMITTALS

- A. General: All submittals shall be in accordance with the applicable requirements of the Supplemental Conditions.
- B. Water samples, test results, and reports specified in "Field Quality Control" and "Cleaning" Articles.
- C. Submit for review drawings, product specifications and installation instructions.
- D. Coordination drawings, drawn accurately to scale and coordinating penetrations.

PART 2- PRODUCTS

2.01 PIPES AND TUBES

- A. General: The application of the following pipe, tube, and fitting materials and joining methods required for plumbing piping systems are indicated in Part 3 Article "Pipe and Fittings Applications."
- B. Hard Copper Tube: ASTM B 88, Type L, water tube, drawn temper.
- C. Soft Copper Tube: ASTM B 88, Type K, water tube, annealed temper.
- D. Steel Pipe: ASTM A 53, Type S, Grade A, Schedule 40, seamless, galvanized, plain ends.
  - 1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, seamless, galvanized, carbon-steel pipe.
- E. Hub and Spigot, Cast-Iron Soil Pipe: ASTM A 74, Service Class.
- F. Polyvinyl Chloride (PVC) Plastic, DWV Pipe: ASTM D 2665, Schedule 40, plain ends.

2.02 PIPE FITTINGS AND TUBE FITTINGS

- A. Wrought-Copper, Solder-Joint Pressure Fittings: ASME B16.22.
- B. Cast-Copper-Alloy, Solder-Joint Pressure Fittings: ASME B16.18.
- C. Bronze Flanges: ASME B16.24, Classes 150 and 300.
- D. Copper Unions: ASME B16.18, cast-copper-alloy body, hexagonal stock, with ball-and-socket joint, metal-to-metal seating surfaces, and solder-joint, threaded, or solder-joint and threaded ends. Threaded ends shall conform to ASME B1.20.1.
- E. Galvanized, Cast-Iron Threaded Drainage Fittings: ASME B16.12, recessed drainage pattern, with threads conforming to ASME B1.20.1.

- F. Cast-Iron Threaded Flanges: ASME B16.1, Classes 125 and 300.
- G. Hub and Spigot, Cast-Iron Soil Pipe Fittings: ASTM A 74, Service Class.
- H. Poly (Vinyl Chloride) (PVC) Plastic, DWV Pipe Fittings: ASTM D 2665, made to ASTM D 3311; socket-type; drain, waste, and vent pipe patterns.

2.03 GREASE INTERCEPTOR

- A. The grease interceptor shall be a Zurn model 1171-500 with all required fittings, venting and Hub Drains as required by the Illinois Administrative Code and Cook Health Department Installation requirements

2.04 JOINING MATERIALS

- A. Solder, brazing, and welding filler metals are specified in Division 22 Section "Basic Mechanical Materials and Methods."
- B. Cast-Iron Soil Pipe and Fittings: ASTM C 564 neoprene rubber gaskets and lubricant.
- C. Cast-Iron Soil Pipe and Fittings: Oakum joints.

PART 3- EXECUTION

3.01 EXCAVATION

- A. Excavation, trenching, and backfilling are specified in Division 2 Section "Earthwork."

3.02 PREPARATION OF FOUNDATION FOR BURIED PIPING

- A. Grade trench bottom to provide smooth, firm, stable, and rock-free foundation throughout length of piping.
- B. Remove unstable, soft, and unsuitable materials at surface on which piping is to be laid and backfill with clean sand or pea gravel to indicated level.
- C. Shape bottom of trench to fit bottom of piping. Fill unevenness with tamped-sand backfill. Dig bell holes at each pipe joint to relieve bells of loads and to ensure continuous bearing of pipe barrel on foundation.

3.03 PIPE AND FITTINGS APPLICATIONS

- A. General: Use pipe, tube, fittings, and joining methods for piping systems according to the following applications.
- B. Water Distribution Piping Below Ground: Use the following:
  - 1. 3-1/2 Inches and Smaller: Soft copper tube, Type K, cast-copper-alloy solder-joint pressure fittings, and soldered joints with Alloy Sn95 solder.

- C. Water Distribution Piping Above Ground: Use the following:
1. 4 to 12 Inches: Steel pipe; galvanized, cast-iron threaded fittings; cast-iron threaded flanges; galvanized, flanged steel expansion joints; malleable-iron unions; and threaded or flanged joints.
  2. 3-1/2 Inches and Smaller:
    - a. Hard copper tube, Type L; wrought-copper or cast-copper-alloy pressure fittings; copper unions; bronze flanges; and solder joints with Alloy Sn95 solder.
    - b. Fittings Option: Mechanically formed outlets, brazing filler alloy, and brazed joints.
- D. Soil, Waste, and Vent Piping Below Ground:
1. 2 to 15 Inches: Hub-and-spigot cast-iron soil pipe, hub-and-spigot cast-iron soil pipe fittings, neoprene rubber gaskets, and compression joints.
- E. Soil, Waste, and Vent Piping Above Ground: Use the following:
1. 2 to 15 Inches: Hub-and-spigot cast-iron soil pipe, hub-and-spigot cast-iron soil pipe fittings, Oakum joints.
  2. 1-1/2 to 4 Inches: Schedule 40 galvanized steel pipe, ASTM A120/A53 welded or seamless.
  3. 1-1/2 to 12 inches: Polyvinyl Chloride (PVC) plastic DWV pipe; PVC socket-type drain, waste and vent pipe pattern fittings.
- F. Storm Drainage Piping Below Ground: Use the following:
1. 4 to 15 Inches: Hub-and-spigot cast-iron soil pipe, hub-and-spigot cast-iron soil pipe fittings, neoprene rubber gaskets, and compression joints.
- G. Storm Drainage Piping Above Ground: Use the following:
1. 2 to 4 Inches: Hub-and-spigot cast-iron soil pipe, hub-and-spigot cast-iron soil pipe fittings, Oakum joints.
  2. 2 to 4 Inches: Schedule 40 galvanized steel pipe, ASTM A120/A53 welded or seamless.
    - a. Threaded black cast-iron drainage fittings, ANSI B16.12.
    - b. Threaded black cast-iron vent fittings, ANSI B16.4.
  3. 1-1/2 to 12 inches: Polyvinyl Chloride (PVC) plastic DWV pipe; PVC socket-type drain, waste and vent pipe pattern fittings.



- H. Oil Contaminated Drainage and Vent Piping Below Ground:
  - 1. 2 to 15 Inches: Hub-and-spigot cast-iron soil pipe, hub-and-spigot cast-iron soil pipe fittings, neoprene rubber gaskets, and compression joints.
- I. Oil Contaminated Vent Piping Above Ground:
  - 1. 2 to 15 Inches: Hub-and-spigot cast-iron soil pipe, hub-and-spigot cast-iron soil pipe fittings, Oakum joints.
  - 2. 1-1/2 to 4 Inches: Schedule 40 galvanized steel pipe, ASTM A120/A53 welded or seamless.
    - a. Threaded black cast-iron drainage fittings, ANSI B16.12.
    - b. Threaded black cast-iron vent fittings, ANSI B16.4.
  - 3. 1-1/2 to 12 inches: Polyvinyl Chloride (PVC) plastic DWV pipe; PVC socket-type drain, waste and vent pipe pattern fittings.

### 3.04 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use gate, ball, or butterfly valves.
  - 2. Throttling Duty: Use ball valves.

### 3.05 PIPING INSTALLATION, GENERAL

- A. Basic piping installation requirements are specified in Division 22 Section "Basic Mechanical Materials and Methods."

### 3.06 SERVICE ENTRANCE PIPING

- A. Extend potable water distribution piping and service water piping and connect to water service piping systems of size and in locations indicated for service entrances to buildings. Water service piping systems are specified in Section 15065.
- B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside buildings at water service entrance.
- C. Extend building storm drain piping and connect to building storm sewer piping of size and in location indicated for service entrance to building. Install cleanout and extension to grade at connection of building storm drain and building storm sewer. See Civil Sheets.
- D. Extend building sanitary drain piping and connect to sanitary sewer piping of size and in location indicated for service entrance to building. Install cleanout and extension to grade at connection of building sanitary drain and building sanitary sewer.

3.07 WATER DISTRIBUTION PIPING INSTALLATION

- A. Install piping with 1/32-inch-per-foot (1/4 percent) slope downward toward drain.
- B. Fittings Option: Mechanically formed outlets may be used instead of fittings, if permitted by the applicable plumbing code.

3.08 DRAINAGE AND VENT PIPING INSTALLATION

- A. Install cast-iron soil pipe and cast-iron soil pipe fittings according to CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- B. Make changes in direction for drainage and vent piping using appropriate Y branches, Y branches with 1/8 bends, and long-sweep 1/4, 1/5, 1/6, 1/8, and 1/16 bends. Sanitary tees and short-sweep quarter bends may be used on vertical stacks of drainage lines where change in direction of flow is from horizontal to vertical. Use long-turn double-Y-branch and 1/8-bend fittings where 2 fixtures are installed back to back or side by side and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers and reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.
- C. Lay buried building drains beginning at low point of each system, true to grades and alignment indicated, with unbroken continuity of invert. Place hub or bell ends of piping facing upstream. Install required gaskets according to manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in piping and pull past each joint as completed.
- D. Install drainage and vent piping at the following minimum slopes, except where another slope is indicated:
  - 1. Sanitary and Oil Contaminated Building Drain: 1/4 inch per foot (2 percent) for piping 3 inches and smaller; 1/8 inch per foot (1 percent) for piping 4 inches and larger.
  - 2. Storm Building Drain: 1/8 inch per foot (1 percent).
  - 3. Vent Piping: 1/8 inch per foot (1 percent).
- E. Sleeves are not required for cast-iron soil pipes passing through concrete slab, without membrane waterproofing, on grade.
- F. Install PVC drainage pipe and fittings according to ASTM D 2665.
- G. Prepare underground cast-iron piping for cathodic protection application.

3.09 JOINT CONSTRUCTION

- A. Basic piping joint construction is specified in Division 22 Section "Basic Mechanical Materials and Methods."
- B. Mechanically Formed Outlet Joints: Make joints according to forming equipment manufacturer's written instructions. Use tool designed for piping material being joined, drill pilot hole, and form collar for branch connection.
  - 1. Copper Tube: Dimple tube to form seating stop and braze branch tube into formed collar outlet.
- C. Cast-Iron Soil Pipe and Cast-Iron Soil Pipe Fitting Joints: Make joints according to recommendations in CISPI 1990 revised and edited edition of "Cast Iron Soil Pipe and Fittings Handbook, Volume I," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
  - 1. Compression Joint for Underground Installation: Make with neoprene gasket matching class of pipe and fittings.
  - 2. Oakum Joint for Aboveground Installation: Make with oakum.
- D. PVC DWV Pipe: Join PVC drainage pipe and fittings according to ASTM D 2665.
- E. Handling of Solvent Cements, Primers, and Cleaners: Comply with procedures in ASTM F 402 for safe handling during joining of plastic pipe and fittings with solvent cements.

3.10 ROUGHING-IN FOR WATER METER

- A. Install roughing-in piping and plumbing as required for water meter installation according to utility company's instructions and requirements.

3.11 INSTALLATION OF VALVES

- A. Sectional Valves: Install sectional valves close to main on each branch and riser serving 2 or more plumbing fixtures or equipment connections and where indicated. Use gate or ball valves for sectional valves 2 inches and smaller. Use gate or butterfly valves for sectional valves 2-1/2 inches and larger.
- B. Shutoff Valves: Install shutoff valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated. For shutoff valves 2 inches and smaller, use gate or ball valves; for shutoff valves 2-1/2 inches and larger, use gate or butterfly valves.
- C. Drain Valves: Install drain valves as required on each plumbing equipment item located to drain equipment for service and repair. Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.

- 1. Install hose-end drain valves at low points in water mains, risers, and branches.
- 2. Install stop and waste drain valves where indicated.
- D. Check Valves: Install swing check valve on discharge side of each pump and elsewhere as indicated. Use MSS SP-80, Class 125, cast-bronze body for 2-inch and smaller piping and MSS SP-71, Class 125, cast-iron body for 2-1/2-inch and larger piping.
- E. Balance Valves: Install valve in each hot-water circulating loop, discharge side of each pump, and elsewhere as indicated. Use ball valve for 2-inch and smaller piping.

3.12 HANGERS AND SUPPORTS INSTALLATION

- A. Hanger and support devices are specified in Division 22 Section "Hangers and Supports."
- B. Install hangers for horizontal piping with following maximum spacing and minimum rod sizes:

Nom. Pipe Size (Inches)	Steel Pipe Max. Span (Feet)	Copper Tube Max. Span (Feet)	Min. Rod Diameter (Inches)
Up to 3/4	7	5	3/8
1	7	6	3/8
1-1/4	7	7	3/8
1-1/2	9	8	3/8
2	10	8	3/8
2-1/2	11	9	1/2
3	12	10	1/2
3-1/2	12	10	1/2
4	12	10	5/8, 1/2 for copper
5	12	10	5/8, 1/2 for copper
6	12	10	3/4, 5/8 for copper

- 1. Support vertical steel pipe and copper tube at each floor.
- C. Pipe Attachments: Install the following:
  - 1. Riser Clamps: MSS Type 8 or Type 42 for vertical runs.
  - 2. Adjustable Steel Clevis Hangers: MSS Type 1 for individual straight horizontal runs 100 feet and less.
- D. Support cast-iron soil pipe and fittings not included in table, at maximum horizontal spacing of 5 feet, except 10-foot sections of pipe may be supported at 10-foot spacing and at maximum vertical spacing of 15 feet.

- E. Support plastic pipe and tubing not included in table at maximum horizontal or vertical spacing of 4 feet.

3.13 CONNECTIONS

- A. Supply Runouts to Fixtures: Install hot- and cold-water supply piping runouts of sizes indicated, but not smaller than required by plumbing code to fixtures.
- B. Drainage Runouts to Fixtures: Provide drainage and vent piping runouts, with approved trap, of sizes indicated, but not smaller than required by plumbing code, to plumbing fixtures and drains.
- C. Locate drainage piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.
- D. Mechanical Equipment Connections: Connect hot- and cold-water supply piping system to mechanical equipment as indicated. Provide shutoff valve and union for each connection; provide drain valve on drain connection.

3.14 FIELD QUALITY CONTROL

- A. Inspect water distribution piping as follows:
  - 1. Do not enclose, cover, or put into operation water distribution piping system until it has been inspected and approved by the authority having jurisdiction.
  - 2. During progress of the installation, notify the plumbing official having jurisdiction at least 24 hours prior to time inspection must be made. Perform tests specified below in presence of the plumbing official.
    - a. Roughing-In Inspection: Arrange for inspection of piping system before concealed or closed-in after system roughing-in and prior to setting fixtures.
    - b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
  - 3. Reinspections: When a plumbing official finds that piping system will not pass test or inspection, make required corrections and arrange for reinspection by the plumbing official.
  - 4. Reports: Prepare inspection reports signed by plumbing official.
- B. Test water distribution piping as follows:
  - 1. Test for leaks and defects in new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of system tested.

2. Leave uncovered and unconcealed in new, altered, extended, or replaced water distribution piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved for testing.
  3. Cap and subject the piping system to a static water pressure of 50 psig above the operating pressure without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for 4 hours. Leaks and loss in test pressure constitute defects that must be repaired.
  4. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
  5. Prepare reports for tests and required corrective action.
- C. Inspect drainage piping as follows:
1. Do not enclose, cover, or put into operation drainage and vent piping system until it has been inspected and approved by the authority having jurisdiction.
  2. During progress of installation, notify the plumbing official having jurisdiction at least 24 hours prior to time such inspection must be made. Perform tests specified below in presence of the plumbing official.
    - a. Roughing-In Inspection: Arrange for inspection of piping system after system roughing-in, before concealing, and prior to setting fixtures.
    - b. Final Inspection: Arrange for final inspection by plumbing official to observe tests specified below and to ensure compliance with requirements of plumbing code.
  3. Reinspections: Make required corrections and arrange for reinspection by plumbing official when piping system fails to pass test or inspection.
  4. Reports: Prepare inspection reports signed by the plumbing official.
- D. Drainage and Vent Piping System Tests: Test drainage and vent systems according to procedures of authority having jurisdiction or, in absence of published procedure, as follows:
1. Test for leaks and defects in new drainage and vent piping systems and parts of existing systems that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with a diagram of the portion of the system tested.
  2. Leave uncovered and unconcealed in new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose for testing work that has been covered or concealed before it has been tested and approved.

3. Rough Plumbing Test Procedure: Except for outside leaders and perforated or open-jointed drain tile, test piping of plumbing drainage and venting systems on completion of roughing-in piping installation. Tightly close all openings in piping system and fill with water to point of overflow, but not less than 10 feet head of water. Water level shall not drop during the period from 15 minutes before inspection starts through completion of inspection. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and their traps filled with water, test connections and prove gastight and watertight. Plug stack openings on roof and building drain where it leaves the building and introduce air into the system equal to pressure of 1-inch water column. Use a U tube or manometer inserted in the trap of a water closet to measure this pressure. Air pressure shall remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.15

CLEANING

- A. Clean and disinfect water distribution piping as follows:
  1. Purge new potable water distribution piping systems and parts of existing potable water systems that have been altered, extended, or repaired prior to use.
  2. Use purging and disinfecting procedure prescribed by authority having jurisdiction or, if a method is not prescribed by that authority, the procedure described in either AWWA C651 or AWWA C652 or as described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill system or part thereof with water/chlorine solution containing at least 50 parts per million of chlorine. Isolate (valve off) and allow to stand for 24 hours.
    - c. Drain system or part thereof of previous solution and refill with water/chlorine solution containing at least 200 parts per million of chlorine. Isolate and allow to stand for 3 hours.
    - d. Flush system with clean, potable water until chlorine does not remain in water coming from system following allowed standing time.

- e. Submit water samples in sterile bottles to authority having jurisdiction. Repeat procedure if biological examination made by the authority shows evidence of contamination.
  - B. Prepare and submit reports for purging and disinfecting activities.
  - C. Clean interior of piping system. Remove dirt and debris as work progresses.
- 3.16 COMMISSIONING
- A. Fill water systems. Check compression tanks to determine that they are not air bound and that system is completely full of water.
  - B. Before operating systems, perform these steps:
    - 1. Close drain valves, hydrants, and hose bibbs.
    - 2. Open shutoff valves to full open position.
    - 3. Open throttling valves to proper setting.
    - 4. Remove plugs used during testing of piping systems and plugs used for temporary sealing of piping during installation.
  - C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.
  - D. Check plumbing specialties and verify proper settings, adjustments, and operation.
  - E. Energize pumps (if applicable) and verify proper operation.

3.17 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- B. Place plugs in ends of uncompleted piping at end of day or when work stops.
- C. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with 2 coats of a water-based latex paint.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for PLUMBING EQUIPMENT, ACCESSORIES, AND RELATED SYSTEMS which shall be payment in full for the work described herein.

END OF SECTION 22 10 00



**SECTION 22 11 16 – COPPER WATER SERVICE & ACCESSORIES**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description**

This Section covers potable water copper pipe service including fittings and appurtenances to be furnished, installed and tested as shown on the Drawings and as specified herein. All piping, fittings and appurtenances necessary to complete the installation shall be included under this Section of Work. Work included in this Section shall include making a pressure tap connection on an existing watermain; providing all copper water service piping; and all valving components necessary to bring a 1 inch water service line to the warming shelter.

**B. Related Work**

1. Other Sections as specified herein.

**1.02 QUALITY ASSURANCE**

**A. Acceptable Manufacturers**

1. Piping: (No preferred manufacturer. Comply with ANSI/AWWA and/or ASTM material Specification).
2. Corporation/Curb Stops & Water Service Boxes: Mueller. (Prior to ordering Contractor to confirm with agency having local jurisdiction for makes, models and styles).
3. Other items: As specified herein.

**B. Applicable Standards**

All Work related to the design, fabrication and installation of the equipment and materials to be provided or Work to be performed under this Section shall conform to the applicable requirements of the Standard Specifications for Water and Sewer Main Construction in Illinois together with ANSI/AWWA and/or ASTM standards, Specifications and requirements as specified herein. Where conflicts occur between codes, standards and Specifications, the more stringent shall apply.

**1.03 SUBMITTALS**

- A. General. All submittals shall be in accordance with the applicable requirements of the Supplemental Conditions.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for water service system materials, products, and related

appurtenances. Prior to ordering Contractor to coordinate with local municipalities for preferences.

- C. Piping and Appurtenances: A certified report of chemical analysis and physical test shall be provided to the ENGINEER for review.
- D. Record Drawings: At Project completion, submit record drawings of installed water service.

PART 2- PRODUCTS

2.01 GENERAL

- A. All piping and pipe fittings used in the various piping systems shall be of the indicated size and conform to the requirements shown on the Drawings. All materials and equipment shall be in accordance with the appropriate requirement specified herein, and shall be equal to the products listed below by brand name and catalog number, as applicable.
- B. Each length of pipe and fitting shall be plainly stamped, marked or color coded to an acceptable standard as to weight, class, and type thereof, and the manufacturer's trademark or name.

2.02 MINIMUM REQUIREMENTS AND RATINGS

ASTM B88, Type K for below grade copper water service lines.

2.03 DETAILS OF CONSTRUCTION

- A. Copper water services shall be provided at designated location as specified herein. Copper water services shall be not less than 1" inch diameter and shall be brought to within 5 feet of the structure requiring water service.
- B. Provide the required water service to the building.
- C. Copper water services shall generally consist of, but not be limited to the following components:
  - 1. Copper tubing shall conform to ASTM B88, Type K, hard drawn or soft temper. Copper tube and pipe shall be for underground service and shall be marked with the manufacturer's name or trademark, ASTM designation and size/weight/class/type.
  - 2. Corporation stop shall be copper flare eighth bend connection, Mueller H-15010. (Prior to ordering Contractor to coordinate with local municipalities for preferences.)
  - 3. Curb stop shall be Mueller H-15154. (Prior to ordering Contractor to coordinate with local municipalities for preferences.)

4. Water service boxes for 1"Ø water service lines shall be Mueller H-10304. (Prior to ordering Contractor to coordinate with local municipalities for preferences.)

PART 3-        EXECUTION

3.01        FACTORY TEST AND INSPECTION

Each item of the equipment shall be shop-assembled and tested in accordance with the manufacturer's standard procedure. Monitoring and control devices shall be functionally tested to verify correct operation and that all component parts function properly.

3.02        INSTALLATION AND TESTING

- A. General: The piping shall be installed as shown on the Drawings. Where changes in the pipe routing are required, the Contractor shall submit a drawing showing the proposed change to the ENGINEER for review.

The Contractor shall provide all tools, labor and equipment necessary for the safe and expeditious installation of all lines and appurtenances as shown on the Drawings and specified herein.

The Contractor shall inspect pipe and appurtenances prior to installation and promptly remove damaged or unsuitable materials and provide with new and unused materials.

- B. Size, Location and Alignment: The Contractor shall be responsible for all checking and conforming to size, location, alignment, and for flange drilling of all existing piping and equipment as required for making proper piping connections. All piping shall be arranged and aligned as far as practicable, in accordance with the Drawings. All risers and drops shall be installed plumb and true. Piping shall not interfere with access to valves or equipment and shall not obstruct passageways. Modifications to arrangement of piping systems may be required, subject to the review of the ENGINEER, to suit field conditions or to avoid interference with existing or new work of other trades. The Contractor shall furnish all offsets, additional fittings, etc., as required to meet the necessary requirements of installation conditions whether detailed on the Drawings or not.
- C. Piping Workmanship: Pipe shall be cut accurately by the Contractor to dimensions established at the site and shall be worked into place without springing or forcing. Cut sections of pipe shall be cut using pipe cutters to provide a square plain end. All pipe shall be cut in a neat and workmanlike manner without damage to the pipe so as to have a smooth end at right angles to the axis of the pipe, deburred and beveled in accordance with pipe manufacturer's recommendations.
- D. Installation: Installation shall generally be made in accordance with the Standard Specifications for Water and Sewer Main Construction in Illinois and as follows:

1. Copper water services shall be installed from the watermain to curb stop and water service box. Curb stop and water service box shall be located as close as possible to the property line of the respective private property owner being serviced.
  2. Installation of copper water services shall be as follows:
    - a. The maximum allowable (open cut) trench width for the installation of any size copper water service shall not exceed twenty four inches (24").
    - b. Any and all trench backfill required for the installation of copper water services shall be provided in accordance with the applicable requirements of other Sections of these Specifications.
    - c. Trench excavation and trench backfill for copper water service installation shall be considered incidental to the cost of this item.
- E. Hydrostatic Testing: Copper Water Service Piping and Accessories including related fittings and valves shall be hydrostatically tested. Tests shall be witnessed by the Owners Representative. Duration of test shall be at least two (2) hours.
- F. Cleaning and Adjustment: At the completion of the Work, all parts of the installations shall be thoroughly cleaned. The potable water service piping system shall be thoroughly flushed with potable water before acceptance for domestic operation.

3.03 PAINTING

(Not Applicable)

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for PLUMBING EQUIPMENT, ACCESSORIES, AND RELATED SYSTEMS which shall be payment in full for the work described herein.

END OF SECTION 22 11 16

**SECTION 22 40 00 – PLUMBING FIXTURES AND ACCESSORIES**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description**

This Section covers the plumbing fixtures (including the piping to plumb the plumbing fixtures), accessories and related appurtenances to be furnished, installed, and tested as shown on the Drawings and as specified herein. All supports, anchors, fittings and associated accessories where required, not otherwise specifically provided for in these Specifications, shall be included under this Section of Work.

**B. Related Work**

1. Other Sections as specified herein.

**1.02 QUALITY ASSURANCE**

**A. Acceptable Manufacturers**

As indicated on the Drawings and/or specified herein where applicable.

**B. Applicable Standards**

All Work shall conform to the applicable provisions of the codes, standards, and Specifications, as specified herein, including authorities having local jurisdiction, BOCA National Plumbing, and the Standard Specifications for Water and Sewer Main Construction in Illinois.

**1.03 SUBMITTALS**

In accordance with the Supplemental Conditions the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions for all equipment furnished.

**PART 2- PRODUCT**

**2.01 GENERAL**

The plumbing fixtures specified shall be furnished and installed as shown on the Drawings. All exposed trim, escutcheons, valves, traps, and accessory hardware shall be chromium plated. All necessary fittings, brackets, supports and fasteners shall be provided.

2.02 PERFORMANCE REQUIREMENTS

Performance requirements, capacities and ratings, where applicable, of the various plumbing fixtures shall be as shown on the Drawings, or as may be specified hereinafter.

2.03 DETAILS OF CONSTRUCTION

A. Plumbing Fixture Schedule

Plumbing fixtures shall be provided as indicated by the plumbing fixture schedule shown on the Drawings and shall include janitor mop sink, hose bibbs, water heater, and domestic water piping and waste piping as shown on the Drawings and as herein specified.

B. Water Heater

1. Point of Use: The single point gas fired tankless water heater shall be Rheem Model #RTGH-84 DVN. The unit shall have an integral flow restrictor and aerator and field serviceable element.

C. Soil (Waste) Piping

1. Sanitary Piping Below Grade shall be cast iron pipe ASTM A74 service weight with cast iron fittings. Joints shall be hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum, except that where shown on the Drawings watermain quality piping shall be used.
2. Sanitary Piping Accessories shall be provided as shown on the Drawings and shall include but not be limited to floor drains and clean outs.

D. Potable Water Piping for Domestic Supply

1. Water Meter shall be provided as shown on the Drawings and shall be of the magnetic drive type. The water meter shall meet or exceed the latest requirements of AWWA C700-77. The water meter assembly shall consist of a roll-sealed register; a cast bronze main case; a nutating disc measuring chamber; and a remote reading register providing remote visual indication. Contractor shall verify type, make and model of water meter with agency having local jurisdiction.
2. Backflow Preventer shall be of the double check valve type as manufactured by Cla-Val. The backflow preventer shall be provided as a complete assembly consisting of two independently acting spring loaded check valves, two service shut-off valves and four test locks. The backflow preventer shall be of bronze construction. Contractor shall verify type, make and model of backflow preventer with agency having local jurisdiction.

3. Gate Valves, 2-1/2 Inches (DN65) and Smaller: MSS SP-80; Class 125, 200-psi (1380-kPa) cold working pressure (CWP), or Class 150, 300-psi(2070-kPa) CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge copper-silicon alloy rising stem, Teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

E. Service Basin/Mop Sink

Service Basin/Mop Sink shall be molded stone construction, with a 10" high wall with integrally molded shelf. Service basin shall be provided complete with faucet fixture of the chrome plated mixing type, rigidly supported, with threaded hose connection and hook for hanging pails. Traps shall be enameled inside and have 3" IPS waste outlet, strainer, and cleanout plug. Sink depth shall be 10" minimum. Minimum overall dimensions shall be approximately 24"L x 24"W; with 10" height.

2.04 RELATED ACCESSORIES

Hose bibbs for house service water distribution shall be provided as shown on the Drawings. Hose bibbs for exterior service shall be freeze proof.

PART 3- EXECUTION

3.01 FACTORY TEST AND INSPECTION

Each item of equipment shall be shop-assembled and tested in accordance with the manufacturer's standard procedure. Electrical devices shall be functionally tested to verify correct operation and that all parts function properly.

3.02 INSTALLATION AND TESTING

The equipment shall be installed as shown on the Drawings in accordance with the manufacturer's instructions and recommended best practices. Installation shall include making the required piping connection(s) and all piping required to pipe and plumb the related plumbing fixtures, and testing to assure system is free of leaks and/or defects. All necessary shims, grout, anchor bolts, and other items required for installation and testing shall be furnished. All items of equipment shall be operated, adjusted, and tested for proper performance in accordance with the manufacturer's recommended test procedure.

3.03 PAINTING & FINISHES

All items specified in this Section shall be shop painted/finished with the manufacturer's standard finish. Chrome and vitreous china finishes shall be as previously specified and/or as shown on the Drawings.

PART 4-      MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for PLUMBING EQUIPMENT, ACCESSORIES, AND RELATED SYSTEMS which shall be payment in full for the work described herein.

END OF SECTION 22 40 00



**SECTION 23 01 00 – HEATING & VENTILATING EQUIPMENT**

PART 1- GENERAL

1.01 SCOPE

A. Description

This Section covers the heating, ventilating and air conditioning equipment and associated accessories including natural gas service to the building along with all coordination and all necessary appurtenances to be furnished, installed and tested as shown on the Drawings and as specified herein. All fittings, connectors, hangers, supports and anchors where required, not otherwise specifically provided for in these Specifications, but necessary to complete the various systems shall be included under this Section of Work.

B. Related Work

1. Other Sections as specified herein.

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers

(No preferred manufacturer. Comply with material/equipment performance specifications.)

B. Applicable Standards

All Work shall conform to the applicable provisions of the codes, standards, Specifications and requirements specified herein, which include, but are not limited to, the following:

<u>Name</u>	<u>Abbreviation</u>
Air Moving and Conditioning Association	AMCA
American Society of Heating, Refrigeration, and Air Conditioning Engineers	ASHRAE
Underwriters Laboratories, Inc.	UL
Sheet Metal and Air Conditioning Contractors National Association, Inc.	SMACNA

1.03 SUBMITTALS

In accordance with Supplemental Conditions the Contractor shall submit to the ENGINEER for review drawings, product specifications and description, together with performance test results, instruction manuals, installation instructions,

operating and maintenance manuals and field check-out, start-up and testing procedures of all equipment furnished.

PART 2-      PRODUCT

2.01      GENERAL

- A. All materials and equipment shall conform to the Specifications listed below and shall be equal to the products listed below by brand name and catalog number. Identification symbols and nomenclature where used in this Section are the same as those shown on the Drawings. Paragraphs of these Specifications describing the requirements of a single item of equipment shall apply equally to all identical items of equipment to be furnished.
- B. Fan bearings shall be either ball or roller type.
- C. Ventilating units shall be furnished complete with electric motor drives. Motors shall be in accordance with the applicable provisions of Section 15010, and as specified herein. Motor housing shall be totally enclosed or as otherwise specified.
- D. Ventilating units shall be statically and dynamically balanced as a unit. All rotating parts of the equipment shall operate throughout the required range without objectionable noise or vibration.

2.02      RATING AND PERFORMANCE

<u>Item</u>	<u>Designation</u>	<u>Rating/Item</u>
Gas Fired Unit Heater	UH1 & 2	70 cfm
Electric Floor Heating System	EFH1	17 w/sq.ft.
Warm Air Furnace	FUR-1	90,000 Btu/hr

2.03      DETAILS OF CONSTRUCTION

- A. Gas Unit Heater (UH1 & 2) shall be 2 kW low profile unit arranged for natural gas service and shall be provided complete with all accessories including couplings/fasteners, gas service piping and integral thermostats.
- B. Electric Floor Heating System (EF1). The electric floor heating system will be as manufactured by Danfoss. The system shall be installed in the top 1 ½" of the cast in place concrete floor of the warming shelter floor and shall consist of a cable layer of TXFH cable with cable protectors, sensors, thermostats, power module with GFCI and light buzzer with continuity alarms.  
  
 The system shall be capable of maintaining the ambient temperature of the warming shelter to 78° and 55° when non-occupied after the last train of the day.
- C. Natural Gas Furnace (FUR-1) shall be direct vent, horizontal mounted in attic space, of the natural gas type and provided with required appurtenances

including wall mounted thermostat and related accessories. The unit shall be of the forced air circulation type and arranged for heating and cooling. Blower system shall be by means of heavy duty motor. Motor shall be equipped with self-aligning bearings. Unit shall be provided with pilot light ignition and shall be arranged for 120 volt blower operation. Unit shall be AGA certified.

2.04 RELATED EQUIPMENT

A. Thermostats

Room thermostats shall be of the heavy duty digital type, 7 day programmable, attached to a subbase mounted on the walls where indicated on the Drawings. Thermostats shall be White Rodgers Model #IRC48. The thermostat shall be of the hard wired type with heat, off, cool, auto system switching. Thermostat covers shall be provided with vandalproof guard.

- B. Ductwork shall be straight and smooth on the inside with neatly finished joints which shall be provided with self-adhesive neoprene gaskets or mastic type sealouts. Where duct work is to be run exposed and attached to structure, it shall be of the single wall spiral type of the size specified in the plans. All exposed duct work shall be factory painted. Contractor shall coordinate color of duct work with Owner prior to ordering of materials. All exposed diffusers, louvers, hangers and supports shall match the color of exposed duct work. All other diffusers and louvers shall match the color of wall, ceiling or door in which they are to be installed. Joints shall be as air-tight as practically possible. Changes in dimensions and shapes of ducts shall be made in a gradual manner or turning vanes shall be provided. Minor adjustment may be made in the location of ducts and associated equipment, subject to the review of the ENGINEER, to avoid interference which might develop during the progress of the Work; but in such cases, duct capacities shall not be reduced nor air velocities increased above allowable limits as determined by the ENGINEER. Minimum thickness of sheet metal ductwork shall be 20 gauge unless otherwise shown on the Drawings or required by the application. Ductwork shall be of galvanized construction unless otherwise shown on the Drawings and shall be provided with all hangers, fitting, fasteners and accessories as required. Ductwork shall be constructed from galvanized sheet steel, except as otherwise shown on the Drawings. Materials of construction shall generally conform to the following. All ductwork shall be insulated in accordance with ASHRAE Standards.

1. Galvanized Sheet Steel

ASTM-A525, "Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process".

2. Aluminum Sheet

ASTM-B209, "Standard Specifications for Aluminum Alloy Sheet and Plate," (Federal Specifications QQA 250/2, Grade 3003-H14).

3. Structural Steel

ASTM-A36, "Specification for Structural Steel".

4. Flexible Connections

Fiberglass cloth, 32 ounce per square yard, with fire resistant neoprene coating on both sides, suitable for operating temperatures of 200 degree F with minimum tensile strength wrap of 450 psi and unpainted, UL listed and meeting the requirements of NFPA Standard 90A.

Supply grilles shall be of the removable core, adjustable, two-way directional type. Frames shall be constructed of stamped or rolled steel sections with air-tight sealing strips and provided with a factory fabricated volume control damper.

C. Gas Service and Piping

Gas service to the building shall be the responsibility of the contractor. The contractor shall be responsible for contacting the local natural gas utility service company and coordinating the required natural gas service to the proposed building. The contractor shall coordinate with the natural gas utility company to locate the proposed gas meter in the general location shown on the plans.

Gas piping above the floor shall be black, Schedule 40, ASTM A120 steel pipe. Fittings shall be black, malleable cast iron for piping 2 inches and smaller and welding fittings for piping 2 1/2 inches and larger.

Gas piping below grade shall be black, Schedule 40, ASTM A120, all welded construction, wrapped with asphalt impregnated Kraft paper. Finish joints with Bitumastic No. 50 and paper.

PART 3- EXECUTION

3.01 FACTORY TEST AND INSPECTION

Each item of the equipment shall be shop-assembled and tested to verify that all parts function properly and that no interference occurs between moving parts. Certified performance test curves from identical equipment shall be submitted to the ENGINEER.

3.02 INSTALLATION AND TESTING

The equipment shall be installed as shown on the Drawings and in accordance with the manufacturer's instructions and recommended best practices. All necessary shims, grout, lubrication, anchor bolts, and other items required for installation and testing shall be furnished. All items of equipment shall be operated, adjusted, and tested for proper performance in accordance with the manufacturer's recommended test procedure. The Contractor shall also test, adjust and balance the equipment specified in this Section, to verify that the air quantities delivered are in accordance with the Drawings.

3.03        PAINING

- A. All equipment specified in this Section shall be shop-painted with the manufacturer's standard finish.

PART 4-        MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for MECHANICAL WORK COMPLETE which shall be payment in full for the work described herein.

END OF SECTION 23 01 00

**SECTION 26 00 10 – GENERAL PROVISIONS FOR ELECTRICAL WORK**

PART 1- GENERAL

1.01 SCOPE

- A. This Section describes the general provisions for the Work to be performed under Division 26, Electrical, of this Contract. The Contractor shall comply with these general provisions and shall perform all Work in accordance with the Specifications contained in this Section, as supplemented by Specification in related Sections, and as shown on the Drawings.
- B. The following specifies the minimum general requirements by which the Contractor shall furnish, fabricate, deliver, erect, install, connect and test electrical materials, equipment and systems specified in the respective Sections of Division 26 and shown on the Drawings, so as to constitute a complete and operating electrical installation.
- C. The Contractor shall provide all necessary coordination between the suppliers of the specified equipment so as to provide a well-designed and satisfactory operating facility to the Owner. The Contractor is advised that these Specifications are not indented to cover every and all details of the Work. In case(s) where details related to the specified Work are not covered by these Specifications, it shall be the responsibility of the Contractor to include and execute such coordination and Work at no additional cost to the Owner.
- D. Items of equipment furnished and installed as a part of the Work under other Sections of the Specifications shall be connected and wired as a part of the Work under this Section.
- E. All operating limits of electrical apparatus whether furnished under this Section or in other Sections of the Specifications shall be adjusted in the field to meet the operating conditions reviewed by the ENGINEER as coordinated with ENGINEER and as required. This shall include settings of all overcurrent and trip devices, limit switches, timers, and control device adjustments, etc.

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers and Equipment Supplier

As shown on the Drawings and/or as specified hereinafter in subsequent Sections.

B. Applicable Standards

1. All electrical work furnished and installed under this Section shall be in strict compliance with the ordinances and bylaws of the City, State and/or any other political subdivision thereof governing the installation of the electrical work on this Project. In the absence of other more stringent authority, the electrical work shall conform to the requirements of the National Electrical Code.
2. The Contractor shall conform to the latest safety standards as required by the Occupational Safety and Health Administration (OSHA) in all Work performed. In addition, all equipment and materials shall meet all applicable OSHA requirements.
3. All equipment shall be U.L. rated.
4. Comply with requirements of Section 16060 for other codes and standards.
5. Illinois Department of Transportation (IDOT) Standard Specifications for Road and Bridge Construction referred to as Standard Specifications.

1.03 SUBMITTALS

- A. In accordance with the Supplemental Conditions the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation requirements for all equipment furnished.
- B. The Contractor shall not install any electrical work for any item of equipment specified under this or other Sections of the Contract until shop drawings of such equipment, reviewed by the ENGINEER, are made available to him/her. Any such Work installed by the Contractor prior to the ENGINEER's review will be the responsibility of the Contractor and any modification of the electrical work necessary to meet the equipment requirements shall be made without additional compensation.
- C. Before fabrication and assembly of equipment, submit the following:
  1. Front and rear elevations showing dimensions and the arrangement for each control cubicle/panel.
  2. Plan and section views, including dimensions, weights and mounting details.
  3. Details of bus, connections, terminals, etc., including the complete ground bus arrangement and enclosure ground connections.

4. Single line diagram of equipment and control schematic diagram.
  5. Wiring Diagrams
    - a. Connection diagrams for the wiring of equipment in each cubicle.
    - b. Interconnection diagrams for the wiring to equipment in other cubicles. Clearly identify the terminal block points for the external wiring to be routed in or out of the cubicles. Provide adequate space on the wiring diagrams for additions (by the Contractor) or cable and wire designations for that external wiring to be routed in or out of the cubicles at the terminal block.
  6. Bill of Material.
  7. Factory test procedures and protocols, as well as installation instructions.
- D. Prior to shipment of the equipment, submit for record and distribution:
1. All drawings as finally reviewed and corrected.
  2. Recommended storage instructions.
  3. Installation instructions and operating and maintenance manuals.
  4. Spare parts bulletins.
  5. Factory test reports (certified).
  6. Booklet on maintenance procedures for circuit breakers and other equipment.
  7. Field test procedures and protocols.
- E. After final installation of the equipment the Contractor shall deliver a complete set of reproducible shop drawings of (including schematics, internal point-to-point and interconnecting) diagrams for all equipment and panels showing Work "as installed".

PART 2-      PRODUCTS

2.01      GENERAL

A.      Standard Products

The equipment furnished shall be standard products in production by reputable companies regularly engaged in the manufacture of high-quality equipment of the type specified. Similar equipment shall have been in satisfactory and successful operation for a period of at least two years. All parts of the specified equipment shall be so designed as to be especially adapted for the service required and shall be proportioned, enclosed, or guarded as to have ample and liberal strength and stability to withstand, without damage, the stresses to which



they may be subjected during erection or operation. The component parts of duplicate items shall be fabricated on a principle of interchangeability to facilitate ready replacement.

B. Materials

All material incorporated in the equipment shall be new and of first-class quality, free from injurious defects and imperfections, and of the classifications and grades designated. Materials not specifically designated herein shall be subject to the review of the ENGINEER and shall be suitable for the purpose intended.

C. Identification Symbols and Nomenclature

Identification symbols and nomenclature where used throughout these Specifications are the same as those shown on the Drawings. Paragraphs of the Specifications describing the requirements of a single item of equipment shall apply equally to all identical items of equipment to be furnished.

2.02 RATINGS

The sizes, ratings, capacities, and performance characteristics of various specified items of equipment and devices are based on currently available standard products, which are available through United States manufacturers. In no case shall the size, rating, capacity or performance characteristic be less than that specified unless approved in writing by the ENGINEER. Ratings and performance characteristics, where applicable, of various devices and items of equipment are specified in respective Sections of these Specifications. All electrical equipment shall be UL rated.

2.03 DETAILS OF CONSTRUCTION

- A. Electrical work shall meet requirements of these Specification, product manufacturer's instructions, recommended tolerances and recommended procedures, and as indicated by final reviewed submittals for the Work.
- B. Materials shall be of size and thickness indicated. If not indicated, size and thickness shall be selected to provide strength and durability in finished Work for intended application. Work to dimensions indicated, using proven fabrication details.
- C. Product finishes, surfaces and edges shall be smooth and free of marks, burrs, seams, roughness and like defects or conditions.
- D. Other electrical-mechanical product construction details shall be in accordance with the best engineering practices, applicable code requirements and as specified in other Sections of these Specifications.

PART 3-      EXECUTION

3.00          GENERAL

- A.      The Contract Drawings indicate the general details necessary for the complete electrical installation. It shall be the Contractor's responsibility to install all electrical work in a neat and workmanlike manner. The Contractor shall cooperate with others to permit the installation of all of the Work without interferences. If changes become necessary to avoid interference between the Work installed under various Sections, the Contractor shall submit to the ENGINEER, for review, the proposed changes and upon review by the ENGINEER, proceed with the installation of such changes without additional cost to the Owners.
  
- B.      The Contractor shall maintain at the site a set of black-line prints on which shall be accurately shown the actual installation of all Work done under Division 26 and any variation from the Contract Drawings as reviewed by the ENGINEER including changes in sizes, locations, and dimensions shall be indicated thereon. At the conclusion of the Work, the Contractor shall furnish record drawings in accordance with the General Conditions and as specified herein.

3.01          FACTORY TEST AND INSPECTION

- A.      All equipment shall be shop-assembled and tested in the manufacturer's shop in accordance with recognized standard practices. Factory tests and inspections shall be conducted to verify that the equipment is operating satisfactorily and in compliance with the Specifications. Certain factory tests and inspections are required to be witnessed by the ENGINEER. Where such witnessing is required by these Specifications the Contractor shall give ample notice to the ENGINEER prior to the scheduled factory test or inspection.

3.02          INSTALLATION AND TESTING

- A.      General: Examine the areas and conditions under which electrical work is to be installed or performed and remedy any conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected.
  
- B.      Existing Facilities: Verify existence, location, and operation of existing electrical facilities to be abandoned, removed, altered, modified and/or temporarily relocated to allow activities during construction of the Work.
  
- C.      Install electrical work. Meet requirements of these Specifications, product manufacturer's instructions, recommended tolerances, and recommended procedures and as indicated by final reviewed submittals for the Work.
  
- D.      Trenching and Backfilling. Unless otherwise specified, trenching and backfilling for conduit, cable, etc. shall be in accordance with IDOT Standard Specifications as a minimum and/or as may otherwise be shown on the Drawings or specified in other Sections of these Specifications.

- E. Tests: Comply with the requirements of Section 16050 as a minimum, and as specified in other Sections of these Specifications.

3.03 PAINING

- A. In general, all specified equipment shall be shop painted with the manufacturer's standard finish and shall be field painted as specified and/or as otherwise directed by the ENGINEER.
- B. The Contractor shall be responsible for coordination of the compatibility between manufacturer's standard finish and the field paint.
- C. Painting shall be as specified in other Sections of these Specifications.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 00 10

**SECTION 26 00 20 – BASIC ELECTRICAL MATERIALS AND METHODS**

**PART 1- GENERAL**

**1.01 SCOPE**

In accordance with the Specifications contained in this Section and as shown on the Drawings, the Contractor shall furnish and install complete, and test, where specified, unless otherwise indicated, the following items of electrical material, equipment and systems for a complete operating electrical installation.

1. Electrical Conduit
2. Electric Devices and Accessories
3. Wire and Cable
4. Electrical Panel(s)
5. Grounding

**PART 2- PRODUCT**

**2.01 GENERAL**

All equipment shall be new and shall be essentially standard products of the manufacturers regularly engaged in the production of the type of equipment specified herein. Like items shall be the product of a single manufacturer.

**2.02 RATINGS/SIZES**

(As specified in other Sections of these Specifications.)

**2.03 DETAILS OF CONSTRUCTION**

- A. All permanent foundation materials such as anchor bolts, either embedded in the concrete or required for anchoring, shall be furnished with the equipment. Approved types of expansion anchors may be used where practicable for small equipment.
- B. Each item of manufactured equipment furnished under these Specifications shall have a permanent nameplate affixed thereto in a readily visible place, showing the serial number, the name and address of the manufacturer, rated capacity, speed, electrical characteristics, and other pertinent data, as applicable. Nameplates of distributing agents only, will not be acceptable.
- C. Control panels shall be furnished with the equipment complete with terminal blocks, wiring, and other miscellaneous devices as indicated or required by the intended operation of the equipment or by the Drawings or Specifications. The equipment shall include all auxiliary and accessory devices, such as auxiliary transformers, auxiliary relays, protective devices, and resistors, whether or not they are expressly specified or indicated on the Drawings. Adequate provisions shall be made to accommodate, support, and connect cables to the terminal blocks or point of attachment. The Contractor shall locate and arrange his/her terminal blocks so that the external cable connections can be made in a neat and

proper fashion. Shielded cables shall be grounded at the panel end only, and shall be terminated on terminal blocks. The shield terminations shall be subject to review.

- D. Control wiring in Control panels shall be Type MTW stranded copper conductors, #12 AWG minimum size, 600-V. Class D stranded wire shall be used for wiring across hinged joints. Wiring shall be neatly arranged, properly supported, and terminated at terminal blocks. At least 20% extra terminals shall be provided at each group of blocks. Control circuits and power circuits shall be completely separated by use of divided cubicles or barriers. Terminal blocks shall be 600-V furnished with covers and marking strips showing the wire designation on the wiring diagrams or as designated by the ENGINEER. Not more than 2 wires shall be connected to any one terminal screw. Terminals shall be suitable for a maximum external conductor size of #8 AWG.
- E. The surfaces of the panel shall be bonderized (or otherwise treated so as to be substantially corrosion-resistant), primed and finished with 2 coats of the manufacturer's standard gray baked enamel applied in accordance with the manufacturer's directions. The interior surfaces shall be finished and painted in accordance with the standard practice of the equipment manufacturer. All surfaces to be painted shall be thoroughly cleaned, and all oil film and loose scale shall be removed before applying the first coat of paint. The color of the paint will be determined by the Owner. One gallon of finish paint used shall be furnished for touching up damaged surfaces after installation.
- F. Each meter, instrument, operating device, control switch, panel and circuit shall have a nameplate with engraved circuit designation mounted in a clearly visible location. If any of the foregoing devices do not have apparatus designation thereon that is visible from the front, a nameplate with engraved apparatus designation shall also be furnished. Nameplates shall be uniform in shape, size, finish and lettering and be made of laminated black and white micarta or clear plastic material with lettering embossed on the back side and filled-in with opaque paint. The width and depth of the lettering shall be so designed as to be legible from reasonable angles of observation. A typical nameplate sample shall be submitted to the ENGINEER for review.
- G. The Contractor shall size, furnish and install all pads and anchorages required for electrical equipment. The necessary excavation, backfilling, concrete and reinforcing steel shall conform to the requirements of applicable codes and other Sections of these Specifications. The Contractor shall furnish and install all the anchor bolts, pipe sleeves, brackets, leveling and setting plates, etc. when and where required.

PART 3-        EXECUTION

3.01        INSTALLATION

The methods of installation of Contractor-furnished equipment and materials are described in subsequent Sections and shall in general be in accordance with the manufacturer's standard procedure and recognized engineering practices.

3.02 TESTS

- A. All electrical equipment, materials, and supplies shall have passed adequate routine factory tests. Field tests shall be made by qualified personnel, having thorough experience in previous jobs of similar scope, approved by the Owner. Field tests shall be made on electrical equipment or on each electrical installation or system as specified below, or as required to establish satisfactory operations and conformance with these Specifications. The tests shall be witnessed by the ENGINEER. The Contractor shall give the ENGINEER two weeks' notice in advance of the tests. The Contractor shall furnish all apparatus, materials, labor, and facilities for performing the required tests. Corrections for any defects shall be made by and at the expense of the Contractor to the satisfaction of the ENGINEER. The Contractor shall submit test methods and a list of test equipment to be used for conducting these tests subject to the review of the ENGINEER. Records of all tests made shall be kept by the Contractor and furnished to the ENGINEER in triplicate, no later than 7 calendar days after each test is completed.
- B. Control circuits shall be tested prior to operational testing with the control circuits energized but with the controlled equipment disconnected or otherwise made inoperable. The control systems shall be checked for proper operation by actuating each contact which initiates a control operation, and then following the control sequence through the affiliated devices to ascertain that correct results are obtained with each condition of interlocking. The actuating of contacts as required to initiate an operation and to set up interlocking conditions shall be accomplished manually or by simulated operating conditions, whichever is applicable. At this time, adjustments shall be made as required to temperature switches, thermostats, pressure switches, flow switches, position switches, limit switches, auxiliary relays, timers and all other automatic control, interlocking and annunciation devices.
- C. After the individual items of wiring and equipment have been tested and proved satisfactory and the preliminary control tests have been completed, the equipment shall be further tested for satisfactory operation under normal operating conditions. The equipment shall be lubricated, balanced, aligned, adjusted and operated through sufficient sequences and for a sufficient length of time to establish, to the satisfaction of the Owner, that the equipment, including all safety and limit devices, has been correctly installed and operates properly.
- D. Specific tests to be performed in addition to the above tests are given in the Sections in which the equipment or system installation is specified.

3.03 PAINTING

(See Paragraph 2.03, E of this Section).

PART 4-      MEASUREMENT AND PAYMENT

4.01          METHOD OF MEASUREMENT:

No separate measurement shall be made for BASIC MATERIALS AND METHODS.

4.02          BASIS OF PAYMENT:

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 00 20

## SECTION 26 00 60 - BASIC ELECTRICAL REQUIREMENTS

### PART 1- GENERAL

#### 1.01 SCOPE OF WORK

- A. The Contractor shall provide items, articles, materials, operations and methods required by the Drawings and Specifications including labor, equipment, supplies and incidentals necessary for completion of the Work under this Contract.
- B. Apparatus, appliance, material or work not shown on the Plans, but mentioned in the Specifications, or vice versa, or any incidental accessories necessary to make the work complete and ready for operation, even though not specified or shown on the Drawings shall be furnished and installed without additional expense to METRA.
- C. Should there be any discrepancies or a question of intent, the Contractor shall refer the matter to the Engineer for decision before ordering any equipment, materials, or before starting any related work.
- D. The Contractor shall furnish, erect, install, connect, clean, adjust, test and condition all manufactured articles, materials and equipment, and place in service in accordance with the manufacturer's directions and recommendations except as otherwise specified herein.

#### 1.02 QUALITY ASSURANCE

##### A. General.

- 1. The Contractor shall carefully examine the Contract Documents, visit the site, and thoroughly become familiar with the local conditions relating to the work. Failure to do so will not relieve the Contractor from the obligations of the Contract.
- 2. Materials and installation shall conform to the applicable Codes and Standards.
- 3. After all equipment, devices and raceways are installed and wires and cables are in place and connected to devices and equipment, the Contractor shall test the system for continuity, property phase rotation, short circuit, improper grounds, and other defects. If any defective conditions are present, the Contractor shall make all necessary corrections and retest for compliance.
- 4. Each major component of equipment shall have the manufacturer's name, address, model number and rating on the manufacturer's nameplate securely affixed in a conspicuous place.
  - a. The nameplate of a distributing agent is not acceptable.



- b. Code ratings, labels or other data which are die-stamped into the surface of the equipment shall be in an easily visible location.

B. Codes and Standards

1. Materials and installation shall comply with codes, laws and ordinances of Federal, State, local governing bodies having jurisdiction.
2. In every installation where regulations of electric utility and telephone companies apply, conformance with their regulations shall be mandatory and any costs involved shall be included in the Contract.
3. In case of differences between building codes, State and Federal laws, local ordinances and utility companies' regulations and the Contract Documents, the most stringent shall govern.
4. All design, equipment and materials specified by design shall conform to any acts, laws, rules and regulations of the following organizations:
  - a. Local municipal code shall take jurisdictional precedence over all other authoritative bodies except that the more stringent shall apply.
  - b. National Electrical Code (ANSI/NFPA 70).
  - c. National Electrical Safety Code (NESC-ANSI C2).
  - d. American National Standards Institute (ANSI).
  - e. National Fire Protection Association (NFPA).
  - f. Institute of Electrical and Electronics Engineers (IEEE).
  - g. Insulated Cable Engineers Association (ICEA).
  - h. National Electrical Manufacturers Association (NEMA).
  - i. Illuminating Engineering Society (IES).
  - j. Underwriters Laboratories Inc. (UL).
  - k. Canadian Standards Association (CSA).
  - l. Occupational Safety and Health Administration (OSHA).
5. Should work be performed which does not comply with the requirements of the applicable building codes, State and Federal laws, local ordinances, industry standards and utility company regulations, changes for compliance shall be done at no additional cost.

6. The Contractor shall secure and pay for all permits, governmental fees, taxes and licenses necessary for the proper execution and completion of the Work.
7. The Contractor shall submit to governmental agencies and utility companies shop drawings, which are required by these agencies, for their approval.
8. The Contractor shall notify the Engineer of any materials or apparatus believed to be inadequate, unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction.

1.03

SUBMITTALS

- A. In accordance with the Supplemental Conditions the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions for all equipment furnished.
- B. As soon as practical and within thirty days after award of contract and before any material or equipment is purchased, the Contractor shall submit to the Engineer for approval one sepia and six prints of all shop drawings to be incorporated in the work.
- C. Shop drawings shall include manufacturer's names, catalog numbers, cuts, diagrams and other such descriptive data as may be required to identify and approve the equipment.
- D. Extended time for submitting special shop drawing may be requested; however, an extension of time approved does not relieve this Contractor of his responsibility of executing this work in accordance with the Contract.
- E. Any listed materials, fixtures, apparatus, or equipment that are not in accordance with the Specification requirements can and will be rejected for use in this installation and construction.
- F. Any materials, fixtures, apparatus or equipment installed without stamped or written approval shall be removed by the Contractor and replaced with specified equipment at the direction of the Engineer and without recourse for additional compensation.
- G. Substitutions to listed acceptable manufacturers equipment and material will not be accepted.

1.04

INFORMATION REQUIREMENTS

- A. The Contractor shall submit data to the Engineer and representatives of METRA prior to purchasing and installation. The data will include but not be limited to the following:

1. Construction design drawings, schematic, wiring, lighting panel schedules, one line diagram, lighting, conduit, duct banks, conduit and cable schedules, grounding, symbols and legends, etc.
2. The Equipment Manufacturer schematic diagrams shall be the JIC ladder type.
3. The Equipment Manufacturers wiring diagrams shall show terminal blocks for external wiring.
4. The Equipment Manufacturers internal point to point and external wiring diagrams between cubicles, panels and components within the equipment line up shall be provided.
5. Catalog cuts and major electrical Equipment Manufacturers' drawings shall be included, but is not limited to, relays, meters, current and potential transformers, disconnect switches, fuses, contactors, lighting and more.
6. Complete rating data for all equipment shall be provided.
7. Instruction books, operation and maintenance manuals with spare parts manuals shall be provided.
8. As Built drawings shall be provided. The Contractor shall prepare As Built drawings in CAD format using Microstation V8 or AutoCAD 2004 software. Digital CD-ROM back-up disks to be turned over to ENGINEER together with one set of reproducible plots.

B. Installation Drawings:

1. In addition to the preparation and submittal of Shop Drawings for manufactured electrical equipment and materials, the Contractor shall prepare and maintain in current status, a complete set of detailed, completely circuited, and dimensioned electrical construction drawings for all electrical work included under this Contract. These drawings shall be made at the Contractor's expense and shall be made by CAD in the format identified in Section 1.04(A)8.
2. The installation drawings shall be made under the direction and supervision of the Contractor and shall show all electrical work inclusive of conduit, wiring, electrical equipment and devices, lighting fixture locations and elevations, points where conduit enters or leaves structural slabs and walls, junction boxes, conduit supports and inserts.
3. The Contractor shall provide a separate set of installation drawings for the lighting system; a separate set of installation drawings for the power and control; and a separate set of installation drawings for the special systems (telephone, security and fire alarm).
4. The complete electrical distribution system from the source including each branch circuit panelboard shall be shown and dimensioned exactly

as installed, with all feeders located on the installation drawings. Major equipment, lighting controls and apparatus shall be shown to scale and properly located, conduit home runs are not acceptable.

5. The installation drawings shall include floor plans and reflected ceiling plans with electrical layouts drawing at a scale (or scales) as required with a minimum scale of 1/8 inch equal 1 foot, 0 inches. It is intended that construction drawings of each trade be the same scale(s) in order to permit respective plans to be superimposed upon all others of each trade.
6. In addition to the floor plans, the layouts of all congested areas such as mechanical and/or electrical equipment rooms, and all functionally critical areas shall be drawn at a minimum scale of 1/4 inch equals 1 foot, 0 inches, or with all details of construction shown. The Engineer may request additional installation drawings if in his opinion they are required to properly coordinate the project.
7. All installation drawings shall be made on sheets of the same size and with the same border lines and title blocks as the METRA Drawings, with the Contractor's name added.
8. The Contractor shall be responsible for the coordination of electrical work with the work of all other trades and shall, in preparing for the installation drawings, continually check the work of all other trades (inclusive of that indicated by shop drawings) in order to avoid possible installation conflicts arising therefrom. It shall be understood that the work shown on the installation drawings has been so coordinated. In the event of conflicts or interferences that cannot be resolved in the field, the Contractor shall request a written clarification from the Engineer.
9. The installation drawings shall indicate the electrical installation exactly as constructed and therefore shall be periodically revised to reflect all changes inclusive of those required by the Engineer, those which are or have been found necessary in the field, those which may be suggested by the Contractor and approved by the Engineer, etc.
10. Conduits shall be shown on the installation drawings as installed. Conduit home runs are not acceptable.
11. Revisions shall be performed when considered necessary by the Engineer or the Contractor in order to facilitate proper coordination, but shall in no event be performed at interim periods exceeding 30 days between each such revision.
12. The initial copy of all installation drawings shall be submitted to the Engineer for review. These submittals shall not be considered as shop drawings, and are not subject to the shop drawing approval process. Subsequent revised copies need not be issued to the Engineer unless so requested. It shall be clearly understood that these installation drawings are for installation coordination purposes only and cannot in any way alter the requirements of the Contract. Therefore, the Contract Drawings,

Specifications, and authorized revisions thereto, shall remain the only determinants of the Contract requirements.

13. Upon completion, the initial installation drawings, and all revised installation drawings thereafter, shall be dated and certified by the Contractor as having been fully coordinated by him. It shall then be understood that the work shown thereupon is ready for construction.
  14. No electrical work shall begin until these drawings (and each revision thereof) are so drawn, and thereafter finally accepted by the Engineer.
  15. All installation drawings shall be made in accordance with an approved schedule, prepared by the Contractor, and arranged to coincide with actual construction in such a manner as to allow the latter to proceed without delay.
  16. If, in the opinion of the Engineer, the coordination drawings are in acceptable condition after each has been finally revised and accepted, the Contractor may submit same as the field record drawings called for elsewhere in the Specifications.
  17. The Contractor shall include wiring diagrams and schematic diagrams. Each schematic diagram shall be JIC ladder type. Wire numbers shall be shown on all schematic and wiring drawings.
  18. The minimum drafting letter size shall be 1/8 inch in height, block style.
- C. The Contractor shall submit test reports as described under Division 26.

#### 1.05

#### DRAWINGS

- A. The Drawings are diagrammatic and/or home-run type which are intended to convey the scope of work and indicate the general arrangement and/or sizes of conduit, equipment, fixtures and other work included in the Contract.
- B. The location of items required by the Drawings or Specifications are not definitely fixed by dimensions, are approximate only. The exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to the approval of the Engineer.
- C. The Contractor shall coordinate the location of the lighting fixtures with the location of the mechanical equipment, and Architectural reflected ceiling plans.
- D. The Contractor shall layout the work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.
  1. Where headroom or space conditions appear inadequate, the Engineer shall be notified before proceeding with installation.

2. Any minor changes in the locations of equipment, fixtures, lighting fixtures conduits, outlets, devices, etc., from those locations as shown on the Drawings shall be made without extra charge to METRA. A minor change in location shall be considered to be within 10'-0 of the location as may be scale from the Drawings for all interior work and 25'-0 for all exterior work.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements and mechanical injury, but readily accessible for inspection until installed.
  1. Items subject to moisture damage shall be stored in dry heated spaces.
  2. Manufacturer's directions shall be followed in the delivery, storage, protection, installation and operation of all equipment and materials.
- B. The Contractor shall determine, from examination of the Drawings, whether any special temporary openings in the building will be required for the admission of apparatus furnished under this SECTION, and notify the Engineer accordingly. In the event of failure to give sufficient notice in time to arrange for these openings during construction, the Contractor shall assume all costs of provide such openings thereafter.
- C. The Contractor shall coordinate with the Engineer the movement of heavy machinery, equipment and heavy parts thereof brought into or onto the building or premises.
- D. Conduit openings shall be kept closed by means of plugs or caps to prevent the entrance of foreign matter.
- E. The Contractor shall cover all fixtures, equipment and apparatus as required to protect them against dirt, water, chemical or mechanical damage both before and after installation.
- F. Equipment shall be inherently safe and moving parts shall be covered with guards.

1.07 EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

- A. In the event that conflicts, if any, cannot be settled rapidly and amicably between the affected trades, with the Work proceeding in a workmanlike manner, then the Engineer shall decide which work is to be relocated and his judgment shall be final and binding on the Contractor.
- B. No measurements of a Drawing by scale shall be used as a definite dimension to work by.

1.08 INSTRUCTIONS AND ADJUSTMENTS

- A. At the conclusion of the Work and before final contract payment is made, the Contractor shall demonstrate and explain to METRA the function, operation and maintenance of all equipment and systems installed.
- B. The primary adjustments of the system(s) shall be accomplished by the Contractor to the complete satisfaction of METRA and Engineer at the time of completion of the installation.

PART 2- PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment shall be new and shall be UL or CSA labeled and shall bear the manufacturer's name, model number and other identification markings.
- B. Materials and equipment shall be the standard product of a manufacturer regularly engaged in the production of the required type of material or equipment for at least five years (unless specifically exempted by the Engineer) and shall be the manufacturer's latest design with published properties.
- C. Equipment and materials of the same general type shall be of the same manufacturer throughout the project to provide uniform appearance, operation and maintenance.
- D. Equipment and materials shall be without blemish or defect and shall not be used for temporary light or power purposes, including lamps, without the Engineer's written authorization.

2.02 ENCLOSURES FOR ELECTRICAL EQUIPMENT/FITTINGS

- A. Enclosures for electrical equipment shall conform to the area classification described below or unless noted on the Drawings.
- B. NEMA Type 1A gasketed shall be used in electrical rooms.
- C. NEMA Type 12 shall be used in indoor dry locations, mechanical equipment room, garages.
- D. NEMA Type 13 oil tight shall be used for all control panels.
- E. NEMA Type 3R or NEMA Type 4X stainless steel shall be used for exterior locations as shown on the drawings or herein specified.

PART 3-      EXECUTION

3.01      INSTALLATION OF WORK

- A. The Contractor shall perform all Work with trained mechanics of the particular trade involved in a neat and workmanlike manner as approved by the Engineer.
- B. The Contractor shall perform all Work in cooperation with other trades and schedule to allow speedy and efficient completion of the Project.
- C. The Contractor shall furnish other trades with advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit trades affected to install their work properly and without delay.
- D. Where there is evidence that the work of one trade will interfere with the work of other trades, all trades shall assist in working out space conditions to make satisfactory adjustments and shall be prepared to submit and revise coordinated shop drawings.
- E. With the approval of the Engineer and without additional cost to METRA, the Contractor shall make minor modifications in the Work as required by structural interferences, by interferences with work of other trades or for proper execution of the Work.
- F. Work installed before coordinating with other trades so as to cause interferences with the work of such other trades shall be changed to correct such condition without addition cost to METRA as directed by the Engineer.
- G. Minor changes in the locations of outlets, fixtures and equipment shall be made prior to rough-in at the direction of the Engineer and at no additional cost to METRA.
- H. The equipment shall be installed with ample space allowed for removal, repair or changes to equipment. Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment which is to be installed or which is in place.
- I. The Contractor shall compare the Drawings and Specifications, checking all measurements to determine the intent of the Contract Documents. Any discrepancies shall be brought to the Engineer's attention for interpretation.
- J. Locations of electrical outlets, lighting panels, cabinets, equipment, etc. are approximate and exact locations shall be determined by the Contractor at the Project site.
- K. The Contractor shall refer to the Contract Documents for details and reflected ceiling drawings.
- L. The Contractor shall protect the materials and work of other trades from damage during installation of the work provided under this Contract.



3.02 EQUIPMENT NOISE LIMITATION

- A. Noise levels of electrical devices and equipment shall be within acceptable limits as established by NEMA or other valid noise rating agencies. Noise levels shall be subject to the Engineer's review which will be based on practical and reasonable considerations of occupancy requirements.
- B. The Contractor shall check and tighten the fastenings of sheet metal plates, covers, doors, and trims to prevent vibration and chatter under normal conditions of use.
- C. When located elsewhere than in high-noise-level equipment rooms, the enclosures or solenoid-operated switching devices and other noise-producing devices shall have anti-vibration mountings and non-combustible sound-absorbing linings.
- D. Transformers, reactors, dimmers, lamp ballasts, and solenoids shall be designed and rated for quiet operation.
- E. The Contractor shall remove and replace any individual electrical item or device that is found to produce a sound energy output exceeding that of other identical devices installed at the Project.

3.03 TRANSMISSION OF VIBRATION

- A. Electrical equipment, conduit, and fittings shall not be mounted to or supported by elements subject to vibration except by methods which will prevent transmission thereof.
- B. Where flexible lengths of conduit are utilized as a means of isolating equipment and conduit systems vibration, care shall be exercised to assure continuity of ground throughout.

3.04 PROTECTION

- A. The Contractor shall protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps.
- B. The Contractor shall cover fixtures, materials, equipment and devices furnished or installed under this SECTION or otherwise protect against damage, both before and after installation.
- C. Fixtures, materials, equipment, or devices damaged prior to final acceptance of the work shall be restored to their original condition or replaced.
- D. Equipment shall be inherently safe and moving parts shall be covered with guards.

3.05 INSTALLATION OF WORK FOR OTHER SECTIONS

- A. The Contractor shall coordinate all electrical work and shall complete all wiring, conduit, material and electrical equipment as required for equipment installed under other Divisions of these Specifications.

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT:

No separate measurement shall be made for BASIC ELECTRICAL REQUIREMENTS.

4.02 BASIS OF PAYMENT:

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 00 60

**SECTION 26 01 20 – REDISTRIBUTION OF EXISTING PLATFORM LIGHTING CONTROLLER****PART 1- GENERAL****1.01 SCOPE**

This item shall consist of electrically connecting the existing platform lighting units to a proposed new electric service meter fitting in the service meter center location shown on the plans and removing the existing electrical feed from the existing Metra electric cabinet and VOM cabinets.

**PART 2- PRODUCTS****2.01 GENERAL**

This work shall consist of providing a new electric service connection and feeders to the existing system and providing new electric meter fitting in the new service meter center, secondary conductors, conduit and connecting new service to the existing main breaker in existing cabinet. Contractor shall provide new photocell in the existing lighting control cabinet to establish standalone operation of controller when complete. See details on Drawings.

**2.02 SIZE REQUIREMENTS**

Conduit sizes shall be as shown on the Drawings. In cases where conduit sizes are not shown on the Drawings, the minimum size shall be in accordance with the applicable provisions of NEC and existing conditions.

**2.03 DETAILS OF CONSTRUCTION**

The contractor shall provide new wiring and conduit to the existing Metra electric cabinet using minimum #6 AWG from the existing Metra electric cabinet to the proposed ComEd meter fitting in the proposed service meter center. This work shall include conduit splices, connectors, fuse holders and fusing, and all material/labor required. Work to be performed is shown in the contract plan drawings and shall be in conformance to the N.E.C. and local ordinances.

**PART 3- EXECUTION****3.01 OPERATION OF EXISTING LIGHTING SYSTEM**

The existing lighting system shall remain in operation throughout construction via existing photocell/time clock circuits fed from the existing Metra electric cabinet. The contractor shall not disconnect existing lighting feeder cables to the main circuit breaker in lighting controller until new ComEd electric service has been installed and inspected by ComEd and the Village of Maywood. The contractor shall be responsible for maintaining and keeping in operation throughout construction all existing lighting units and controls.

PART 4-      MEASUREMENT AND PAYMENT

4.01          METHOD OF MEASUREMENT

No separate measurement shall be made for REDISTRIBUTION OF EXISTING PLATFORM LIGHTING CONTROLLER.

4.02          BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 01 20

**SECTION 26 01 40 - ELECTRICAL TESTING**

**PART 1- GENERAL**

**1.01 SCOPE OF WORK**

**A. Description of Work**

The Contractor shall be responsible for testing all equipment.

This Section of Specifications covers the test and checks that shall be made on all electrical equipment and wiring to ensure compliance with the applicable codes and standards and with the Drawings and Specifications. Whenever possible, all checks and tests shall be coordinated with the field schedule and field conditions.

Before testing and energizing a system, all necessary precautions shall be taken by the Contractor to ensure the safety of personnel and equipment. All conductors and all electrical equipment shall be properly insulated and enclosed. All enclosures for conductors and equipment shall be properly grounded. Insulation resistance measurements must have been made and approved on all conductors and energized parts of electrical equipment.

**B. Related Work**

All mechanical and electrical equipment specified in Division 22 & 26 which are electrically connected.

**1.02 QUALITY ASSURANCE**

All test procedures shall be in accordance with recognized and safe procedures.

**1.03 SUBMITTALS**

Prior to testing the Contractors shall submit a protocol of test procedures.

**PART 2- PRODUCTS**

(NOT USED)

**PART 3- EXECUTION**

**3.01 TESTING**

A. The following tests are required but shall not be limited to this list. Tests will be supervised and witnessed by the METRA authorities.

1. Proper phase rotation.
2. Short circuits.

3. Improper grounds.
  4. Power and control electrical circuits for circuit continuity and function test.
- B. The Contractor shall furnish all meters, instruments, cable connections, equipment or apparatus necessary for making all tests.

3.02 TESTS

- A. The Contractor shall check and test all transformers, power panels, feeders, power and control cables and connections, and motors to assure correct phase sequence and rotation. Phase sequence shall be A-B-C as follows:
1. Top to bottom, left to right and front to rear when facing protective or disconnecting mechanism.
  2. Phasing shall be accomplished by using distinctive colors for various phases, as indicated.
- B. After wires and cables are in place and connected to devices and equipment, the system shall be tested for short circuits, improper grounds, and other faults. If fault condition is present, the trouble shall be rectified, then retested.
- C. Phase conductors, if shorted, grounded or at fault shall be removed, replaced and then retested.
- D. A voltage test shall be made at lighting panel and at the last outlet on each circuit. If drop in potential exceeds 2%, the Contractor shall correct the condition by locating the ground or high resistance splice or connection and retest.
- E. Any wiring device, electrical apparatus, or lighting fixture grounded or shorted on any integral live part, shall be removed and the trouble rectified by replacing the defective parts or materials.
- F. Upon completion of the electrical work, the Contractor shall place the entire installation in operation, test for proper function, and show systems and equipment to be free of defects.
- G. The Engineer will conduct from time to time such tests as may be required to any part of the equipment to determine if it is installed in accordance with specifications. The Contractor shall extend to the Engineer all facilities to this end and shall furnish skilled or unskilled help required. All tests shall be witnessed by the Engineer and three copies of the verified test results shall be given to the Engineer promptly upon completion of a test.
- H. The Contractor shall provide assistance to the various Equipment Manufacturer's field engineers as required in the testing and adjusting of the electrical power and control equipment. Cooperation of the Contractor must be such that a minimum of time is required for equipment testing.
- I. A log shall be maintained for all tests. This log shall be certified before completion of the job, both as to test value and date of test.

- J. Any faults in the work performed by this Contractor or in materials or equipment furnished by the Contractor shall be corrected or replaced promptly by this Contractor at his own expense. Any faults in materials or equipment furnished by the Contractor which are the result of careless, incompetent or improper handling or installation by the Contractor shall be corrected or replaced promptly by this Contractor at his own expense.
- K. All tests shall be made at the Contractor's expense and certification of the tests shall be submitted to the Engineer. If any failures occur during the tests, the Contractor shall replace the equipment or material.

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT:

No separate measurement shall be made for ELECTRICAL TESTING.

4.02 BASIS OF PAYMENT:

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 01 40

**SECTION 26 01 50 – MAINTENANCE OF EXISTING LIGHTING SYSTEMS**

**PART 1- GENERAL**

**1.01 SCOPE**

- A. Replace Article 801.12 of the Standard Specifications with the following:
- B. Effective the date the Contractor's activities (electrical or otherwise) at the job site begin, the Contractor shall be responsible for the proper operation of all existing and proposed lighting systems which are part of, or which may be altered by the work until final acceptance or as otherwise determined by the Engineer.
- C. Before performing any excavation, removal or installation work (electrical or otherwise) at the site, the Contractor shall initiate a request for a maintenance preconstruction inspection, to be held in the presence of the Engineer and a representative of the party or parties responsible for maintenance of any lighting systems which may be affected by the work. The request for the maintenance preconstruction inspection shall be made no less than seven (7) calendar days prior to the desired inspection date.
- D. The Contractor shall conduct an inventory of any existing lighting equipment which may be affected by the work, making note of any parts which are found broken or missing, defective or malfunctioning. This inventory shall be reviewed with and approved by the Engineer and a record of the inventory shall be submitted to the Engineer for the record. Existing electric cables shall also be meggered and readings recorded. Without such a record, all systems transferred to the Contractor for maintenance during construction shall be returned at the end of construction in complete, fully operating condition.

**1.02 MAINTENANCE OF EXISTING LIGHTING SYSTEMS**

- A. Existing Lighting Systems. Existing lighting systems shall be defined as any lighting system or part of a lighting system, which has been installed within the limits of this project. The contract drawings may indicate the general extent of any existing lighting, but whether indicated or not, it remains the Contractor's responsibility to ascertain the extent of effort required for compliance with these Specifications and failure to do so will not be justification for extra payment or reduced responsibilities.
- B. Full Maintenance. If the number of circuits affected by the contract is greater than 40% of the total number of circuits in a given controller, or the subject controller requires work, the Contractor shall maintain the entire controller and all associated circuits.



PART 3-        EXECUTION

3.00        MAINTENANCE OF PROPOSED LIGHTING SYSTEMS

- A.        Proposed Lighting Systems. Proposed lighting systems shall be defined as any lighting system or part of a lighting system which is to be constructed under this contract.
  
- B.        The Contractor shall be fully responsible for maintenance of all items installed under this contract until acceptance by the ENGINEER. Maintenance shall include, but not limited to, any equipment failures or malfunctions as well as equipment damage either by the motoring public, Contractor operations, or other means. The cost of replacing or repairing any malfunctioning or damaged equipment shall be included in the bid price of this item and will not be paid for separately. In the case of equipment damage caused by the motoring public, the Contractor shall have the right to recover costs associated with repair of the damage from the motoring public.

3.01        LIGHTING SYSTEM MAINTENANCE OPERATIONS

- A.        The Contractor's responsibility shall include all applicable responsibilities of the State of Illinois, Department of Transportation, Division of Highways, District One as defined in Art. 800 of the SSRBC. These responsibilities shall include lighting units (including sign lighting), cable runs and lighting controls. In the case of a pole knockdown or sign light damage caused by normal vehicular traffic, the Contractor shall promptly clear the lighting unit and circuit discontinuity and restore the system to service.
  
- B.        Responsibilities shall also include weekly night-time patrol of the lighting system, with patrol reports filed immediately with the Engineer and with deficiencies corrected within 24 hours of the patrol. Patrol reports shall be presented on standard forms as designated by the Engineer. Uncorrected deficiencies may be designated by the Engineer as necessitating emergency repairs as described elsewhere herein.
  
- C.        Failure to provide this service will result in liquidated damages of \$500 per day per occurrence. In addition, Metra reserves the right to assign any work not completed within this time frame to an Electrical Contractor. All costs associated to repair this uncompleted work shall be the responsibility of the Contractor. Failure to pay these costs to the Electrical Contractor within one month after the incident will result in additional liquidated damages of \$500 per month per occurrence. Unpaid bills will be deducted from the cost of the Contract.

3.02        OPERATION OF LIGHTING

The lighting shall be operational every night, dusk to dawn. Duplicate lighting systems (such as temporary lighting and proposed new lighting) shall not be operated simultaneously. Lighting systems shall not be kept in operation during long daytime periods at the Owner's expense.

PART 4-      MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

Damage caused by the Contractor's operations shall be repaired at no additional cost to the Contract and shall be included in this item.

END OF SECTION 26 01 50

**SECTION 26 05 19 – WIRE AND CABLE**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description**

This Section specifies the furnishing, installing, connecting, and testing of all insulated wire and cable required for component parts of electrical power, control, annunciation, low level control, signal, instrumentation, lighting, and telephone, including lugs and terminals, terminal blocks, cable joints, splice connectors, splicing materials, cable grips and wedges, cable clamps, cable supports, cable terminators, identification tags, and other miscellaneous equipment required to make a complete installation ready for operation.

**B. Related Work**

All equipment to be electrically connected.

**1.02 QUALITY ASSURANCE**

**A. Acceptable Materials**

Conductors shall be annealed copper wire, tinned where required and shall conform to the requirements of ICEA Standards.

Cable and wire shall conform to the corresponding requirements of the below listed Applicable Standards.

**B. Applicable Standards**

Construction and testing of all wire and cable shall conform to the applicable requirements of the ICEA Standard S-19-81, NEMA Pub. WC-4 "Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy"; ICEA Standard S-61-402, NEMA Pub. No. WC-5, "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy"; or ICEA Standard S-66-524, NEMA Pub. No. WC-7, "Cross Linked Thermosetting-Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy"; ICEA Pub. No. 68-516, NEMA Pub. No. WC-8, "Ethylene-Propylene-Rubber-Insulated Wire and Cable for Transmission and Distribution of Electrical Energy"; or ICEA Pub. No. S-56-434, "Standard for Polyethylene-Insulated Thermoplastic-Jacketed Communication Cables". Installation shall conform to the requirements of the NEC.

**1.03 SUBMITTALS**

In accordance with the Supplemental Conditions, the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions and field check-out/testing procedures for all cable and wire furnished. Construction and insulation material features of all

cable and wire shall be submitted for review. Samples shall be furnished when requested.

PART 2-      PRODUCT

2.01          GENERAL

Conductors shall be annealed copper wire, tinned when required and shall conform to the requirements of ICEA Standards.

2.02          SIZE REQUIREMENTS

Not less than required by NEC and as shown on the Drawings.

2.03          DETAILS OF CONSTRUCTION

A.          600-V Power and Lighting Cable

Service entrance cables and any other power and lighting cables installed in conduits which are routed in concrete slabs or underground shall be Type RHH-RHW-USE with insulation suitable for 600-V operation. Branch power and lighting circuits installed in conduits which are routed in conduit above or below grade shall be Type RHW or USE, with insulation suitable for 600-V operation. No wire smaller than No. 12 AWG shall be used. Conductors No. 10 AWG and smaller may be solid. Conductors larger than No. 10 AWG shall be Class B stranded.

B.          Control, Instrumentation, and Annunciation Cable

Control, instrumentation, and annunciation cable shall be single conductor suitable for 600-V service. Cable shall consist of Class B stranded conductors with insulation the same as that for 600-V power cable specified above. An overall outer jacket of polyvinyl chloride or neoprene shall be provided. Individual conductors of a multi-conductor cable shall be color coded.

C.          Low Level Control, Instrumentation, and Signal Cable

The low level control, instrumentation and signal cables for carrying digital, analog, audio, or DC pulsed signals shall have individually shielded twisted pairs, PVC insulated for 600-V service, with overall shielding, and PVC jackets. The conductor shall be Class C stranded, No. 16 AWG or larger. Individual conductors of all twisted pairs shall be color Coded.

D.          Telephone Cable

Telephone cable shall consist of No. 16 AWG or larger conductors with polyethylene insulation made up in color-coded twisted pairs to reduce crosstalk, a non-hygroscopic tape cable binder, a copper tape shield, and a polyethylene jacket.

E. Fixture Wire

Fixture wire shall be No. 12 AWG or larger with Class B stranding and with construction conforming to NEC, Type SF-2, consisting of a silicone rubber insulation with a protective woven fiber glass braid.

PART 3- EXECUTION

3.01 FACTORY TESTS AND INSPECTION

Routine factory testing and inspection shall be performed in accordance with the requirements of the applicable standard.

3.02 INSTALLATION AND TESTING

A. Installation

1. Cable runs shall be continuous from terminal to terminal to the extent permitted by available commercial lengths. If splices are made in a run, they shall be made in boxes provided for the purpose and in an approved manner. The splicing process shall produce a joint which is as moisture-proof as the cable itself. Splices concealed in conduit shall not be permitted.
2. Insulated wire and cable shall be handled with care so as to avoid kinking and damage to insulation and outer jackets. Cables shall not be bent around a radius less than that recommended by the manufacturer.
3. The Contractor shall furnish all boxes, lugs, terminal blocks, and spade or ring terminals required where not furnished with the equipment and shall make all connections required to provide a complete installation ready to operate.
4. Cable identification tags of a permanent type shall be provided and installed on all cables used for power, control, annunciation, telephone, metering and relaying, and lighting (except branch lighting conductors) for easy identification of the cables. Splices made in boxes shall also be permanently and prominently tagged. Tags shall bear the cable or wire designation shown on the Drawings or as directed. Samples of the proposed tags shall be submitted for review.
5. Wires and cables, in addition to being permanently tagged for identification, shall also be color coded as much as possible, except that Green shall always be used exclusively for "Ground" and White always for "Neutral" or "Return". In 1-ph service, Black shall always be "Hot". Switch and branch legs may be Red, Blue, Brown, Orange, Purple, or Yellow.
6. No cable shall be pulled into conduit unless the conduit is clean and dry.

7. Cable wedges, basket-weave grips, and clamps shall be furnished and installed to support vertical or inclined cable runs as shown on the Drawings or as required. Cables passing through hand holes shall be grouped, formed along the walls, and supported on brackets.
8. Sufficient slack shall be allowed in each run to permit contraction and expansion. Where a number of single conductor cables or wires comprising a circuit are trained through a pullbox, terminal box, or wiring gutter, they shall be neatly laced and tied together. Lacing shall also apply from the point of leaving a raceway to the point of attachment on the terminals of the Service Entrances/Switchboard, Motor Control Centers, Control Cabinets, or other devices unless the run will be in conduit. Lacing cord and the method of lacing shall be subject to review. Exposed wires and cables shall be cleaned of all wire pulling lubricant which may have remained on the cables after pulling through conduits or ducts.
9. Cables entering free standing equipment compartments from below shall be supported near the floor by means of approved cable clamps and brackets.
10. Metallic braid or tapes of shielded cables shall be grounded at only one end of the cables.
11. Connections in wires and cables shall be made in conformance with National Electrical Code.
12. Splicing of wires and cables shall be made in appropriately sized enclosures, as follows:
  - a) Lighting wires and cables AWG sizes 12-10 shall be spliced by means of spring action type, insulated, color coded connectors, Scotchlock. Connectors shall be individually sealed by means of Scotchlock connector sealing compound.
  - b) Power and control cables AWG sizes 12-6 shall be spliced using in line compression type copper connectors.
  - c) Power cables AWG sizes 4-350 MCM shall be spliced using compression type, one or two holes straight copper lugs.
13. Any and all excavation, trenching, concreting, backfilling required for the installation of wire and cables, shall be performed by the Contractor and at the Contractor's expense.

B. Testing

1. All circuits shall be rung-out or talked-out with proper signaling devices, and with all equipment disconnected at each end, to indicate that the circuit is continuous.

2. Resistance measurements shall be taken after installation on all wire and cable, but before connections are made to equipment terminal, including shielded cables but excluding telephone circuits, to determine the adequacy of the insulation. Each circuit shall be tested for insulation between conductors, and between conductors and ground. Insulation resistances shall not be less than 1,000,000 Ohms to ground when testing with a 500-V DC direct reading "Megger" Ohmmeter.

3.03 PAINING

(Not applicable to this Section).

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

No separate measurement shall be made for WIRE AND CABLE.

4.02 BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 19

**SECTION 26 05 20 – WIRES AND CABLES FOR SITE ELECTRICAL WORK**

PART 1- GENERAL

1.01 SCOPE

A. Description of Work

This Work shall consist of furnishing and installing all wires and cables as shown in the plans, or as directed by the Engineer. The work shall include all labor, materials, tools and equipment necessary to furnish place, and connect all wires, cables, and associated items.

B. Related Work

1. General Electric Requirements
2. Basic Electrical Materials & Methods/Requirements
3. Voice of Metra Instrument Cabinet
4. Underground Conduit Runs
5. UP-W Electric Cabinet and Pad
6. Electrical Connection for Site Equipment

1.02 QUALITY ASSURANCE

Comply with the provisions of the following codes:

- A. National Electric Code (NEC)
- B. NFPA 70 "National Electrical Code." Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.
- C. UL Compliance: Provide components which are listed and labeled by UL under the following standards.

UL Std. 486A - Wire connectors and soldering lugs for use with copper conductors.  
UL Std. 854 - Service entrance cable.

1.03 SUBMITTALS

The Contractor shall submit to the ENGINEER for review drawings, product specifications and descriptions, in accordance with the applicable requirements as specified in the Supplemental Conditions for all equipment furnished.



1.04        REFERENCES

Except as modified herein, the Work shall conform to the applicable portions of Sections 801, 810, 820, 821, 822, and 1085 of the Standard Specifications.

1.05        QUALITY ASSURANCE

Comply with the provisions of the following codes:

- A.    National Electric Code (NEC)
- B.    NFPA 70 "National Electrical Code." Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.
- C.    UL Compliance: Provide components which are listed and labeled by UL under the following standards.

UL Std. 486A - Wire connectors and soldering lugs for use with copper conductors.

UL Std. 854 - Service entrance cable.

PART 2-    PRODUCTS

2.01        WIRES AND CABLES

The material shall meet the requirements of Articles 1085.01, 1085.02, 1085.25, 1085.26, and 1085.27 of the Standard Specifications.

- A.    Conductor Material- Copper for all wires and cables.
- B.    Conductor sizes indicated are based on copper.
- C.    Insulation: Provide cross-linked polyethylene all on conductors.

2.02        CONNECTORS FOR CONDUCTORS

- A.    Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.
- B.    For each electrical connection, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.
- C.    Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.

- D. Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, electrical solder, electrical soldering flux, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated.

PART 3-      EXECUTION

3.01      INSTALLATION REQUIREMENTS

Work under this item shall be performed in accordance with Sections 820, 821, and 822 of the Standard Specifications, except as herein modified.

- A. Install electrical cables, wires, and connectors in compliance with the NEC.
- B. Pull conductors simultaneously where more than one is being installed in same conduit.
- C. Use pulling means such as fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or conduits. Do not use rope hitches for pulling wire or cable.
- D. Keep conductor splices to a minimum.
- E. Install splice and tap connectors which are compatible with conductor material, and which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.
- F. Provide a minimum of 18" of length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.
- G. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.
- H. Install electrical connections as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- I. Coordinate with other work, including wires/cables, conduits and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- J. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.

- K. Prepare cables and wires, by cutting and stripping jacket and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- L. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- M. All wire/cable shall be installed with care to prevent damage to the cable insulation. The contractor shall check the wire/cable for defects as it is being installed. Any defects found shall be reported to the Engineer, and if they may be remedied, they shall be repaired to the satisfaction of the Engineer, or the wire/cable shall be replaced as directed.
- N. The wire/cable shall be pulled into the conduit with a minimum of dragging on the ground or pavement. This shall be accomplished by means of reels mounted on jacks or other suitable devices conveniently located for unreeling wire/cable directly into conduit in such a manner as to not damage the wire/cable.
- O. Where lubricants are necessary to facilitate installation of the wire/cable, only a vegetable based lubricant may be used for plastic coated wire/cable.
- P. Bends in the wire/cable shall conform to the recommended minimum radius as outlined in the NEC.
- Q. The wire/cable shall be color coded so that each lead of all circuits may be easily identified and lighting units connected to the proper leg as indicated on the plans and wiring diagram. The smallest conductor or equipment grounding conductor shall always be green in color.
- R. All wire or cable in the distribution and control cabinets shall be properly trained and have sufficient slack provided for any rearrangement of equipment for future additions.
- S. Any wire/cable terminations or splices, where approved, shall be made in a workmanlike manner. All connectors and insulating tapes and materials shall be approved by the Engineer. Splices and terminations shall be considered incidental to the installation of the wire/cable, and no additional payment shall be made for same.

3.02 FIELD QUALITY CONTROL

- A. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled in accordance with Article 801.14 of the Standard Specifications.
- B. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.

- C. Subsequent to wire and cable hook-ups, energize circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.

PART 4-      MEASUREMENT AND PAYMENT

4.01          METHOD OF MEASUREMENT

No separate measurement shall be made for WIRES AND CABLES FOR SITE ELECTRICAL WORK.

4.02          BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 20

**SECTION 26 05 21 – OUTLETS, PLUGS, SWITCHES, & APPURTENANCES**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description**

This Section covers power receptacles, outlets and plugs, and switches for the control of lighting circuits to be furnished, installed and tested as shown on the Drawings and as specified herein. All supports, anchors, fittings and associated accessories where required but not specifically provided for in these Specifications, shall be included under this Section of Work.

**B. Related Work**

1. Other Sections as specified herein.

**1.02 QUALITY ASSURANCE**

**A. Acceptable Manufacturers**

Crouse-Hinds Company, Appleton Electric Company, Russell and Stoll.

**B. Applicable Standards**

All Work shall conform to the applicable provision of the codes, standards and Specifications as specified herein, including but not limited to the National Electric Code.

**1.03 SUBMITTALS**

In accordance with the Supplemental Conditions the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions for all equipment furnished.

**PART 2- PRODUCT**

**2.01 GENERAL**

Receptacles shall be duplex type. All receptacles, switches, and devices shall be U.L. listed.

**2.02 RATING**

Devices shall be arranged for 120 volt service (as a minimum). Other ratings shall be as specified hereinafter or as may be shown on the Drawings.

2.03 DETAILS OF CONSTRUCTION

A. Convenience Outlets and Plugs

1. Outlets shall be duplex type, 3-wires, GFCI type, rated 20A., 125 Volt AC installed in weatherproof box with IN USE type covers. The weatherproof cast box shall be Crouse-Hinds Co., Cat. No. FD2 by Appleton Electric Co., or Russell and Stoll. The gasketed cover shall be Crouse-Hinds Co., WLGF-FS by Appleton Electric Company.
2. All Outlets installed shall be of the ground fault interrupting type. Outlet rating and enclosure shall be the same as in A.1 above.
3. Each receptacle shall be furnished with two matching plugs of the same type and rating.

B. Switches

Switches used for the control of lighting fixtures shall be of the weatherproof type. The switches shall be specification grade, AC only, rated 20A, 120-277 V. AC single pole, double pole, three-way or four-way as required. The weatherproof cast box shall be Crouse-Hinds Co., type FD, neoprene gasket by Appleton Electric Co., or Russell and Stoll. Switches installed in public access areas shall be of the locking type.

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT:

No separate measurement shall be made for OUTLETS, PLUGS, SWITCHES & APPURTENCES.

4.02 BASIS OF PAYMENT:

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 21

**SECTION 26 05 26 – GROUNDING SYSTEM**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description**

This Section covers the grounding system(s) to be furnished, installed and tested as specified herein and as shown on the Drawings. All related fittings and connections where required, not otherwise specifically provided for in these Specifications but necessary to complete the system, shall be included under this Section of Work.

**B. Related Work**

1. All electrically connected equipment and components.
2. All non-current carrying metal parts.
3. Other Sections as specified herein.

**1.02 QUALITY ASSURANCE**

**A. Acceptable Manufacturers**

1. Connectors and Fittings: Cadweld
2. Other items as specified.

**B. Applicable Standards**

The grounding system(s) shall conform to the applicable requirements of the National Electrical Code.

**1.03 SUBMITTALS**

In accordance with the Supplemental Conditions, the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions and field check-out/testing procedures for all equipment furnished.

**PART 2- PRODUCT**

**2.01 GENERAL**

All electrically connected equipment and components shall be grounded. Grounding shall be furnished complete and shall permanently and effectively ground neutral points of transformers, electrical equipment frames, conduits, and all non-current carrying metal parts including structural steel as shown on the Drawings and as specified herein.

2.02 GROUNDING REQUIREMENTS

Measurement of ground resistance shall be made by an approved method. If the measured value of ground resistance exceeds the required value, additional grounding cables and/or ground rods shall be installed as directed. The required value of grounding resistance shall not exceed 50 ohms.

2.03 DETAILS OF CONSTRUCTION

A. Ground Conductors

Ground conductors shall be soft drawn, Class B stranded copper cables, and copper bus bars. Conductors shall be bare except as otherwise shown on the Drawings.

B. Ground Rods

Ground rods shall be 3/4" (minimum) diameter, copperweld, 10-ft. minimum length buried depth.

C. Connections

Cable-to-cable and cable-to-ground rod connections within the grounding system shall be made by a mechanical connection U.L. listed for direct burial service. The cable shall be cleaned of all dirt, grease, moisture, and oxidation before connections are made. Soldered connections will not be accepted.

PART 3- EXECUTION

3.01 FACTORY TEST AND INSPECTION

(Not applicable to this Section).

3.02 INSTALLATION AND TESTING

A. Installation

1. Connections to building steel, reinforcing steel, embedded metal, stairs, hatches, and other metalwork shall be welded except connections to galvanized equipment which shall be made with bolted copper lugs welded to the cable.
2. Ground cables embedded in concrete shall cross expansion or contraction joints at right angles to the joint and shall be installed in such a manner that movement will not damage the cable. All metal conduit shall be grounded by means of independent copper connections to the ground system. Grounding bushings may be used to establish ground connections to the conduit.



3. Where ground taps emerge from concrete, grounding inserts or pads shall be furnished and installed flush with the finished concrete. Grounding inserts shall be Cadweld Type B-164 Ground Connectors, or AMPACT ground pad type 276950-1. Ground connections to switchboard, motors, motor control centers, and other equipment can be made by copper cable taps from the ground system brought out of the concrete provided that the location of the equipment is known and the taps can be correctly placed.

B. Tests

The grounding system(s) shall be tested for continuity of all ground connections and for overall resistance to ground of the entire interconnected grounding system. Three certified copies of the field tests shall be furnished to the Engineer. The Contractor shall notify the Engineer 48 hours prior to field testing so that such tests may be witnessed.

PART 4-      MEASUREMENT AND PAYMENT

4.01      METHOD OF MEASUREMENT

No separate measurement shall be made for GROUNDING SYSTEM.

4.02      BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 26

**SECTION 26 05 29 - SUPPORTING DEVICES**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description of Work**

This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings. Conduit shall not be supported by spring clips.

**B. Related Work**

1. General Provisions for Electrical Work.
2. Basic Electrical Materials & Methods.
3. Basic Electrical Requirements.
4. Electrical Conduit.
5. Other Sections of Division 26 requiring supporting devices.

**1.02 QUALITY ASSURANCE**

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code, latest edition."
- B. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally
- C. Recognized testing and listing agency that provides third-party certification follow-up services.

**1.03 SUBMITTALS**

- A. General: All submittals shall be in accordance with the applicable requirements of the Supplemental Conditions.
- B. Product data for each type of product specified, including hanger and support schedule showing manufacturer's figure number, size, spacing, features, and application for each required type of hanger, support, sleeve, seal, and fastener to be used.
- C. Shop drawings indicating details of fabricated products and materials.

**PART 2- PRODUCTS**

**2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
  1. Slotted Metal Angle and U-Channel Systems:

- a. Allied Tube & Conduit
- b. American Electric
- c. B-Line Systems, Inc.
- d. Unistrut Diversified Products

2. Conduit Sealing Bushings:

- a. Bridgeport Fittings, Inc.
- b. Cooper Industries, Inc.
- c. Killark Electric Mfg. Co.
- d. O-Z/Gedney
- e. Raco, Inc.
- f. Spring City Electrical Mfg. Co.
- g. Thomas & Betts Corp.

2.02 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

2.03 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:
1. Expansion Anchors: Carbon steel wedge or sleeve type.
  2. Toggle Bolts: All steel springhead type.
  3. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.

- E. U-Channel Systems: 16-gage steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.
- 2.04 FABRICATED SUPPORTING DEVICES
- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.
- C. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal for sleeve diameter noted:
    - a. 3-inch and smaller: 20-gage.
    - b. 4-inch to 6-inch: 16-gage.
    - c. over 6-inch: 14-gage.
  2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
  3. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe.

PART 3- EXECUTION

3.01 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC and the following requirements:
1. Conform to manufacturer's recommendations for selection and installation of supports.
  2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
  3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.

4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
  5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
  6. Space supports for raceways in accordance with Table I of this section. Space supports for raceway types not covered by the above in accordance with NEC.
  7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
  8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- D. Vertical Conductor Supports: Install simultaneously with installation of conductors.
- E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.
- F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- G. Sleeves: Install in concrete slabs and walls and all other fire-rated floors and walls for raceways and cable installations. For sleeves through fire-rated-wall or floor construction, apply UL-listed fire stopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with "Fire Resistant Joint Sealers" requirement of Division 7 Section "Joint Sealers."
- H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

- I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:
  1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.
  2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
  3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.
- J. Tests: Test pull-out resistance of one of each type, size, and anchorage material for the following fastener types:
  1. Expansion anchors.
  2. Toggle bolts.
  3. Powder-driven threaded studs.
- K. Provide all jacks, jigs, fixtures, and calibrated indicating scales required for reliable testing. Obtain the structural Engineer's approval before transmitting loads to the structure. Test to 90 percent of rated proof load for fastener. If fastening fails test, revise all similar fastener installations and retest until satisfactory results are achieved.

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

No separate measurement shall be made for SUPPORTING DEVICES.

4.02 BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 29

**SECTION 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

PART 1- GENERAL

1.01 SCOPE

This Section covers the general provision for furnishing and installing all conduits, related boxes and fittings, and associated accessories as required for the electrical power, control, annunciation, instrumentation, communication, and lighting systems as shown on the Drawings and as specified herein. All necessary hardware including, but not limited to screws, bolts, hangers, concrete inserts, clamps, locknuts, bushings, sealing bushings, couplings, pulling-in irons, identification tags, etc. shall be included.

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers

Shall include but not be limited to LTV Steel Company, Allied Tube and Conduit Corporation, The Steelduct Company, American Brass Company, Republic Steel.

B. Applicable Standards

All Work shall conform to the applicable provisions of the codes, standards, and Specifications, as specified herein, and the following:

<u>Name</u>	<u>Abbreviation</u>
Specifications for Rigid Steel Conduit, Zinc Coated	ANSI C80.1
Specifications for Fittings for Rigid Metal Conduit and Electrical Metallic Tubing	ANSI C80.4
Conduit Fittings and Accessories	NEMA FB-1
Outlet Boxes and Fittings	UL-514
National Electrical Code	NEC

1.03 SUBMITTALS

- A. The Contractor shall submit to the ENGINEER for review drawings, product specifications and descriptions, together with operating and maintenance instructions, specified in Section 01 33 00 of all equipment furnished.
- B. As part of the Record Drawings submitted, the Contractor shall submit a conduit schedule at the completion of the Project.

The conduit schedule shall contain, as a minimum, the following information for each run of conduit.

1. Conduit designation.
2. Conduit type and size.
3. Routing: the routing shall identify the equipment (from-to) connected at the conduit termination.
4. Description of cables installed in the conduit including function of cables.

PART 2-      PRODUCTS

2.01      GENERAL

Electrical conduit and related fittings shall be U.L. listed. The conduit inside diameter shall have a smooth finish to facilitate fishing and/or pulling of wires and cables. Where flexible conduits are used they shall be of the liquid tight type.

2.02      SIZE REQUIREMENTS

Conduits smaller than 3/4-inch diameter shall not be allowed. Conduit sizes shall be as shown on the Drawings. In cases where conduit sizes are not shown on the Drawings, the minimum size shall be in accordance with the applicable provisions of NEC.

2.03      DETAILS OF CONSTRUCTION

A.      Rigid Metal Conduit and Fittings

1. Rigid metal conduit shall be heavy wall, hot-dip galvanized steel. Thin wall conduits and metallic tubing are not acceptable unless specifically shown on the Drawing or specified for use in other Sections of these Specifications.
2. Metal conduit fittings and covers shall be galvanized or sherardized iron or malleable iron castings with gaskets as required. Composition or rubber gaskets shall be provided where required to prevent entrance of moisture.
3. Rigid metal conduit expansion joint fittings shall consist of standard manufactured products, designed so as to prevent damage to the cables and equipped with approved means of providing electrical continuity of the conduit run. Expansion joint fittings shall permit a small amount of transverse movement as well as longitudinal movement. All couplings and fitting joints shall be of the threaded type.
4. Aluminum shall not be used either for conduits, fittings, pullboxes, junction boxes, or any other electrical device, unless otherwise specifically shown on the Drawings.



B. Flexible Liquid-Tight Conduit

1. Flexible liquid-tight conduit shall be "Sealtite Type UA".
2. The conduit shall consist of an interlocked galvanized steel core and a liquid tight cover made of polyvinyl chloride synthetic resin. A ground bonding conductor shall be included.

C. Electrical Metallic Tubing (EMT) and Related Fittings

Electrical metallic tubing shall comply with FS WW-C-563 and ANSI C80.3. EMT fittings shall comply with FS W-F-408. EMT shall be provided only as shown on the Drawings or as otherwise specified in other Sections of these Specifications. Couplings, connectors and other fittings for EMT shall be cadmium or zinc plated steel, or cadmium plated malleable iron and shall be raintight, compression type.

D. Rigid Nonmetallic Conduit

1. Rigid nonmetallic conduit shall be of the polyvinyl chloride (PVC) type, schedule 80 as shown on the Drawings, and shall be in accordance with the applicable requirements of NEC.
2. The conduit, fittings and accessories shall be manufactured from polyvinyl chloride complying with ASTM D1784 and shall comply with all the applicable requirements of NEMA Publication No. TC2, UL 651 for EPC-40-PVC and N.E.C. Article 347.
3. Fittings and accessories for the electrical plastic conduit shall comply with all applicable requirements of NEMA Publication No. TC3.
4. The solvent cement used to join the conduit and fittings shall meet the requirements of ASTM D2564.

E. Junction, Outlet, Terminal, and PullBoxes and Covers

Junction, outlet, and pullboxes and covers shall be constructed of stainless steel, painted aluminum, sheet steel or cast-metal as shown on the Drawings. Covers shall be secured with screws, except for boxes 16 inches or larger which shall have piano hinged covers with quarter turn screws, or as otherwise specified. Gaskets shall be provided for all boxes and be padlockable. Terminal boxes shall be furnished with UL listed terminal blocks as required and as indicated on the Drawings for the wire sizes indicated.

F. Handholes

1. Handholes and covers shall be made of precast polymer concrete reinforced with fiberglass. Enclosures, boxes and covers are required to conform to all test provisions of the most current ANSI/SCTE 77 "Specification for Underground Enclosure Integrity" for a minimum Tier 15 rating, or as otherwise indicated on the Drawings. When multiple "Tiers"

are specified the boxes must physically accommodate and structurally support compatible covers while possessing the highest Tier rating. All covers are required to have the Tier level rating embossed on the surface. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box and cover) are manufactured using matched surface tooling. Handholes (including box and cover) shall be UL listed.

2. Handholes shall be as indicated on the Drawings and shall be stackable straight wall enclosures, provided with skid resistant, 2-bolt lids, engraved with specified logo. Handholes shall be provided with stainless steel hardware and cable racks/hooks.

### PART 3- EXECUTION

#### 3.01 FACTORY TEST AND INSPECTION

Routine factory testing and inspection shall be performed in accordance with the requirements of the applicable standard.

#### 3.02 INSTALLATION AND TESTING

##### A. General

Any and all excavation, trenching, coring, backfilling, incidental concreting (not part of a structure in which conduits are embedded) and/or concreting required for duct banks, etc. as required for the installation of Electrical Conduit shall be performed by the Contractor at the Contractor's expense. Installation of all raceway conduits and fittings shall be in accordance with these Specifications, manufacturer's recommendations, applicable standards, codes and regulations, and best engineering practices.

##### B. Installation of Rigid Steel Conduit

1. Installation of all conduits, boxed fittings, and accessories shall conform to the requirements of the "National Electrical Code", insofar as this is applicable. During installation, precaution shall be taken to protect the conduits and conduit threads from mechanical injury. The ends of conduits shall be sealed in an approved manner during installation whenever the work is interrupted. Runs shall be sealed upon completion by the use of caps and discs or plugs. The seals shall be maintained, except during inspection and tests, until the conductors are pulled in. Conduits shall be inspected before conductors are installed and thoroughly cleaned of water and dirt by means of compressed air, swabs or other approved methods. Conduits shall be checked for freedom from obstructions by pulling a wooded mandrel of the proper size through the conduit. All boxes and fittings shall be kept closed and free from dirt, moisture, and debris.
2. Each run of conduit between boxes or equipment shall be electrically continuous. Threads shall conform to ANSI-B2.1 standards for taper pipe

threads. Conduits shall be cut square, ends reamed and threads cut with approved dies. Running or non-tapered threads will not be permitted. Conduits entering slip holes in boxes shall be secured with a locknut on each side at the box wall and terminated with bushings.

3. Threaded conduit joints shall be made watertight by use of red lead and oil, white lead and oil, or other approved compounds. Threaded joint compound shall be electrically conductive.
4. Exposed conduit shall be 3/4 inch IPS or larger and shall run in straight lines parallel to walls, beams or columns. Required offsets shall be accomplished by use of uniform offsets, bends, conduit fittings, or standard boxes. Where conduits are grouped, the offsets shall be made in a manner which will present a uniform and symmetrical appearance.
5. Conduits shall be supported as required by NEC. Capped conduit and conduit terminating in boxes or fittings shall be supported as close to the terminal as possible but in no case farther than 3 feet from the terminal. Galvanized clamps, U-bolts, and J-bolts shall be used to fasten conduits. Boxes and equipment housings shall be supported independently of the conduits. Conduits and boxes shall not be fastened directly to concrete but shall be spaced away by means of one inch galvanized metal channels or spacers. Machine screws or bolts set in concrete inserts or cinch anchors shall be used for securing clamps and boxes to concrete or to steel supporting channels. The use of explosive-driven anchors for securing clamps, supports, and boxes to concrete will not be permitted, except in such cases where special permission has been obtained in writing from the Owner.
6. Exposed conduits inside building shall run supported on walls or on trapezes away from wall.
7. Conduit embedded in concrete shall be one inch or larger, unless otherwise shown on the Drawings. Embedded conduit shall be sloped towards drain points and shall be rigidly supported and braced to avoid shifting during placement of concrete. Embedded conduit runs parallel to concrete surfaces shall be located behind the reinforcing steel except at terminal connections to outlets or junction boxes. Conduit extending out of concrete walls, floors, or beams shall be at right angles to the surface.
8. Minimum spacing of conduits embedded in concrete shall be as required by N.E.C. for proper conductor heat dissipation. The minimum spacing shall be maintained except where approaching and entering a box or panel. Conduit spacing shall also permit the flow of concrete between them.
9. Conduits embedded in concrete and terminating at motors or other equipment mounted on concrete bases shall be brought up to the equipment within the concrete base wherever possible.

10. All conduit boxes shall be so located that covers and openings are easily accessible. They shall be installed parallel with building lines, and where embedded shall be flush with the surface of the finished floor, wall, or ceiling. The Contractor shall remove and reset all boxes not properly installed or shifted out of line during concreting, whenever required or directed.
11. Conduits shall have long-sweep field bends wherever possible, but shall in no case have smaller radii bends than are allowed by NEC or as recommended by the manufacturer whichever is the most stringent. All field bends shall be manufactured bends or made with a bending machine or other approved device. Field bends shall not reduce the internal diameter of the conduit or injure the protective coatings. The bend shall be free of kinks, indentations, or flattened surfaces. Heat shall not be applied. Standard bends shall be used where conduits turn out of the concrete, at the conduit terminations, and at electrical equipment. Where conduits enter switchgear cubicles or other enclosures, they shall be located by template.
12. Where conduits cross expansion joints or contraction joints, they shall be installed perpendicular to the plane of the joint and shall have expansion fittings. Expansion fittings shall be as follows:
  - a. Expansion fittings for exposed conduit shall have external bonding jumpers for ground continuity and shall be O.Z. Electrical Mfg. Co. Type Ex, Crouse-Hinds Type XJ.
  - b. Expansion fittings embedded in concrete shall be expansion deflection type consisting of molded neoprene sleeves with bonding jumpers passing through separate waterproof compartments, and two silicon bronze couplings. They shall permit a 3/4-inch expansion and contraction and a 3/4-inch deflection without deformation.
13. All conduits shall be installed as shown on the Drawings, with the exact location and routing to be determined in the field as required.
14. Cable runs shall be segregated so that no two of the following types of cable occupy the same conduit:
  - a) 480-V power cable.
  - b) 240/120-V, AC, miscellaneous lighting and receptacle circuit cable; plug-in type.
  - c) 240/120-V, AC, power and control cable.
  - d) Low voltage or current, DC, control cable.
  - e) Instrumentation cable.
15. Conduits penetrating walls, ceilings and floors of buildings and/or structures shall be sealed as shown on the Drawings. Sealing of conduit ID shall be by combination seal/drain fittings where shown on the Drawings. Sealing of conduit OD shall be by means of conduit sleeve

and sealing compound. Sealing compound shall be of a type approved for the conditions and use.

C. Installation of Flexible Liquid-Tight Conduits

1. Flexible liquid-tight conduits shall be used for connection to motors and to any other equipment subject to vibration. Liquid-tight fittings and connectors shall be used in conjunction with the liquid-tight flexible conduit installation.
2. Flexible liquid-tight conduit lengths shall not exceed 6 feet.

D. Installation of EMT Conduits and Fittings

1. Installation of EMT shall conform to the applicable requirements of rigid steel conduits as previously specified.
2. EMT conduits shall be connected to the outlet boxes and panelboards by means of "gland" type connectors. Couplings between conduits shall be "gland" couplings. Conduits shall enter all couplings and connectors the full distance required and shall be securely held in place by a tightening of a "Locking Nut".
3. EMT shall not be embedded in concrete, used in hazardous locations where explosion-proof equipment is required, or buried in earth. Indentor or set screw type fittings shall not be used.

E. Installation of Rigid Nonmetallic (PVC) Conduits

1. Installation of rigid nonmetallic (PVC) conduit shall conform to applicable requirements of installation of rigid steel conduits as previously specified. Installation of rigid nonmetallic (PVC) conduit shall be as shown on the Drawings and shall be in accordance with the manufacturer's recommended procedures.
2. Installation shall meet the requirements of N.E.C. Article 347 Part A.
3. The conduit shall be cut square. All burrs shall be removed from the inside and outside of the conduit.
4. Bending:
  - a) Bending of the conduit shall be made so that the conduit will not be injured and the internal diameter of the conduit will not be effectively reduced. Bends shall be made with a standard PVC pipe bending equipment.
  - b) The conduit section shall be heated evenly over the entire length of the bend. The use of torches or other flame-type devices will not be allowed. Sections showing evidence of scorching or discoloration shall not be acceptable for use on the project.

- c) The radius of the bend shall not be less than that shown in Table 346-10 of the National Electric Code.

5. Joints:

- a) All joints shall be test mated without forcing. The socket depth of the fitting shall be marked on the outside of the conduit without scratching or damaging the surface. The conduit should enter the fitting for the full depth of the socket depth.
- b) Before applying cement, the surfaces to be joined shall be wiped clean and free of dirt, oil, grease or moisture. The solvent cement shall be applied to the conduit and fittings quickly, consistent with good workmanship. Under conditions of high humidity, a second full coating of cement shall be applied to the conduit before insertion.
- c) Immediately after applying the coat of cement to the conduit and fittings, the conduit shall be inserted into the fitting socket until it bottoms at the fitting shoulder. The conduit shall be turned 1/4 turn during insertion to distribute the cement evenly. Excess cement shall be wiped away from the outside of the joint.
- d) Newly assembled joints shall be handled carefully until the cement has gone through the set period. The recommended set periods are related to temperature as follows:

60 to 100 degrees F:	30 minutes
40 to 60 degrees F:	1 hour
20 to 40 degrees F:	2 hours
0 to 20 degrees F:	4 hours

6. Conduit Encased in Concrete:

- a) Underground concrete-encased conduit shall be supported on plastic spacers specifically designed for the purpose spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common duct bank shall be not less than 3 inches. Concrete cover overall shall not be less than 3 inches all around the encased run. Space below the conduit, and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. When pouring concrete the concrete shall be deflected or diverted during placement to minimize the possible damage to or movement of the conduits.
- b) Conduit encased in concrete shall have steel reinforcing where installed below roadway or other paved vehicle areas (including shoulder) and the reinforcement shall extend not less than 5 feet additional from the edge of pavement unless otherwise indicated.

Steel reinforcement shall not be less than No. 4 bars at corners and otherwise spaced on 12-inch centers, tied with No. 4 bars on 12-inch centers. Reinforcement shall be provided as shown on the Drawings and in accordance with Section 032000.

7. Expansion Fittings

- a) Expansion fittings shall be provided for all runs crossing structural expansion joints.
- b) Expansion fittings, as specified herein, shall be installed in all raceway runs crossing structural expansion joints. Unless otherwise indicated or approved by the ENGINEER expansion fittings shall include an 8-inch expansion fitting plus a deflection fitting allowing not less than a 3/4-inch deflection in any direction. The drawings shall be examined to determine complete extent of expansion joints.
- c) Concrete shall be formed around the expansion fittings in a manner to permit their movement as specified.

3.03 PAINTING

(Not applicable in this Section).

PART 4- MEASUREMENT AND PAYMENT

4.01

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

4.02

- A. Payment for the Work specified in this Section will be made at the lump sum price for Item 26 05 33/01, Raceways and Boxes for Electrical Systems; and 26 05 33/02, Pump Cable Junction Terminal Boxes; in the Schedule of Prices.
- B. This price shall be full compensation for furnishing all materials; and for all preparation; and for all labor, equipment, tools, and incidentals necessary for the Work as required by the Specifications and Drawings.
- C. Payment will not be made for any other items except as listed above. All other costs associated with such Work shall be included in the prices bid for the various items to which they pertain.

END OF SECTION 26 05 33

**SECTION 26 05 34 – ELECTRICAL CONDUIT**

PART 1- GENERAL

1.01 SCOPE

This Section covers the general provision for furnishing and installing all conduits, related boxes and fittings, and associated accessories as required for the electrical power, control, annunciation, instrumentation, communication, and lighting systems as shown on the Drawings and as specified herein. All necessary hardware including, but not limited to screws, bolts, hangers, concrete inserts, clamps, locknuts, bushings, sealing bushings, couplings, pulling-in irons, identification tags, etc. shall be included.

1.02 QUALITY ASSURANCE

A. Acceptable Manufacturers

Shall include but not be limited to LTV Steel Company, Allied Tube and Conduit Corporation, The Steelduct Company, American Brass Company, Republic Steel Arnco and Tamaqua.

B. Applicable Standards

All Work shall conform to the applicable provisions of the codes, standards, and Specifications, as specified herein, and the following:

<u>Name</u>	<u>Abbreviation</u>
Specifications for Rigid Steel Conduit, Zinc Coated	ANSI C80.1
Specifications for Fittings for Rigid Metal Conduit and Electrical Metallic Tubing	ANSI C80.4
Conduit Fittings and Accessories	NEMA FB-1
Outlet Boxes and Fittings	UL-514
National Electrical Code	NEC

1.03 SUBMITTALS

- A. In accordance with the Supplemental Conditions, the Contractor shall submit to the ENGINEER for review drawings, product specifications and descriptions, together with operating and maintenance instructions of all equipment furnished.
- B. As part of the Record Drawings submitted, the Contractor shall submit a conduit schedule at the completion of the Project.



The conduit schedule shall contain, as a minimum, the following information for each run of conduit.

1. Conduit designation.
2. Conduit type and size.
3. Routing: the routing shall identify the equipment (from-to) connected at the conduit termination.
4. Description of cables installed in the conduit including function of cables.

PART 2-      PRODUCTS

2.01      GENERAL

Electrical conduit and related fittings shall be U.L. listed. The conduit inside diameter shall have a smooth finish to facilitate fishing and/or pulling of wires and cables. Where flexible conduits are used they shall be of the liquid tight type.

2.02      SIZE REQUIREMENTS

Conduits smaller than 3/4-inch diameter shall not be allowed. Conduit sizes shall be as shown on the Drawings. In cases where conduit sizes are not shown on the Drawings, the minimum size shall be in accordance with the applicable provisions of NEC.

2.03      DETAILS OF CONSTRUCTION

A.      Rigid Metal Conduit and Fittings

1. Rigid metal conduit shall be heavy wall, hot-dip galvanized steel. Thin wall conduits and metallic tubing are not acceptable unless specifically shown on the Drawing or specified for use in other Sections of these Specifications.
2. Metal conduit fittings and covers shall be galvanized or sherardized iron or malleable iron castings with gaskets as required. Composition or rubber gaskets shall be provided where required to prevent entrance of moisture.
3. Rigid metal conduit expansion joint fittings shall consist of standard manufactured products, designed so as to prevent damage to the cables and equipped with approved means of providing electrical continuity of the conduit run. Expansion joint fittings shall permit a small amount of transverse movement as well as longitudinal movement. All couplings and fitting joints shall be of the threaded type.
4. Aluminum shall not be used either for conduits, fittings, pullboxes, junction boxes, or any other electrical device, unless otherwise specifically shown on the Drawings.

B. Flexible Liquid-Tight Conduit

1. Flexible liquid-tight conduit shall be "Sealtite Type UA".
2. The conduit shall consist of an interlocked galvanized steel core and a liquid tight cover made of polyvinyl chloride synthetic resin. A ground bonding conductor shall be included.

C. Electrical Metallic Tubing (EMT) and Related Fittings

1. Electrical metallic tubing shall comply with FS WW-C-563 and ANSI C80.3. EMT fittings shall comply with FS W-F-408. EMT shall be provided only as shown on the Drawings or as otherwise specified in other Sections of these Specifications. Couplings, connectors and other fittings for EMT shall be cadmium or zinc plated steel, or cadmium plated malleable iron and shall be raintight, compression type.

D. Rigid Nonmetallic Conduit

1. Rigid nonmetallic conduit shall be of the polyvinyl chloride (PVC) type, Schedule 80 or HDPE duct as shown on the Drawings, and shall be in accordance with the applicable requirements of NEC.
2. The conduit, fittings and accessories shall be manufactured from polyvinyl chloride complying with ASTM D1784 and shall comply with all the applicable requirements of NEMA Publication No. TC2, UL 651 for EPC-40-PVC and N.E.C. Article 347.
3. Fittings and accessories for the electrical plastic conduit shall comply with all applicable requirements of NEMA Publication No. TC3.
4. The solvent cement used to join the conduit and fittings shall meet the requirements of ASTM D2564.

E. Junction, Outlet, Terminal, and PullBoxes and Covers

1. Junction, outlet, and pullboxes and covers shall be made of sheet steel or cast-metal. Covers shall be secured with screws, except for boxes 20 inches or larger which shall have hinged covers or as otherwise specified. Gaskets shall be provided for all boxes. Terminal boxes shall be furnished with terminal blocks as required and as indicated on the Drawings.
2. Where shown on the Drawings, Electrical Junction Boxes shall be solid box types for bridge and street lighting, suitable for underground electrical work, furnished with neoprene gaskets and stainless steel cap screws provided with cored and tapped holes for conduits as required, polymer concrete or cast aluminum as shown on drawings.

PART 3-      EXECUTION

3.01      FACTORY TEST AND INSPECTION

Routine factory testing and inspection shall be performed in accordance with the requirements of the applicable standard.

3.02      INSTALLATION AND TESTING

A.      General

Any and all excavation, trenching, coring, backfilling, incidental concreting (not part of a structure in which conduits are embedded) and/or concreting required for duct banks, etc. as required for the installation of Electrical Conduit shall be performed by the Contractor at the Contractor's expense. Installation of all raceway conduits and fittings shall be in accordance with these Specifications, manufacturer's recommendations, applicable standards, codes and regulations, and best engineering practices.

B.      Installation of Rigid Steel Conduit

1.      Installation of all conduits, boxed fittings, and accessories shall conform to the requirements of the "National Electrical Code", insofar as this is applicable. During installation, precaution shall be taken to protect the conduits and conduit threads from mechanical injury. The ends of conduits shall be sealed in an approved manner during installation whenever the work is interrupted. Runs shall be sealed upon completion by the use of caps and discs or plugs. The seals shall be maintained, except during inspection and tests, until the conductors are pulled in. Conduits shall be inspected before conductors are installed and thoroughly cleaned of water and dirt by means of compressed air, swabs or other approved methods. Conduits shall be checked for freedom from obstructions by pulling a wooded mandrel of the proper size through the conduit. All boxes and fittings shall be kept closed and free from dirt, moisture, and debris.
2.      Each run of conduit between boxes or equipment shall be electrically continuous. Threads shall conform to ANSI-B2.1 standards for taper pipe threads. Conduits shall be cut square, ends reamed and threads cut with approved dies. Running or non-tapered threads will not be permitted. Conduits entering slip holes in boxes shall be secured with a locknut on each side at the box wall and terminated with bushings.
3.      Threaded conduit joints shall be made watertight by use of red lead and oil, white lead and oil, or other approved compounds. Threaded joint compound shall be electrically conductive.
4.      Exposed conduit shall be 3/4 inch IPS or larger and shall run in straight lines parallel to walls, beams or columns. Required offsets shall be accomplished by use of uniform offsets, bends, conduit fittings, or

- standard boxes. Where conduits are grouped, the offsets shall be made in a manner which will present a uniform and symmetrical appearance.
5. Conduits shall be supported as required by NEC. Capped conduit and conduit terminating in boxes or fittings shall be supported as close to the terminal as possible but in no case farther than 3 feet from the terminal. Galvanized clamps, U-bolts, and J-bolts shall be used to fasten conduits. Boxes and equipment housings shall be supported independently of the conduits. Conduits and boxes shall not be fastened directly to concrete but shall be spaced away by means of one inch galvanized metal channels or spacers. Machine screws or bolts set in concrete inserts or cinch anchors shall be used for securing clamps and boxes to concrete or to steel supporting channels. The use of explosive-driven anchors for securing clamps, supports, and boxes to concrete will not be permitted, except in such cases where special permission has been obtained in writing from the Owner.
  6. Conduit embedded in concrete shall be one inch or larger, unless otherwise shown on the Drawings. Embedded conduit shall be sloped towards drain points and shall be rigidly supported and braced to avoid shifting during placement of concrete. Embedded conduit runs parallel to concrete surfaces shall be located behind the reinforcing steel except at terminal connections to outlets or junction boxes. Conduit extending out of concrete walls, floors, or beams shall be at right angles to the surface.
  7. Minimum spacing of conduits embedded in concrete shall be as required by N.E.C. for proper conductor heat dissipation. The minimum spacing shall be maintained except where approaching and entering a box or panel. Conduit spacing shall also permit the flow of concrete between them.
  8. Conduits embedded in concrete and terminating at motors or other equipment mounted on concrete bases shall be brought up to the equipment within the concrete base wherever possible.
  9. All conduit boxes shall be so located that covers and openings are easily accessible. They shall be installed parallel with building lines, and where embedded shall be flush with the surface of the finished floor, wall, or ceiling. The Contractor shall remove and reset all boxes not properly installed or shifted out of line during concreting, whenever required or directed.
  10. Conduits shall have long-sweep field bends wherever possible, but shall in no case have smaller radii bends than are allowed by NEC or as recommended by the manufacturer whichever is the most stringent. All field bends shall be manufactured bends or made with a bending machine or other approved device. Field bends shall not reduce the internal diameter of the conduit or injure the protective coatings. The bend shall be free of kinks, indentations, or flattened surfaces. Heat shall not be applied. Standard bends shall be used where conduits turn out of the concrete, at the conduit terminations, and at electrical equipment.

Where conduits enter switchgear cubicles or other enclosures, they shall be located by template.

11. Where conduits cross expansion joints or contraction joints, they shall be installed perpendicular to the plane of the joint and shall have expansion fittings. Expansion fittings shall be as follows:
  - a. Expansion fittings for exposed conduit shall have external bonding jumpers for ground continuity and shall be O.Z. Electrical Mfg. Co. Type Ex, Crouse-Hinds Type XJ.
  - b. Expansion fittings embedded in concrete shall be expansion deflection type consisting of molded neoprene sleeves with bonding jumpers passing through separate waterproof compartments, and two silicon bronze couplings. They shall permit a 3/4-inch expansion and contraction and a 3/4-inch deflection without deformation.
12. All conduits shall be installed as shown on the Drawings, with the exact location and routing to be determined in the field as required.
13. Cable runs shall be segregated so that no two of the following types of cable occupy the same conduit:
  - a) 240-V power cable.
  - b) 240/120-V, AC, miscellaneous lighting and receptacle circuit cable; plug-in type.
  - c) 240/120-V, AC, power and control cable.
  - d) Low voltage or current, DC, control cable.
  - e) Instrumentation cable.
14. Conduits penetrating walls, ceilings and floors of buildings and/or structures shall be sealed as shown on the Drawings. Sealing of conduit ID shall be by combination seal/drain fittings where shown on the Drawings. Sealing of conduit OD shall be by means of conduit sleeve and sealing compound. Sealing compound shall be of a type approved for the conditions and use.

C. Installation of Flexible Liquid-Tight Conduits

1. Flexible liquid-tight conduits shall be used for connection to motors and to any other equipment subject to vibration. Liquid-tight fittings and connectors shall be used in conjunction with the liquid-tight flexible conduit installation.
2. Flexible liquid-tight conduit lengths shall not exceed 6 feet.

D. Installation of EMT Conduits and Fittings

1. Installation of EMT shall conform to the applicable requirements of rigid steel conduits as previously specified.

2. EMT conduits shall be connected to the outlet boxes and panelboards by means of "gland" type connectors. Couplings between conduits shall be "gland" couplings. Conduits shall enter all couplings and connectors the full distance required and shall be securely held in place by a tightening of a "Locking Nut".
3. EMT shall not be embedded in concrete, used in hazardous locations where explosion-proof equipment is required, or buried in earth. Indentor or set screw type fittings shall not be used.

E. Installation of Rigid Nonmetallic (PVC or Coilable HDPE) Ducts and Conduits

1. Installation of rigid nonmetallic (PVC or HDPE) conduit shall conform to applicable requirements of installation of rigid steel conduits as previously specified. Installation of rigid nonmetallic (PVC or HDPE) conduit shall be as shown on the Drawings and shall be in accordance with the manufacturer's recommended procedures.
2. Installation shall meet the requirements of N.E.C. Articles 352 and 353.
3. The conduit shall be cut square. All burrs shall be removed from the inside and outside of the conduit.
4. Bending:
  - a) Bending of the conduit shall be made so that the conduit will not be injured and the internal diameter of the conduit will not be effectively reduced. Bends shall be made with a standard PVC pipe bending equipment.
  - b) The conduit section shall be heated evenly over the entire length of the bend. The use of torches or other flame-type devices will not be allowed. Sections showing evidence of scorching or discoloration shall not be acceptable for use on the project.
  - c) The radius of the bend shall not be less than that shown in Table 2, Chapter 9 of the National Electric Code.
5. Joints:
  - a) All joints shall be test mated without forcing. The socket depth of the fitting shall be marked on the outside of the conduit without scratching or damaging the surface. The conduit should enter the fitting for the full depth of the socket depth.
  - b) Before applying cement, the surfaces to be joined shall be wiped clean and free of dirt, oil, grease or moisture. The solvent cement shall be applied to the conduit and fittings quickly, consistent with good workmanship. Under conditions of high humidity, a second

full coating of cement shall be applied to the conduit before insertion.

- c) Immediately after applying the coat of cement to the conduit and fittings, the conduit shall be inserted into the fitting socket until it bottoms at the fitting shoulder. The conduit shall be turned 1/4 turn during insertion to distribute the cement evenly. Excess cement shall be wiped away from the outside of the joint.
- d) Newly assembled joints shall be handled carefully until the cement has gone through the set period. The recommended set periods are related to temperature as follows:

60 to 100 degrees F:	30 minutes
40 to 60 degrees F:	1 hour
20 to 40 degrees F:	2 hours
0 to 20 degrees F:	4 hours

6. Conduit Encased in Concrete:

- a) Underground concrete-encased conduit shall be supported on plastic spacers specifically designed for the purpose spaced along the length of the run as recommended by the manufacturer. Spacing between raceways within a common duct bank shall be not less than 2 inches. Concrete cover overall shall not be less than 3 inches all around the encased run. Space below the conduit, and concrete fill shall be assured. Care shall be exercised during concrete placement to assure that there are no voids, so that spacers are undisturbed, and so that conduit joints stay secure and unbroken. When pouring concrete the concrete shall be deflected or diverted during placement to minimize the possible damage to or movement of the conduits.
- b) Conduit encased in concrete shall have steel reinforcing where installed below roadway or other paved vehicle areas (including shoulder) and the reinforcement shall extend not less than 5 feet additional from the edge of pavement unless otherwise indicated. Steel reinforcement shall not be less than No. 4 bars at corners and otherwise spaced on 12-inch centers, tied with No. 4 bars on 12-inch centers.

7. Expansion Fittings

- a) Expansion fittings shall be provided for all runs crossing structural expansion joints.
- b) Expansion fittings, as specified herein, shall be installed in all raceway runs crossing structural expansion joints. Unless otherwise indicated or approved by the ENGINEER expansion fittings shall include an 8-inch expansion fitting plus a deflection fitting allowing not less than a 3/4-inch deflection in any direction.

The drawings shall be examined to determine complete extent of expansion joints.

- c) Concrete shall be formed around the expansion fittings in a manner to permit their movement as specified.

3.03 PAINING

(Not applicable in this Section).

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT:

No separate measurement shall be made for ELECTRICAL CONDUIT.

4.02 BASIS OF PAYMENT:

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 34



**SECTION 26 05 43 – UNDERGROUND CONDUIT RUNS**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description of Work**

This Work shall consist of constructing conduit trenches and conduit runs at the locations shown in the plans, or as directed by the Engineer. This work shall include trench and backfill, conduit runs, electrical identification, regrading, and all labor, tools, and equipment necessary to install the conduit runs to connect all components including but not limited to the lighting systems, Voice of Metra system, platform lighting controller, Voice of Metra cabinet, and the power source, including clean-up and restoration of the locations.

**B. Related Work**

1. General Electric Requirements
2. Basic Electrical Materials & Methods/Requirements
3. Wire & Cables for Site Electrical Work
4. Metra Electric Cabinet and Pad
5. Electrical Connection for Site Equipment

**1.02 STANDARDS**

- A. Foundation and Conduits Detail, as shown on the Drawings.
- B. Conduit Trench Detail, as shown on the Drawings.
- C. Conduit Bending Detail, as shown on the Drawings.

**1.03 SUBMITTALS**

In accordance with the Supplemental Conditions, the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions and field check-out/testing procedures for all equipment furnished.

**1.04 REFERENCES**

Work under this item shall be performed in accordance with Sections 801, 810, 812, 821, 868, 1003, and 1085 of the Standard Specifications, except as herein modified; as well as all applicable portions of the National Electric Code (NEC) and National Electrical Manufacturer's Association (NEMA).

1.05 GENERAL REQUIREMENTS

- A. Conduct site clearing operations to ensure minimum interference with railway, roads, streets, walks and/or adjacent facilities. Do not close traveled ways without written permission from authorities having jurisdiction.
- B. Provide protection to prevent damage to existing structures, track, roadway, sidewalk and/or other improvements on or adjacent to the job site. Restore any damaged improvement to its original condition as acceptable to parties having jurisdiction, with no additional compensation due the Contractor.

PART 2- PRODUCTS

2.01 CONDUIT BODIES

- A. General: Types, shapes, and sizes shall be as required to meet individual applications and NEC requirements.
- B. Unless otherwise noted, all conduit is to be rigid galvanized steel conforming to Articles, 1085.15 and 1085.16 of the Standard Specifications.

2.02 ELECTRICAL WARNING TAPE

The material shall meet the requirements of Article 1085.23 of the Standard Specifications.

2.03 TRENCH BACKFILL

The material shall have an FA 6 gradation conforming to Article 1003.04 of the Standard Specifications, except wet bottom boiler slag as defined in Article 1003.01 will not be permitted.

PART 3- EXECUTION

3.01 INSTALLATION REQUIREMENTS

Work under this item shall be performed in accordance with Article 810.03 of the Standard Specifications, except as herein modified.

- A. Complete installation of electrical conduits before starting installation of conductors within conduits.
- B. Prevent foreign material from entering conduits by using temporary closure protection.
- C. Protect stub-ups from damage where conduits rise from concrete foundations. Arrange so curved portion of bends is not visible above the finished slab.

- D. Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.
- E. The contractor shall exercise care in installing the conduit to ensure that it is smooth, free from sharp bends or kinks, and has the minimum practical number of bends. Crushed or deformed conduit will not be accepted. All conduit and fittings shall have the burrs and rough edges smoothed, and all conduit runs shall be cleaned and swabbed before installation of electric cables.
- F. All conduit is to contain fish tape or pull wires for wire pulls. Use no. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength.
- G. Install conduit sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL-listed sealing compound. For concealed conduits, install each fitting in a flush galvanized steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install conduits sealing fittings at the end points.
- H. Stub-up Connections: Extend conduits above concrete foundation or ground 6", unless otherwise noted on plans. Extend conductors to equipment with rigid steel conduit. Where equipment connections are not made under this contract, install screwdriver-operated threaded flush plugs flush with slab.
- I. Conceal all conduits, unless indicated otherwise. Install conduits at proper elevations.
- J. Electrical Warning Tape is to be installed in all conduit trenches, at the location shown on the Drawings.

3.02 TRENCH AND BACKFILL

Work under this item shall be performed in accordance with Article 868.03 of the Standard Specifications. Trench backfill shall be in accordance with Section 2.03 of this specification.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 43

## **SECTION 26 05 53 - ELECTRICAL IDENTIFICATION**

### **PART 1- GENERAL**

#### **1.01 SCOPE**

##### **A. Description of Work**

This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:

1. Buried electrical line warnings.
2. Identification labeling for raceways, cables, and conductors.
3. Operational instruction signs.
4. Warning and caution signs.
5. Equipment labels and signs.

##### **B. Related Sections:** The following Sections contain requirements that relate to this Section:

1. Division 26 "Wires and Cables" for requirements for color coding of conductors for phase identification.
3. Refer to other Division 26 sections for additional specific electrical identification associated with specific items.

#### **1.02 QUALITY ASSURANCE**

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."
- B. ANSI Compliance: Comply with requirements of ANSI Standard A13.1, "Scheme for the Identification of Piping Systems," with regard to type and size of lettering for raceway and cable labels.

#### **1.03 SUBMITTALS**

- A. General: All submittals shall be in accordance with the applicable requirements of the Supplemental Conditions.
- B. Product Data for each type of product specified.
- C. Schedule of identification nomenclature to be used for identification signs and labels.

- D. Samples of each color, lettering style, and other graphic representation required for identification materials; samples of labels and signs.

PART 2-  
PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. American Labelmark Co.
  2. Cole-Flex Corp.
  3. Ideal Industries, Inc.
  4. Markal Corp.
  5. National Band and Tag Co.
  6. Panduit Corp.
  7. Seton Name Plate Co.
  8. Standard Signs, Inc.
  9. W.H.Brady, Co.

2.02 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Adhesive Marking Labels for Raceway and Metal-clad Cable: Pre- printed, flexible, self-adhesive labels with legend indicating voltage and service (Emergency, Lighting, Power, Light, Power d.c., Air Conditioning, Communications, Control, Fire).
- B. Label Size: as follows:
1. Raceways 1-Inch and Smaller: 1-1/8 inches high by 4 inches long.
  2. Raceways Larger than 1-Inch: 1-1/8 inches high by 8 inches long.
- C. Color: Black legend on orange background.
- D. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape not less than 3 mils thick by 1 inch to 2 inches in width.
- E. Pretensioned Flexible Wraparound Colored Plastic Sleeves for Raceway and Cable Identification: Flexible acrylic bands sized to suit the raceway diameter and arranged to stay in place by pre- tensioned gripping action when coiled around the raceway or cable.

- F. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, plastic tape compounded for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- G. Wire/Cable Designation Tape Markers: Vinyl or vinyl-cloth, self- adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.
- H. Brass Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 inches by 2 inches by 19 gage.
- I. Engraved, Plastic-Laminated Labels, Signs, and Instruction Plates: Engraving stock melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 square inches, or 8 inches in length; 1/8-inch thick for larger sizes. Engraved legend in white letters on black face and punched for mechanical fasteners.
- J. Exterior Metal-Backed Butyrate Warning and Caution Signs: Weather-resistant, nonfading, preprinted cellulose acetate butyrate signs with 20-gage, galvanized steel backing, with colors, legend, and size appropriate to the location. Provide 1/4-inch grommets in corners for mounting.
- K. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless steel screws or number 10/32 stainless steel machine screws with nuts and flat and lock washers.
- L. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self- locking nylon cable ties, 0.18-inch minimum width, 50-lb minimum tensile strength, and suitable for a temperature range from minus 50 deg F to 350 deg F. Provide ties in specified colors when used for color coding.

PART 3-        EXECUTION

3.01        INSTALLATION

- A. Lettering and Graphics: Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and as required by code.
- B. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
- C. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- D. Conduit Identification:
- E. Identify Junction, Pull, and Connection Boxes: Code-required caution sign for boxes shall be pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange background. Install on outside of box cover. Also label box covers with identity of contained circuits. Use pressure- sensitive

plastic labels at exposed locations and similar labels or plasticized card stock tags at concealed boxes.

- F. Underground Electrical Line Identification: During trench backfilling, for exterior underground power, signal, and communications lines, install continuous underground plastic line marker, located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.
- G. Limit use of line markers to direct-burial cables.
- H. Install line marker for underground wiring, both direct-buried and in raceway.
- I. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as shown in Section 16120.
- J. Use conductors with color factory-applied the entire length of the conductors except as follows:
  - 1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 10 AWG.
    - a. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.
    - b. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.
- K. Power Circuit Identification: Securely fasten identifying metal tags or aluminum wraparound marker bands to cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms with 1/4-inch steel letter and number stamps with legend to correspond with designations on Drawings. If metal tags are provided, attach them with approximately 55-lb test monofilament line or one-piece self-locking nylon cable ties.
- L. Tag or label conductors as follows:
  - 1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.

2. Multiple Circuits: Where multiple branch circuits or control wiring or communications/signal conductors are present in the same box or enclosure (except for three-circuit, four-wire home runs), label each conductor or cable. Provide legend indicating source, voltage, circuit number, and phase for branch circuit wiring. Phase and voltage of branch circuit wiring may be indicated by mean of coded color of conductor insulation. For control and communications/signal wiring, use color coding or wire/cable marking tape at terminations and at intermediate locations where conductors appear in wiring boxes, troughs, and control cabinets. Use consistent letter/number conductor designations throughout on wire/cable marking tapes.
3. Match identification markings with designations used in panelboards shop drawings, Contract Documents, and similar previously established identification schemes for the facility's electrical installations.

M. Apply warning, caution, and instruction signs and stencils as follows:

1. Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic- laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.
2. Emergency Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, or other emergency operations.

N. Install equipment/system circuit/device identification as follows:

1. Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2-inch-high lettering on 1-1/2-inch-high label (2-inch-high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.
  - a. Panelboards, electrical cabinets, and enclosures.
  - b. Access doors and panels for concealed electrical items.
  - c. Motor starters.
  - d. Contactors.



- e. Remote-controlled switches.
  - f. Control devices.
  - g. Telephone switching equipment.
- O. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.
- P. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 53

**SECTION 26 05 83 – ELECTRICAL CONNECTIONS FOR SITE EQUIPMENT & WARMING SHELTER**

PART 1- GENERAL

1.01 SCOPE

A. Description

This Work shall consist of furnishing and installing all electrical connectors, insulating tape, cables tie and other accessories as needed for electrical connections of cables and wires. The work under this Section shall include all labor, materials and tools required to complete the installation of cables and wires to produce or complete and operating system.

B. Related Work

1. General Electric Requirements
2. Basic Electrical Materials & Methods/Requirements
3. New Parking Area Lighting Units
4. Underground Conduit Runs
5. Wire & Cables for Site Electrical Work
6. UP-W Electric Cabinet and Pad

1.02 QUALITY ASSURANCE

NEC Compliance: Comply with applicable requirements of NEC as to type products used and installation of electrical power connections (terminals and splices), for junction boxes and disconnect switches.

1.03 SUBMITTALS

In accordance with the Supplemental Conditions, the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions and field check-out/testing procedures for all equipment furnished.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver electrical connection products wrapped in proper factory-fabricated type containers.
- B. Store electrical connection products in original cartons and protect from weather, construction traffic and debris.

- C. Handle electrical connection products carefully to prevent breakage, denting, and scoring finish.

PART 2-      PRODUCTS

2.01            ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products of one of the following (for each type of product), or approved equal:

- A. Appleton Electric Co.
- B. Gould, Inc.
- C. Harvey Hubbell Inc.
- D. Square D Company.

2.02            MATERIALS AND COMPONENTS

- A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire-nuts, and other items and accessories as needed to complete splices and terminations of types indicated.
- B. Connectors:
  - 1. Connectors and Terminals: Provide electrical connectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.
  - 2. Electrical Connection Accessories: Provide electrical insulating tape,- heat-shrinkable insulating tubing and boots, electrical solder, electrical soldering flux, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated.

PART 3-      EXECUTION

3.01            INSPECTION

Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02            INSTALLATION OF ELECTRICAL CONNECTIONS

- A. Install electrical connections as indicated, in accordance with equipment manufacturer's written instructions and with recognized industry practices, and

complying with applicable requirements of UL, NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.

- B. Coordinate with other work, including wires/cables, conduits and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.
- C. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced.
- D. Prepare cables and wires, by cutting and stripping jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
- E. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance.
- F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torqueing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torqueing requirements are not available, tighten connectors and terminals to comply with torqueing values contained in UL's 486A.

3.03 FIELD QUALITY CONTROL

Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Correct malfunctioning units at site, then retest to demonstrate compliance.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 05 83

## SECTION 26 24 13 – PANEL BOARDS

### PART 1- GENERAL

#### 1.01 SCOPE

- A. Description of Work. This Section includes lighting and power panelboard and associated auxiliary equipment rated 600 V or less.
- B. Related Sections: The following Division 26 Sections contain requirements that relate to this Section:
  - 1. Disconnects & Circuit Breakers for circuit breakers, fusible switches, fuses, and other devices which may be used in panelboards.
- C. Definitions. Overcurrent Protective Device (OCPD): A device operative on excessive current that causes and maintains the interruption of power in the circuit it protects.

#### 1.02 QUALITY ASSURANCE

- A. Listing and Labeling: Provide products specified in this Section that are listed and labeled.
  - 1. The terms "listed" and "labeled" shall be defined as they are in the National Electrical Code, Article 100.
  - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- B. Field-Testing Organization Qualifications: To qualify for acceptance, the independent testing organization must demonstrate, based on evaluation of organization-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct satisfactorily the testing indicated.
- C. Electrical Component Standard: Components and installation shall comply with NFPA 70, "National Electrical Code."
- D. NEMA Standard: Comply with NEMA PB1, "Panelboard."
- E. UL Standards: Comply with UL 61, "Panelboards," and UL 50, "Cabinets and Boxes."

#### 1.03 SUBMITTALS

- A. General: All submittals shall be in accordance with the applicable requirements of the Supplemental Conditions.
- B. Product data for panelboard, accessory item, and component specified.

- C. Shop drawings from manufacturers of panelboard including dimensioned plans, sections, and elevations. Show tabulations of installed devices, major features, and voltage rating. Include the following:
  - 1. Enclosure type with details for types other than NEMA Type 1.
  - 2. Bus configuration and current ratings.
  - 3. Short-circuit current rating of panelboard.
  - 4. Features, characteristics, ratings, and factory settings of individual protective devices and auxiliary components.
  - 5. Spare Fuse Cabinets: Show materials, dimensions, and features including storage provisions for fuse cartons.
- D. Wiring diagrams detailing schematic diagram including control wiring, and differentiating between manufacturer-installed and field-installed wiring.
- E. Qualification data for field-testing organization certificates, signed by the Contractor, certifying that the organization complies with the requirements specified in Quality Assurance below. Include list of completed projects with project names, addresses, and names of Engineer and Owner plus basic organization qualifications data.
- F. Report of field tests and observations certified by the testing organization.
- G. Panel schedules for installation in panelboard. Submit final versions after load balancing.
- H. Maintenance data for panelboard components, for inclusion in Operating and Maintenance Manual specified in Division 1 and in Division 26 Section "Basic Electrical Requirements." Include instructions for testing circuit breakers.

1.04 EXTRA MATERIALS

- A. Keys: Furnish six spares of each type for panelboard cabinet locks.
- B. Touch-up Paint for surface-mounted panelboards: One half-pint container.

PART 2- PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following, or approved equal:
  - 1. ABB Power Distribution, Inc.
  - 2. Crouse-Hinds Distribution Equipment.
  - 3. General Electric Co.

4. Siemens Energy & Automation, Inc.
5. Square D Co.
6. Westinghouse Electric Corp.

2.02 PANELBOARDS, GENERAL REQUIREMENTS

- A. Overcurrent Protective Devices (OCPDs): Provide type, rating, and features as indicated. Comply with Division 26 Section "Overcurrent Protective Devices," with OCPDs adapted to panelboard installation. Tandem circuit breakers shall not be used. Multipole breakers shall have common trip.
- B. Enclosures: Cabinets, flush or surface mounted as indicated. NEMA Type 1 enclosure.
- C. Front: Secured to box with concealed trim clamps except as indicated. Front for surface-mounted panels shall be same dimensions as box. Fronts for flush panels shall overlap box except as otherwise specified.
- D. Panelboard in general shall be enclosed in 12 gauge steel cabinet of dead front type, having steel trim, and door with continuous piano concealed hinges and cylinder type locks.
  1. Cabinets shall provide not less than 6 inches clear space for wiring in lighting panels, at top, bottom and sides, respectively. Each cabinet shall be a minimum of 24 inches of width.
  2. Each cabinet shall be thoroughly cleaned and bonderized before painting. Painting shall consist of enamel or lacquer over a rust inhibitor, light gray color.
  3. Doors and trim shall each be in one piece so designed that doors will close against a rabbet. Doors shall have concealed hinges. Trims shall be fastened with self-adjusting clamps. Double doors shall be provided where necessary or as indicated.
  4. A typewritten directory with frame and plastic face shall be furnished and installed on the inside of the door of each cabinet. Directory shall indicate the lighting or service controlled by each breaker and the wire gauge of the feeder serving the cabinet.
  5. Circuit breakers shall be provided with copper lugs to accommodate cables as shown on the drawings.
  6. Each cabinet shall be large enough to accommodate the external cables and any special lug bus required to connect to the cables shown on the drawings.

7. Circuit breakers for the panel shall be thermal-magnetic with each pole providing inverse time delay and instantaneous circuit protection.
  8. Circuit breakers shall be back connected to bus bars, molded case heavy duty type.
  9. Panels shall be furnished with a full length ground bus with terminals.
  10. Branch circuit breakers shall be single or multiple pole with capacities and trip ratings as specified or as shown on the panelboard schedules.
- E. Directory Frame: Metal, mounted inside each panel door.
- F. Bus: Hard drawn copper of 98 percent conductivity.
- G. Main and Neutral Lugs: Compression type.
- H. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors. Bonded to box.
- I. Provision for Future Devices: Equip with mounting brackets, bus connections, and necessary appurtenances, for the OCPD ampere ratings indicated for future installation of devices.
- J. Special Features: Provide the following features for panelboards as indicated:
1. Circuit breakers for 120 volt and 240 volt service shall be 240 volt rated, shall be of the bolt on type and shall have an interrupting rating of 22,000 amperes at 240 volts ac. The trip settings shall be as shown on the Drawings.
    - a. Each branch circuit breaker shall be identified by a card holder or designating button mounted adjacent to the circuit breaker for properly identifying each circuit.
    - b. Neutrals, where called for, shall be grouped and arranged on a common bus and each terminal shall be stamped to indicate the number of the breaker with which it is associated. Neutral bars shall be located at the top or bottom as required.
    - c. Each panel interior shall be provided with adjustable brackets to permit leveling and alignment in the cabinet.
    - d. All lugs and terminators shall be copper. Aluminum copper connectors are not acceptable.
    - e. Interchangeable locking devices shall be provided to lock the breakers in the "OFF" or "ON" position.
    - f. Each panelboard not located in a heated enclosure, room, or building, shall be provided with a thermostatically controlled



electric strip heater, sufficiently sized to keep the interior of the panelboard free of moisture.

- K. Feed-Through Lugs: Sized to accommodate feeders indicated.

#### 2.03 LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS

- A. Branch OCPDs: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Double-Width Panels: Where more than 42 poles are indicated or where otherwise indicated, provide two panelboards under single front.
- C. Doors: In panel front, with concealed hinges. Secure with flush catch and tumbler lock, all keyed alike.

#### 2.04 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items as required for overcurrent protective device test, inspection, maintenance, and operation.
- B. Portable Test Set: Arranged to permit testing of functions of solid-state trip devices without removal from panelboard.
- C. Fungus Proofing: Permanent fungicidal treatment for panelboards interior including OCPDs and other components.

#### 2.05 IDENTIFICATION

- A. General: Refer to Division 26 Section "Electrical Identification" for labeling materials.
- B. Panelboard Nameplates: Engraved laminated plastic or metal nameplate for each panelboard mounted with epoxy or industrial cement or industrial adhesive.

### PART 3- EXECUTION

#### 3.01 INSTALLATION

- A. General: Install panelboards and accessory items in accordance with NEMA PB 1.1, "General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less" and manufacturers' written installation instructions.
- B. Ground Fault Protection: Install panelboard ground fault circuit interrupter devices in accordance with installation guidelines of NEMA 289, "Application Guide for Ground Fault Circuit Interrupters."
- C. Mounting Heights: Top of trim 6'-2" above finished floor, except as indicated.

- D. Mounting: Plumb and rigid without distortion of box. Mount flush panels uniformly flush with wall finish.
- E. Circuit Directory: Typed and reflective of final circuit changes required to balance panel loads. Obtain approval before installing.
- F. Install filler plates in unused spaces.
- G. Provision for Future Circuits at Flush Panelboards: Stub four 1-inch empty conduits from panel into accessible ceiling space or space designated to be ceiling space in future. Stub four 1-inch empty conduits into raised floor space or below slab other than slabs on grade.

3.02 IDENTIFICATION

- A. Identify field-installed wiring and components and provide warning signs in accordance with Division 26 Section "Electrical Identification."

3.03 GROUNDING

- A. Connections: Make equipment grounding connections for panelboards as indicated.
- B. Provide ground continuity to main electrical ground bus indicated.

3.04 CONNECTIONS

- A. Tighten electrical connectors and terminals, including grounding connections, in accordance with manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.05 FIELD QUALITY CONTROL

- A. Pretesting: Upon completing installation of the system, perform the following preparations for independent tests:
  - 1. Make insulation resistance tests of panelboard buses, components, and connecting supply, feeder, and control circuits.
  - 2. Make continuity tests of circuits.
  - 3. Provide set of Contract Documents to test organization. Include full updating on final system configuration and parameters where they supplement or differ from those indicated in original Contract Documents.
- B. Quality Control Program: Conform to the following:
  - 1. Procedures: Make field tests and inspections and prepare panelboard for satisfactory operation in accordance with manufacturer's recommendations and these specifications.

2. Schedule tests with at least one week in advance notification.
  3. Reports by Testing Organization: Report written reports of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Include records of repairs and adjustments made.
  4. Labeling: Upon satisfactory completion of tests and related effort, apply a label to tested components indicating results of tests and inspections, responsible organization and person, and date.
  5. Protective Device Ratings and Settings: Verify indicated ratings and settings to be appropriate for final system configuration and parameters. Where discrepancies are found, recommend final protective device ratings and settings. Use accepted ratings or settings to make the final system adjustments.
- C. Visual and Mechanical Inspection: Include the following inspections and related work:
1. Inspect for defects and physical damage, labeling, and nameplate compliance with requirements of up-to-date drawings and panelboard schedules.
  2. Exercise and perform of operational tests of all mechanical components and other operable devices in accordance with manufacturer's instruction manual.
  3. Check panelboard mounting, area clearances, and alignment and fit of components.
  4. Check tightness of bolted electrical connections with calibrated torque wrench. Refer to manufacturer's instructions for proper torque values.
  5. Perform visual and mechanical inspection and related work for overcurrent protective devices as specified in Division 26 Section "Disconnects and Circuit Breakers."
- D. Electrical tests: Include the following items performed in accordance with manufacturer's instruction:
1. Insulation resistance test of buses and portions of control wiring. Insulation resistance less than 100 megohms is not acceptable.
  2. Ground resistance test on system and equipment ground connections.
  3. Test main and subfeed overcurrent protective devices in accordance with Section "Overcurrent Protective Devices."
- E. Retest: Correct deficiencies identified by tests and observations and provide retesting of panelboards by testing organization. Verify by the system tests that the total assembly meets specified requirements.

3.06 CLEANING

- A. Upon completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish.

3.07 COMMISSIONING

- A. Balancing Loads: After Substantial Completion, but not more than two months after Final Acceptance, conduct load-balancing measurements and circuit changes as follows:
1. Perform measurements during period of normal working load as advised by the Owner.
  2. Perform load-balancing circuit changes outside the normal occupancy/working schedule of the facility. Make special arrangements with Owner to avoid disrupting critical 24-hour services such as FAX machines and on-line data processing, computing, transmitting, and receiving equipment.
  3. Recheck loads after circuit changes during normal load period. Record all load readings before and after changes and submit test records.
  4. Tolerance: Difference between phase loads exceeding 20 percent at any one panelboard is not acceptable. Rebalance and recheck as required to meet this minimum requirement.
- B. Infrared Scanning: After Substantial Completion, but not more than two months after Final Acceptance, perform an infrared scan of the panelboard. Remove fronts to make joints and connections accessible to a portable scanner.
- C. Follow-up Infrared Scanning: Perform one additional follow-up infrared scan of the panelboard 11 months after the date of Substantial Completion.
- D. Instrument: Use an approved infrared scanning device designed to measure temperature or detect significant deviations from normal values. Provide calibration record for device used.
- E. Record of Infrared Scanning: Prepare a certified report identifying panelboard checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 24 13

**SECTION 26 27 01 – SERVICE AND DISTRIBUTION**

PART 1- GENERAL

1.01 SCOPE

- A. This Section covers the requirements for the furnishing, installing and connecting of a complete working installation of the electrical service and distribution system as outlined in related sections of Division 26, specified in detail in other parts of this Section, other related Sections and/or as shown on the Drawings. It should be noted that this Section of the Specification may include some items which are not required for, or related to, the completion of the electrical work for this Project. The Contractor shall coordinate the requirements of the various parts of this Section of the Specifications with the Drawings when ordering materials or performing Work in conformance with the applicable provisions of this Section.

PART 2- PRODUCTS

2.01 ELECTRICAL SERVICES

- A. ComEd will deliver electrical power service at 120/240 volts, single phase, three (3) wires, 60 Hertz to an existing service pole adjacent to the proposed electric cabinet located on the east side of the building.
- B. The Contractor's responsibility shall be to supply and install the proposed electric cabinet and coordinate as required to keep existing service intact until new services are in place. The work also includes furnishing the secondary voltage cables and conduit from the proposed ComEd meters to the secondary conductors of the power company which will be located on the north side of Main Street and secondaries fed to the proposed ComEd pole. ComEd will furnish connectors and make connections to the transformer. The underground conduit shall be provided and installed as specified in Part 3 of this Section and as shown on the Drawings.

PART 3- EXECUTION

3.01 GENERAL

- A. The methods of installation of Contractor furnished equipment and materials are described in related Sections of these Specifications and as shown on the Drawings, and shall in general be in accordance with the manufacturer's and/or Commonwealth Edison's standard procedures and recognized engineering practices.
- B. The intent of these Specifications is to provide and coordinate electrical service from the ComEd service pole to the proposed customer owned pole and distribute service to the Metra electric cabinet. Underground electrical service/ conduits/ducts shall be installed in accordance with ComEd's requirements.

PART 4-      MEASUREMENT AND PAYMENT

4.01      METHOD OF MEASUREMENT:

No separate measurement shall be made for SERVICE AND DISTRIBUTION.

4.02      BASIS OF PAYMENT:

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 27 01

**SECTION 26 27 16 – VOICE OF METRA INSTRUMENT CABINET**

**PART 1- GENERAL**

**1.01 SCOPE**

A. Description of Work: This Work shall consist of furnishing and installing the Voice of Metra Instrument Cabinet. The work under this section shall include all labor, materials, tools and equipment required to furnish and install the Voice of Metra Instrument Cabinet and accessories as specified herein and/or shown on the Drawings.

B. Related Work:

1. Cast-in-Place Light Pole Foundations and Cabinet Pads
2. General Electric Requirements
3. Basic Electrical Materials & Methods/Requirements
4. Underground Conduit Runs
5. Wire & Cables for Site Electrical Work
6. Metra Electric Cabinet and Pad
7. Electrical Connection for Site Equipment

1.02 QUALITY ASSURANCE: Regulatory Requirements: Comply with provisions of the following code: UL Compliance: Comply with the requirements of UL 50.

1.03 SUBMITTALS

In accordance with the Supplemental Conditions, the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions and field check-out/testing procedures for all equipment furnished.

1.04 DELIVERY, STORAGE AND HANDLING:

Deliver products in factory containers. Store in clean, dry space in original A. containers. Protect the products from fumes and construction traffic. Handle carefully to avoid damage.

**PART 2- PRODUCTS**

2.01 The Contractor shall furnish the Voice of Metra Instrument Cabinet as per the following requirements.

- A. Enclosure: The Instrument Cabinet shall be constructed of steel, 12 gauge base, 14 gauge sides and door, and 16 gauge top and backboard support panels. The

Cabinet shall be manufactured by Safetran catalog # 567200 - 41X or approved equal.

- B. Insulation: B. Minimum 1/2" thick plastic form sheets (Atlas High Performance Insulative Sheathing or equivalent), attached to the inside of all exterior surfaces.
- C. Cabinet and Panel Size: As shown on the Drawings.
- D. Painting: Prime and finish both inside and outside with ANSI 61 gray polyester powder coating over phosphatized surfaces.
- E. Back Board: 3/4" thick exterior grade plywood, (1" from the back).
- F. Accessories
  - 1. Door - Single door size 36 11/16" wide x 55 11/16" high with locking handle.
  - 2. Vent Fan - Approx. 120 CFM, 110 volt, single phase, 60 Hz.
  - 3. Fan Thermostat - Adjustable 70 to 140 degrees Fahrenheit, set to turn on at 90 degrees.
  - 4. Strip heater - Approx. 1250 watts, 110 volts, single phase, 60 Hz.
  - 5. Heater Thermostat - Adjustable 20 to 80 degrees Fahrenheit, set to turn on at 40 degrees F.
  - 6. Duplex Outlet - Two duplex 110 volt outlets.
  - 7. Electrical Ground terminal - Attached to the instrument Cabinet.
  - 8. Fuse Disconnect Assembly - Single fuse disconnect assembly, 15 amperes, 250 VAC with insulated terminal caps.
  - 9. Riser conduit - 3/4" diameter attached to the interior right side of the cabinet.

2.02 WIRING

All wiring is to be in conduit, with all electrical boxes securely attached to the instrument Cabinet.

PART 3- EXECUTION

3.01 NOTIFICATION

Notify Communications Field Staff at (312) 322-7777 at least ten working days prior to installation of VOM cabinet so that Metra personnel can remove existing VOM equipment and coordinate the connection of all new VOM equipment.



3.02 EXAMINATION

- A. Do not proceed until unsatisfactory conditions have been corrected.

3.03 INSTALLATION

- A. General: Install equipment in accordance with manufacturer's written instructions.
- B. Wiring Methods: Install wiring in conduits.
- C. Wiring Within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.
- D. Splices, Taps, and Terminations: Make splices, taps and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets and equipment enclosures.

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

No separate measurement shall be made for VOICE OF METRA INSTRUMENT CABINET.

4.02 BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 27 16

**SECTION 26 27 19 – UP-W ELECTRIC CABINET AND PAD**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description of Work**

This Work shall consist of furnishing, installing and testing the UP-W electric cabinet and the related wiring as shown on the Drawings or as directed by the Engineer. The work in this section shall include all labor, materials, tools and equipment to furnish and install the lighting control cabinet and associated wiring connections associated with light poles. Work of this Section shall also include all items as required for providing and installing the lighting control cabinet equipment pad.

**B. Related Work**

1. General Electric Requirements
2. Basic Electrical Materials & Methods/Requirements
3. Disconnects & Circuit Breakers
4. New Platform Lighting Units
5. Underground Conduit Runs
6. Wire & Cables for Site Electrical Work
7. Electrical Connection for Site Equipment

**1.02 QUALITY ASSURANCE**

Regulatory Requirements: Comply with provisions of the following codes:

- A. NFPA 70 "National Electrical Code": Conform to applicable codes and regulations regarding the internal wiring of the cabinet.
- B. UL Compliance: Provide components which are listed and labeled by UL under the following standards.
  1. UL Standards 50 and 508 for enclosure.
  2. UL Standard 486A for wire connector.
  3. UL Standard 854 for power cables.

1.03 SUBMITTALS

The Contractor shall submit to the ENGINEER for review drawings, product specifications and descriptions, including control schematic diagrams, wiring connection diagrams, together with installation instruction, and operating and maintenance procedures in accordance with the applicable requirements specified in the Supplemental Conditions for all equipment furnished.

PART 2- PRODUCTS

2.01 THE ELECTRICAL CABINET

The Contractor shall furnish the electrical cabinet as per the requirements:

- A. The cabinet shall be constructed of 14 gauge steel lobby with integral trough offset.
- B. The door shall also be 14 gauge steel and all welds shall be ground smooth.
- C. The cabinet shall be rain tight and dust tight (NEMA Type 3R).
- D. Body and door ground studs shall provide positive ground.
- E. Furnish plastic plugs to provide seals to mounting holes.
- F. Cabinet Size shall be as noted on the Drawings.
- G. Painting: Prime and finish both inside and outside with ANSI 61 gray polyester powder coating over phosphatized surfaces.
- H. Accessories:
  - 1. Locking handle on door.
  - 2. Weather resistant louvers on both sides.
  - 3. Strip Heater – Approximately 800 Watts, 120 Volts, Single Phase, 60 Hz with heater thermostat adjustable 20 to 80 degrees Fahrenheit. Set to turn on at 40 degrees Fahrenheit.
- I. The electrical cabinet shall include all the components as noted on the plans.

2.02 THE EQUIPMENT PAD

Equipment pad shall be provided as required and shall be of the poured-in-place reinforced concrete type adequately sized to accommodate the cabinet. Concrete and related concrete products shall be in accordance with the details shown on the plans.

PART 3-      EXECUTION

3.01      EXAMINATION

- A. Do not proceed until unsatisfactory conditions have been corrected.

3.02      INSTALLATION

- A. General: Install equipment in accordance with manufacturer's written instructions.
- B. Wiring Methods: Install wiring in conduits.
- C. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess. Provide and use lacing bars.
- D. Splices, Taps, and Terminations: Make splices, taps and terminations on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets and equipment enclosures.
- E. Photoelectric Cell: To be mounted on the electrical cabinet.

3.03      GROUNDING

- A. Provide equipment grounding connections for system. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
- B. Provide grounding electrodes, made of steel with copper welded exterior, 3/4" in diameter and 10 feet in length as shown on drawings.
- C. Provide a solid copper grounding bar of 2" wide x 4" long x 1/4" thick and mount at lower left corner in the electrical cabinet.
- D. Connect the grounding electrode and grounding bar to the grounding stud of the electrical cabinet.
- E. Ground equipment and conductor to eliminate shock hazard. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
- F. For additional requirements refer to Section 16450.

3.04      FIELD QUALITY CONTROL

- A. Pretesting: Upon completing installation of the system, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the conformance of the system to the requirements of the drawings and specifications. Correct deficiencies observed in pretesting. Replace

malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

- B. Testing: Upon completion of pretesting, notify the ENGINEER, Village of Maywood and Metra's Engineer a minimum of 10 days in advance, of acceptance tests performance schedule and conduct tests in his presence. Provide a written record of test results.
- C. Inspection: Make observations to verify that units and controls are properly labeled, and interconnecting wires and terminals are identified.
- D. Retesting: Rectify deficiencies indicated by tests and completely retest work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the specifications and complies with applicable standards.

3.05 CLEANING AND PROTECTION

- A. Prior to final acceptance, clean system components and protect from damage and deterioration.

PART 4- MEASUREMENT AND PAYMENT

4.01 METHOD OF MEASUREMENT

No separate measurement shall be made for UP-W ELECTRIC CABINET AND PAD.

4.02 BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 27 19

**SECTION 26 28 16 - DISCONNECTS AND CIRCUIT BREAKERS**

PART 1- GENERAL

1.01 SCOPE

A. Description of Work: This Section includes the following:

1. Service disconnects.
2. Feeder and equipment disconnects.
3. Enclosed circuit breakers.

B. Related Work

1. Division 26.

1.02 QUALITY ASSURANCE

A. Comply with NFPA 70 "National Electrical Code" for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

C. Single-Source Responsibility: All enclosed switches and circuit breakers shall be the product of a single manufacturer.

1.03 SUBMITTALS

A. General: All submittals shall be in accordance with the applicable requirements of the Supplemental Conditions.

B. Product data for switches, circuit breakers, and accessories specified in this Section.

C. Descriptive data ratings for protective devices and let-through current ratings of devices.

D. Wiring diagrams detailing power and control wiring and differentiating clearly between manufacturer-installed wiring and field-installed wiring.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of

- completed projects with project names, addresses, names of Engineers and Owners, and other information specified.
- F. Field test reports indicating and interpreting test results.
  - G. Maintenance data for tripping devices to include in the "Operating and Maintenance Manual" specified in Division 1.

PART 2-      PRODUCTS

2.01      MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering enclosed switches and circuit breakers that may be incorporated in the Work include:
  - 1. Fusible Switches:
    - a. Allen-Bradley Co.
    - b. Crouse-Hinds Distribution Equipment.
    - c. Distribution and Controls (formerly Westinghouse Electric Co.).
    - d. Cutler-Hammer Products; Eaton Corp.
    - e. Electrical Distribution and Control; General Electric Co.
    - f. General Switch Corp.
    - g. Siemens Energy & Automation, Inc.
    - h. Square D Co.
  - 2. Fused Power Circuit Devices:
    - a. Boltswitch.
    - b. Electrical Distribution and Control; General Electric Co.
    - c. Pringle Electrical Mfg. Co.
    - d. Square D Co.
  - 3. Molded-Case Circuit Breakers:
    - a. Crouse-Hinds Distribution Equipment.
    - b. Distribution and Control (formerly Westinghouse Electric Co.).
    - c. Cutler-Hammer Products; Eaton Corp.

- d. Electrical Distribution and Control; General Electric Co.
- e. General Switch Corp.
- f. Klockner-Moeller.
- g. Siemens Energy & Automation, Inc.
- h. Square D Co.

PART 3-      EXECUTION

3.01          INSTALLATION

- A. Install enclosed switches and circuit breakers level and plumb.
- B. Connect enclosed switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts according to equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.02          FIELD QUALITY CONTROL

- A. Testing: After installing enclosed switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
  - 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
- B. Correct malfunctioning units at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

3.03          ADJUSTING

- A. Set field-adjustable enclosed switches and circuit breaker trip ranges as indicated.

3.04          CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.



PART 4-      MEASUREMENT AND PAYMENT

4.01      METHOD OF MEASUREMENT

No separate measurement shall be made for DISCONNECTS AND CIRCUIT BREAKERS.

4.02      BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 28 16

**SECTION 26 51 13 – INTERIOR AND EXTERIOR BUILDING LIGHTING**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description**

This Section covers the lighting systems to be furnished, installed, connected and tested as specified and described herein and as shown on the Drawings. The lighting system(s) shall include outlet boxes, pull and junction boxes, conduit and fittings, wire, cable, grounding connections, wiring devices and plates, fixtures, lamps, and accessories required for a complete lighting system. All related fittings, connectors, supports and anchors where required, but not specifically provided for in these Specifications shall be included under this Section of Work.

**B. Related Work**

1. Other Sections as specified herein.

**C. Definitions**

1. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include lamps and parts required to distribute the light, position and protect lamps, and connect lamps to the power supply. Internal battery powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units are available with and without integral lamp heads and lamps.
2. Luminaire: Fixture.
3. Average Life: The time after which 50 percent will have failed and 50 percent will have survived under normal conditions.
4. Heater: A complete operational unit including all parts, switches, wiring, conduit and electrical connections. Coordinate with Section 16582.

**1.02 QUALITY ASSURANCE**

- A. Comply with NFPA 70 "National Electrical Code" for components and installation.
- B. Listing and Labeling: Provide fixtures and emergency lighting units that are listed and labeled for their indicated use on the Project.
  1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations and recessed in combustible construction specifically listed and labeled for such use.

2. The terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
  3. Listing and Labeling Agency Qualification: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- C. Manufacturers Qualifications: Firms experienced in manufacturing fixtures that are similar to those indicated for this Project and that have a record of successful in-service performance.
- D. Coordination of Fixtures with Ceiling: Coordinate fixtures mounting hardware and trim with the ceiling system.

1.03 SUBMITTALS

- A. General: The Contractor shall submit to the ENGINEER for review drawings, product specifications and descriptions, including control schematic diagrams, wiring connection diagrams, polar charts of the lighting pattern together with installation instruction, and operating and maintenance procedures in accordance with the applicable requirements specified in the Supplemental Conditions for all equipment furnished.
- B. Product data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange product data for fixtures in order of fixture designation. Include data on features and accessories and the following information:
1. Outline drawings of fixtures indicating dimensions and principal features.
  2. Electrical ratings and photometric data with specified lamps and certified results of independent laboratory tests.
  3. Data on batteries and chargers of emergency lighting units.
- C. Product certifications signed by manufacturers of lighting fixtures certifying that their fixtures comply with specified requirements.
- D. Shop drawings from manufacturers detailing nonstandard fixtures and indicating dimensions, weights, methods of field assembly, components, features and accessories.
- E. Coordination drawings for fixtures mounted on, in or above the ceiling indicating coordination with ceiling grids and other equipment installed in the same place.
- F. Samples for verification purposes of specific individual fixtures.
- G. Samples for use in full size mockup of specific individual fixtures.

PART 2-      PRODUCTS

2.01          GENERAL

The Drawings show the approximate locations of lighting fixtures, switches, receptacles, and other equipment connected to the lighting panelboards. They also show the circuit assignment to each device. Conduit and wiring connections shall be furnished by the Contractor in accordance with the circuiting and control shown on the Drawings. Branch circuit breakers, spares, and spaces shall be shown on the Drawings.

2.02          FIXTURES

A.          Interior and Exterior Lighting Fixtures

Fixtures shall be of the types specified on Drawings in the Lighting Fixture Schedule and shall be furnished complete with mounting brackets, fixture mounting stems, or hangers, together with steel supports and/or channels as required, and fixture wires. Fixture wire shall be as specified in Section 16120, Wire and Cable.

B.          Exit Signs and Emergency Lighting Fixtures

Exit signs and emergency lighting fixtures shall be self-contained, battery operated during emergency. They shall be completely automatic and shall provide a minimum of one and a half hours operation under emergency condition. A solid state SCR charger shall maintain the battery at full charge. Upon interruption of normal AC power, the transfer circuit shall automatically switch the load to the battery. A low voltage disconnect circuit shall be included to protect the battery from damage. When normal AC power is restored, the unit shall automatically transfer to the normal power supply and the battery charger shall resume the recharge cycle. A test switch and a rate of charge indicating pilot light shall be included. Battery shall be of the no-maintenance, long life (minimum 15 years) type.

2.03          DETAILS OF CONSTRUCTION

A.          Outlet Boxes

1.          Each fixture or continuous row of fixtures and all switches, receptacles, and other wiring devices shall be provided with suitable outlet boxes.
2.          Outlet boxes shall be of the cast ferrous or aluminum alloy type.
3.          Drains shall be provided on all boxes located at lowest point in conduit run, as specified, or as shown on the Drawings.
4.          Outlet boxes shall be equipped with suitable covers, canopies, or device plates as specified.

5. Outlet box extension rings shall be provided for exposed conduit extensions from embedded outlet boxes. Extension rings shall match the embedded boxes. Where extension rings are mounted on cast type boxes, neoprene gaskets shall be used.

B. Wiring Devices and Plates

1. The Contractor shall furnish and install all wiring devices and device plates as shown on the Drawings and as specified herein and in Section 26 05 20.
2. Wall switches and receptacles shall be covered with device plates suitable for the type and number of devices enclosed. Covers mounted on boxes containing 2 or more devices shall be of the combination type.
3. Switches for the control of lighting shall be as specified in Section 26 05 20.
4. Convenience outlets shall be as specified in Section 26 05 20.

PART 3- EXECUTION

3.01 FACTORY TEST AND INSPECTION

Each item of equipment shall be shop-assembled and tested in accordance with the manufacturer's standard procedure. Monitoring and control devices shall be functionally tested to verify correct operation and that all parts function properly.

3.02 INSTALLATION

- A. **Setting and Securing:** Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's printed instructions and approved shop drawings. Hang all conduit from hangers and not from ceiling grid system. Conduit system shall not be used to support fixtures.
- B. **Support For Recessed and Semi recessed Fixtures:** Install units may be supported from suspended ceiling support system. Install ceiling system support rods or wires at a minimum of four rods or wires per fixture located not more than 6 inches from fixture corners.
  1. **Fixtures Smaller Than Ceiling Grid:** Install a minimum of four rods or wires for each fixture and locate at corner of the ceiling grid where the fixture is located. Do not support fixtures by ceiling acoustical panels.
  1. **Fixtures of Sizes Less Than Ceiling Grid:** Center in the acoustical panel. Support fixtures independently with at least two 3/4-inch metal channels spanning and secured to the ceiling tees.
  3. **Recessed fixtures shall be securely fastened to roof structural members, at four corners of each fixture.**

- C. Support for Suspended Fixtures: Brace pendants and rods that are 4-feet long or longer to limit swinging. Support stem mounted single-unit suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.
- D. Lamping: Lamp units according to manufacturer's instructions.

3.03 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Give advance notice of dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following in tests of emergency lighting equipment.
  - 1. Duration of supply.
  - 2. Low battery voltage shut-down.
  - 3. Normal transfer to battery source and retransfer to normal.
  - 4. Low supply voltage transfer.
- E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

3.04 ADJUSTING, CLEANING AND TESTING

- A. Clean fixtures upon completion of installation. Use methods and materials recommended by manufacturer.
- B. Adjust aimable fixtures to provide required light intensities.
- C. After installation, the complete lighting system shall be given adequate field visual and functional tests, witnessed by the ENGINEER, to demonstrate that the requirements of the Specifications and Drawings have been met and that the performance of the system is satisfactory. Three certified copies of the field tests shall be furnished to the ENGINEER.

PART 4-      MEASUREMENT AND PAYMENT

4.01      METHOD OF MEASUREMENT

No separate measurement shall be made for INTERIOR AND EXTERIOR BUILDING LIGHTING.

4.02      BASIS OF PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 51 13

**SECTION 26 56 00 – NEW PARKING AREA LIGHTING UNITS**

PART 1-      GENERAL

1.01          SCOPE

A.          Description of Work

This Work shall consist of furnishing and installing light pole foundations, poles, and luminaires at the locations shown in the plans or as directed by the Engineer for the new parking area lighting system. This Work shall include all excavation and backfill; furnishing and installing of reinforcement; furnishing and placing concrete, Class SI, and protective coat, regarding; furnishing and installing light poles, luminaires, grounding rods, anchor bolts, and all associated hardware and electrical connection items and all labor, tools, and equipment necessary to complete the work as specified, including clean-up and restoration of the location.

B.          Related Work

1.          General Electric Requirements
2.          Basic Electrical Materials & Methods/Requirements
3.          Underground Conduit Runs
4.          Wire & Cables for Site Electrical Work
5.          Metra Electric Cabinet and Pad
6.          Electrical Connection for Site Equipment
7.          Voice of Metra Speakers

1.02          STANDARDS

- A.          Foundation and Conduits Detail, as shown on the Drawings.
- B.          Standard Light Pole Detail, as shown on the Drawings.
- C.          Typical Pole Wiring, as shown on the Drawings.

1.03          SUBMITTALS

The Contractor shall submit to the ENGINEER for review drawings, product specifications and descriptions, including control schematic diagrams, wiring connection diagrams, polar charts of the lighting pattern together with installation instruction, and operating and maintenance procedures in accordance with the applicable requirements specified in the Supplemental Conditions for all equipment furnished.



1.04        REFERENCES

Work under this item shall be performed in accordance with Sections 508, 801, 810, 812, 830, 836, 1003, 1004, 1006, 1020, 1021, 1022, 1023, 1058 and 1103 of the IDOT Standard Specifications for Road and Bridge Construction (referred to as Standard Specifications), except as herein modified; as well as all applicable portions of the National Electric Code (NEC), National Electrical Manufacturer's Association (NEMA), UL 1572, and ANSI.

PART 2-        PRODUCT

2.01        LUMINAIRES:

- A.        General: The luminaires shall be as shown on the Drawings. They shall be totally enclosed, rain tight, dust tight and corrosion resistant.
- B.        The luminaires shall be completely assembled at the manufacturer and there shall not be any disassembly required for installation at work site.
- C.        Housing: The housing shall be light weight, rugged, one piece formed and welded aluminum, and shall ensure smooth construction. The luminaires shall be predrilled for mounting to the pole.
- D.        Electrical: The ballast shall be the high power factor type. The ballast shall be rated for -20° F for a metal halide vapor lamp and shall operate as per ANSI standards.
- E.        Lens Door Frame: The frame shall be extruded with rigid corner bracing and die cast zinc latches to permit toolless entry for servicing. The door shall have high quality silicon gasket to seal against the entry of insects, dirt and moisture. The lens shall be flat, tempered and impact resistant glass.
- F.        Finish: The finish shall be two mils minimum of electro-statically applied powder coating and the finish shall be high temperature bonded to the surface for maximum adherence. The finish shall be satin black.
- G.        The fixture shall meet the UL 1572 requirements for wet locations.

2.02        LIGHT POLES

- A.        As shown on the plans.

2.03        CONCRETE MATERIALS

Concrete materials shall meet the requirements of Sections 1020, 1021, 1022, and 1023 of the Standard Specifications. The concrete shall be Class SI and meet the following requirements:

- A.        Portland Cement: ASTM C150, domestic brand, Type I, normal Portland Cement; Type III for high-early strength Portland cement as per the requirements of

Section 1001 of the Standard Specifications. The same brand of Portland Cement shall be used for exposed concrete throughout the job unless a change is approved by the Engineer. Air entraining cement is not acceptable.

- B. High-early strength concrete may be used subject to Engineer's approval. All provisions of the specifications shall apply except that the 7 day compressive strength shall equal the 28 day compressive strength required for normal concrete.
- C. Admixtures: Admixtures shall meet the requirements of Article 1020.05 and Section 1021 of the Standard Specifications.
- D. Water-Reducing Admixture: As per the requirements of Article 1021.03 of the Standard Specifications.
- E. Air-Entraining Admixture: Use air-entraining admixtures in all concrete, as per the requirements of Article 1021.02 of the Standard Specifications. Add air entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having an air content of not less than 5% nor more than 8% of the volume of the concrete.
- F. Calcium Chloride: Shall not be used.
- G. Concrete Curing Materials: Burlap curing blankets, waterproof blankets, white polyethylene sheeting, and burlap-polyethylene blanket shall meet the requirements of Section 1022 of the Standard Specifications.
- H. Curing and Finishing Materials:
  - 1. Liquid Membrane-Forming Compounds for Curing Concrete: Fed. Spec. TT-C-800A, Type I Styrene Acrylate or Type 11 Chlorinated Rubber; non-pigmented; "Kure-N-Seal" (Sonneborn Div. of Contech Inc.), "DekoteT130" (W.R. Grace & Co.) or "CR-26" (W.R. Meadows, Inc.)
  - 2. Curing compounds shall be guaranteed not to affect the bond, adhesion or effectiveness of damp-proofing, or surface treatments.
- J. Ready Mix Concrete:
  - 1. All ready-mixed concrete shall comply with Article 1020.11 of the Standard Specifications

The ready-n-fixed concrete producer shall submit duplicate delivery tickets, one for the Contractor and one for the Engineer, with each load of concrete delivered to the site.

Delivery tickets shall provide the following information:

  - a. Date
  - b. Name of ready-mix concrete plant
  - c. Contractor

- d. Job Location
- e. Type of cement (Standard or H.E.S.)
- f. Cement content in bags per cubic yard of concrete
- g. Truck number
- h. Time dispatched, and time unloaded
- i. Amount of concrete in load in cubic yards
- j. Admixtures in concrete, if any

2.04 REINFORCEMENT

- A. Reinforcement bars shall be epoxy coated, deformed bars, Grade 60 conforming to Article 1006. 10 (b) of the Standard Specifications.
- B. Tie wire shall be black annealed wire, 16 gauge or heavier if necessary for providing cage rigidity. Where the tie wire is in contact with epoxy-coated bars, the tie wire shall be epoxy coated.

2.05 PROTECTIVE COAT

The material shall meet the requirements of Section 1023 of the Standard Specifications.

PART 3- EXECUTION

3.00 FACTORY TESTS & INSPECTIONS

Each item of equipment shall be shop assembled and tested in accordance with the manufacturer's standard procedures. Monitoring and control devices shall be functionally tested to verify correct operation and that all parts function properly.

3.01 LIGHT POLES AND LUMINAIRES

Installation of poles and luminaires shall be performed in accordance with Section 830 of the Standard Specifications, except as herein modified.

- A. To obtain adequate ventilation for rust prevention, the bottom of the pole base shall be set elevated above the concrete foundation. This elevation shall be a distance of 2-3/8" above the level of the finished foundation. A rodent screen shall be provided for the full height of ties gap.
- B. Any exposed portions of anchor bolts extending above the nuts which interfere with the installation of the bolt covers shall be cut off with a saw to provide the necessary clearance. The excess shall not be burned off
- C. The pole shall be set secure and plumb using the nuts and washer provided with the anchor bolts. AR appurtenances shall be attached for the final plumb check. The bolt covers, handhole cover, and pole cap shall be securely attached.
- D. Light pole foundations shall be constructed in accordance with Section 836 of the Standard Specifications.

- E. Comply with applicable requirements related to Field Quality Control, Adjusting, Cleaning and Testing.

3.02 CONCRETE PLACEMENT

Work under this item shall be performed in accordance with Section 420 of the Standard Specifications, except as herein modified.

- A. Pre-placement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other trades to permit the installation of their Work; cooperate with other trades in setting such work as required, Thoroughly wet wood forms immediately before placing concrete, as required where form coatings are not used. Coordinate the installation of joint materials with placement of forms and reinforcing steel.
- B. General Requirements: Comply with Section 420 of the Standard Specifications.
- C. Temperature Control for Placement: Comply with Article 1020.14 of the Standard Specifications.
- D. Concrete Curing and Protection: Concrete curing shall meet the requirements of Article 1020.13 of the Standard Specifications.
- E. Concrete Joints: Expansion joints, construction joints, and control joints shall be as shown on the Drawings, and as specified. Additional construction joints shall be subject to approval by the Engineer.
- F. Concrete Finishing:
  - 1. Horizontal concrete surfaces shall be finished as per Article 424.06 of the Standard Specifications.
  - 2. Vertical concrete surfaces shall be finished smooth and even, and given a light brush finish while the concrete is still workable. The edges shall be rounded with approved finishing tools having the radii shown on the plans.

3.03 REINFORCEMENT

Work under this item shall be performed in accordance with Section 508 of the Standard Specifications, except as herein modified.

- A. The placement of reinforcement shall meet the requirements of Articles 420.09 and 420.10 of the Standard Specifications.
- B. The reinforcement bars shall be securely tied to prevent displacement during the concreting operation.
- C. All reinforcing bars shall be placed with a tolerance of 1/2" to provide for adequate protective concrete cover, unless stated specifically on the Plans.

- D. Coordinate with Metra's Engineer at least 24 hours prior to placement of concrete to arrange for inspection of steel reinforcement.
- E. Reinforcement bar supports shall meet the requirements of Article 420. 1 0 of the Standard Specifications.
- F. The reinforcement bars, when delivered on the job, shall be stored above the surface of the ground on wooden or padded steel cribbing, and shall be protected from mechanical injury and from deterioration by exposure. When placed in the work, they shall be free from dirt, paint, oil or other foreign substances.
- G. All systems for handling epoxy-coated reinforcement bars shall have padded contact areas. The bars or bundles shall not be dropped or dragged.
- H. Epoxy-coated reinforcement bars to be cut in the field shall be either sawed or sheared but shall not be flame cut. Patching of the bars cuts shall be in accordance with ASTM specifications. Placing and securing of the reinforcement bars shall be in accordance with Article 508.05. All tie wire shall be epoxy coated.

3.04 PROTECTIVE COAT

Work under this item shall be performed in accordance with Section 420 of the Standard Specifications, except as herein modified.

- A. Protective coat shall be applied on all exposed concrete surfaces in accordance with Article 420.21 of the Standard Specifications.
- B. Inspection: Before commencing work, the surface shall be examined to determine that it is clean, dry and free of grease, oil or other surface contaminants which might be detrimental to proper and timely completion of work.
- C. Clean adjoining surfaces of smears, compound, or other soiling due to these operations, as work progresses. Restore, refinish or replace any adjacent surfaces or materials which are marred or damaged to the satisfaction of the Engineer.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 26 56 00

**SECTION 27 05 00 – TELEPHONE SERVICE**

**PART 1 - GENERAL**

**1.01 SCOPE**

A. This Section covers the requirements for providing telephone service to the site as required by the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Work

1. Other sections as specified herein.

**1.02 QUALITY ASSURANCE**

A. Comply with the following requirements:

1. NFPA 70 National Electrical Code (NEC).
2. Local codes and ordinances.
3. Telephone company requirements.

**PART 2- PRODUCTS**

Telephone service to the site shall be coordinated by the Contractor. Telephone service will be provided by the local telephone utility and will include one (1) standard voice grade private line circuit for normal telephone communications and two (2) data lines, one for the Auto Dialer and one for the VOM cabinet.

**PART 3- EXECUTION**

**3.01 PREPARATION**

A. Contractor shall coordinate installation of each telephone service by the local telephone company to the point of termination at telephone network interface to provide for a complete and proper installation.

B. Notify ENGINEER in a timely manner when telephone service will be required so that the service application can be processed by Owner as coordinated with the ENGINEER.

**3.02 INSTALLATION**

A. Telephone company will provide the following:

1. Service up to termination location.
2. Telephone network interface enclosures.

B. Contractor shall provide the following for a complete installation:

1. Cable from telephone network interface enclosure to each point of use.

3.03 OWNER RESPONSIBILITY

- A. The Owner will initiate service application upon request by Contractor to obtain service from the local telephone company.
- B. The Owner will pay directly to telephone company all installation charges, if any, and monthly service charges.

PART 4- MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 27 05 00

**SECTION 27 51 16 – VOICE OF METRA SPEAKERS**

**PART 1- GENERAL**

**1.01 SCOPE**

**A. Description of Work**

This Work shall consist of furnishing and installing the speaker for the Voice of Metra speakers as shown on the Drawings. The Work under this Section shall include all labor, materials, tools and equipment required to furnish the speaker for the Voice of Metra speakers including related conduits and accessories as needed and/or shown on the Drawings.

**B. Related Work**

1. General Electric Requirements
2. Basic Electrical Materials & Methods
3. Basic Electrical Requirements
4. Electrical Conduit
5. Voice of Metra Instrument Cabinet
6. Underground Conduit Runs
7. UP-W Electric Cabinet and Pad

**1.02 QUALITY ASSURANCE**

Regulatory Requirements: Comply with provisions of the following code:

- A. UL Compliance: Comply with the requirements of UL- 50.

**1.03 SUBMITTALS**

In accordance with the Supplemental Conditions, the Contractor shall submit to the ENGINEER for review drawings, product specifications, and description, together with installation instructions and field check-out/testing procedures for all cable and wire furnished. Construction and insulation material features of all cable and wire shall be submitted for review. Samples shall be furnished when requested.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect the products from fumes and construction traffic. Handle carefully to avoid damage.



PART 2-      PRODUCTS

2.01          MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by the following:

1.      Bogen Communications, Inc.

2.02          VOM SPEAKERS

Horn Type Loudspeakers: Comply with EIA-SE-103. Provide weatherproof units with the following features:

1.      Type: Single-horn units, double reentrant design, with minimum full-range power rating of 15 W.
2.      Matching Transformer: Comply with EIA-160. Full power rated 70.07 volt with 4 EIA standard taps. Maximum insertion loss of 0.5 dB.
3.      Frequency Response: Within plus or minus 3 dB from 250 to 12,000 Hz.
4.      Dispersion Angle: 130 degrees by 110 E.
5.      Mounting: Integral bracket.

2.03          WIRING

Wiring of speakers to be done by METRA.

PART 3-      EXECUTION

3.01          EXAMINATION

- A.      Do not proceed until unsatisfactory conditions have been corrected.

3.02          INSTALLATION

- A.      General: Install equipment in accordance with manufacturer's written instructions.
- B.      Pull Ropes: Contractor to provide pull ropes within conduits.

PART 4-      MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 27 51 16

**SECTION 27 51 25 – AUTO DIALER**

**PART 1- GENERAL**

**1.01 SCOPE**

- A. Description. This Section covers the autodialer type alarm system, including associated accessories to be furnished, installed and tested as shown on the Drawings and as specified herein. All fittings, connectors, supports and anchors, where required, including telephone hook-up service, shall be included under this Section of Work.
- B. Related Work
  - 1. Other Sections specified herein.

**1.02 QUALITY ASSURANCE**

- A. Applicable Manufacturer. The alarm system shall be as manufactured by RACO. Other items of equipment as specified herein.
- B. Applicable Standards. The alarm system and all related components shall conform to the applicable requirements of NEMA, U.L. and the NEC and as specified herein.

**1.03 SUBMITTALS**

The Contractor shall submit to the ENGINEER for review drawings, product specifications and description, together with internal and interconnecting wiring diagrams, installation instructions, operating and maintenance manuals, and field check-out testing procedures as specified in Section 01300 for all equipment furnished.

**PART 2- PRODUCT**

**2.01 GENERAL**

The alarm system shall be of the automatic dialing (auto dialer), plain English reporting, remote monitoring type suitable for installation and mounting as shown on the Drawings and arranged for plugging into the specified telephone jack. The alarm system shall be of the four (4) channel type, Chatterbox as manufactured by RACO.

**2.02 OPERATIONAL AND DESIGN REQUIREMENTS**

The alarm system shall be of the type to automatically dial the preprogrammed telephone number and report the station identification and the specific alarm condition that exists via standard telephone hook up arranged for pulse dialing or touch tone dialing. The normal power supply input shall be 120 volt, 1-phase, 60 Hz. A battery shall be provided inside the panel for emergency power operation.

2.03 DETAILS OF CONSTRUCTION

- A. Alarm Monitoring. The dialer shall be provided with analog input channels designed to monitor any Owner selected dry contact status. Due to Owner supplied equipment variations, the "normal" status shall be selected as either normally open or normally closed contact input by programming at time of installation. The input point shall also be selectable as "no alarm". Each of the inputs shall be individually programmable. In addition, the dialer shall monitor internal AC power and indicate power failure on the front panel face.
- B. Alarm Programming. Each alarm channel shall be custom programmed at time of installation. Additional programming or changes in programming may be done via remote programming ability or on-site visit. A different alarm event message will be generated for each status.
- C. Alarm Calling. Upon initiating an alarm call the dialer shall report only the channels currently in "alarm" status. The alarm shall be acknowledged by call back or pressing 9 on pushbutton telephone systems. The dialer shall begin calling the programmed phone numbers in sequence after an unacknowledged alarm occurs and stays activated beyond the preprogrammed "time delay before calling" time. Eight phone numbers, each with up to 16 digits, shall be programmable. A time delay between calling sequential numbers shall also be field programmable.
- D. Call In. Calling in to the dialer shall generate a report of the current status of all channels. Indication of which alarm have been acknowledgment shall also be reported. Alarms shall automatically reset after a programmable delay period. A door mounted "talk/listen" switch shall allow the caller to talk through the dialer to someone located at the dialer. If left in the listen position, the caller shall hear the station at the end of the message segment of report.
- E. Programming. All programming shall be achieved via the door mounted keypad. All keyboard, switches, and LED's shall be sealed to prevent contamination. Standard programming shall be either sequential or direct and allow control of the following items:
1. Alarm reset time. (Or no reset.)
  2. Time between sequential calls.
  3. Incoming call ring delay.
  4. Time delay before calling.
  5. Autocall On/Off time set.
  6. Input alarm criteria (N.O., N.C., No Alarm).
  7. Running time meter.
  8. Alarm output enabled/disabled.
- F. Power Supply. Normal power shall be 120 VAC, 15 watts maximum. A rechargeable Gel Cell battery shall be supplied to provide 6 hours back up on continuous calling. The battery shall last for up to 24 hours on standby while still

monitoring all channels. The dialer shall have a built in charger of the precision voltage type.

Solid state surge protection shall be provided on all inputs and phone and signal lines. These protectors shall be integrally incorporated into the main circuit board for maximum protection.

- G. Phone Line. The dialer shall operate on a standard rotary pulse or Touch Tone "dial-up" phone line (direct or leased lines will not be required) and shall be F.C.C. approved. A regular private line is to be provided by the Owner. Connection to the telephone shall be through an industry standard 8-pin modular jack (RJ-11).
- H. Analog Input. The dialer shall be required to have a 4 to 20 mA analog input channel.
- I. Accessories. The following accessories shall be included:
  - 1. 24 hour battery backup
  - 2. NEMA 1 enclosure
  - 3. Strip heater and thermostat

### PART 3- EXECUTION

#### 3.01 FACTORY TEST AND INSPECTION

All equipment shall be inspected and tested in the manufacturer's shops. Factory tests and inspections shall be conducted to verify that the equipment is operating satisfactorily. Minimum requirements of such tests and inspections shall be in accordance with the manufacturer's standard practice and/or other recognized procedures. Electrical monitoring and control devices shall be functionally tested to verify correct operation and that all components function properly.

#### 3.02 INSTALLATION AND TESTING

- A. The equipment shall be installed as shown on the Drawings and in accordance with the manufacturer's instructions and recommended best practices. All necessary fittings, connectors, supports, anchors and other items required for installation and testing shall be furnished. All items of equipment shall be operated, adjusted and tested for proper performance in accordance with the manufacturer's recommended test procedure.
- B. The equipment manufacturer shall provide the services of factory trained field supervisory personnel who shall perform all necessary coordination to check-out, start-up and place into operation the specified equipment as well as instruct Owner personnel in its control and operation.

3.03        PAINING

- A.        All equipment specified in this Section shall be shop painted with the manufacturer's standard finish. All equipment specified in this Section shall be field painted per Owner's direction.
  
- B.        The Contractor shall be responsible for coordination of the compatibility between manufacturer's standard finish and the field-paint.

PART 4-        MEASUREMENT AND PAYMENT

The work shall be paid as part of the Contract lump sum price for ELECTRICAL SYSTEM which shall be payment in full for the work described herein.

END OF SECTION 27 51 25

## **IDOT TRAINING PROGRAM GRADUATE ON-THE-JOB TRAINING SPECIAL PROVISION (TPG)**

Effective: August 1, 2012

Revised: February 1, 2014

In addition to the Contractor's equal employment opportunity affirmative action efforts undertaken as elsewhere required by this Contract, the Contractor is encouraged to participate in the incentive program to provide additional on-the-job training to certified graduates of IDOT funded pre-apprenticeship training programs outlined by this Special Provision.

It is the policy of IDOT to fund IDOT pre-apprenticeship training programs throughout Illinois to provide training and skill-improvement opportunities to assure the increased participation of minority groups, disadvantaged persons and women in all phases of the highway construction industry. The intent of this IDOT Training Program Graduate (TPG) Special Provision is to place certified graduates of these IDOT funded pre-apprentice training programs on IDOT project sites when feasible, and provide the graduates with meaningful on-the-job training intended to lead to journey-level employment. IDOT and its sub-recipients, in carrying out the responsibilities of a state contract, shall determine which construction contracts shall include "Training Program Graduate Special Provisions." To benefit from the incentives to encourage the participation in the additional on-the-job training under this Training Program Graduate Special Provision, the Contractor shall make every reasonable effort to employ certified graduates of IDOT funded Pre-apprenticeship Training Programs to the extent such persons are available within a reasonable recruitment area.

Participation pursuant to IDOT's requirements by the Contractor or subcontractor in this Training Program Graduate (TPG) Special Provision entitles the Contractor or subcontractor to be reimbursed at \$15.00 per hour for training given a certified TPG on this contract. As approved by the Department, reimbursement will be made for training persons as specified herein. This reimbursement will be made even though the Contractor or subcontractor may receive additional training program funds from other sources for other trainees, provided such other source does not specifically prohibit the Contractor or subcontractor from receiving other reimbursement. For purposes of this Special Provision the Contractor is not relieved of requirements under applicable federal law, the Illinois Prevailing Wage Act, and is not eligible for other training fund reimbursements in addition to the Training Program Graduate (TPG) Special Provision reimbursement.

No payment shall be made to the Contractor if the Contractor or subcontractor fails to provide the required training. It is normally expected that a TPG will begin training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project through completion of the contract, so long as training opportunities exist in his work classification or until he has completed his training program. Should the TPG's employment end in advance of the completion of the contract, the Contractor shall promptly notify the designated IDOT staff member under this Special Provision that the TPG's involvement in the contract has ended and supply a written report of the reason for the end of the involvement, the hours completed by the TPG under the Contract and the number of hours for which the incentive payment provided under this Special Provision will be or has been claimed for the TPG.

The Contractor will provide for the maintenance of records and furnish periodic reports documenting its performance under this Special Provision.

**METHOD OF MEASUREMENT:** The unit of measurement is in hours.

BASIS OF PAYMENT: This work will be paid for at the contract unit price of \$15.00 per hour for certified TRAINEES TRAINING PROGRAM GRADUATE. The estimated total number of hours, unit price and total price have been included in the schedule of prices.

The Contractor shall provide training opportunities aimed at developing full journeyworker in the type of trade or job classification involved. The initial number of TPGs for which the incentive is available under this contract is 1. During the course of performance of the Contract the Contractor may seek approval from the Department for additional incentive eligible TPGs. In the event the Contractor subcontracts a portion of the contract work, it shall determine how many, if any, of the TPGs are to be trained by the subcontractor, provided however, that the Contractor shall retain the primary responsibility for meeting the training requirements imposed by this Special Provision. The Contractor shall also insure that this Training Program Graduate Special Provision is made applicable to such subcontract if the TPGs are to be trained by a subcontractor and that the incentive payment is passed on to each subcontractor.

For the Contractor to meet the obligations for participation in this TPG incentive program under this Special Provision, the Department has contracted with several entities to provide screening, tutoring and pre-training to individuals interested in working in the applicable construction classification and has certified those students who have successfully completed the program and are eligible to be TPGs. A designated IDOT staff member, the Director of the Office of Business and Workforce Diversity (OBWD), will be responsible for providing assistance and referrals to the Contractor for the applicable TPGs. For this contract, the Director of OBWD is designated as the responsible IDOT staff member to provide the assistance and referral services related to the placement for this Special Provision. For purposes of this Contract, contacting the Director of OBWD and interviewing each candidate he/she recommends constitutes reasonable recruitment.

Prior to commencing construction, the Contractor shall submit to the Department for approval the TPGs to be trained in each selected classification. Furthermore, the Contractor shall specify the starting time for training in each of the classifications. No employee shall be employed as a TPG in any classification in which he/she has successfully completed a training course leading to journeyman status or in which he/she has been employed as a journeyman. Notwithstanding the on-the-job training purpose of this TPG Special Provision, some offsite training is permissible as long as the offsite training is an integral part of the work of the contract and does not comprise a significant part of the overall training.

Training and upgrading of TPGs of IDOT pre-apprentice training programs is intended to move said TPGs toward journeyman status and is the primary objective of this Training Program Graduate Special Provision. Accordingly, the Contractor shall make every effort to enroll TPGs by recruitment through the IDOT funded TPG programs to the extent such persons are available within a reasonable area of recruitment. The Contractor will be responsible for demonstrating the steps that it has taken in pursuance thereof, prior to a determination as to whether the Contractor is in compliance and entitled to the Training Program Graduate Special Provision \$15.00 an hour incentive.

The Contractor or subcontractor shall provide each TPG with a certificate showing the type and length of training satisfactorily completed.






Christopher B. Burke Engineering, Ltd.  
Metra, Maywood Station Improvements

Boring No. B-1  
Project ID: CBE1402  
Drafter: J. Smith  
Page: 1 of 8



Driller:		HTI		Drilling Completed:		7/15/2014		Water Level During:		Dry	
Drill Rig:		CME 75		Surface Elevation		627.6		Water Level After:		Dry	
Sample	Recover y, in	Blow Count	Depth, ft	Graphic Log	Material Description	$C_p$ , tsf	$W_c$ , %	$Y_{dr}$ , pcf	MS	Remarks	
1			1		6" concrete 4" stone						
			2		brown/gray/trace dark gray silty clay, trace sand, trace gravel, tough POSSIBLE FILL (CL)	1.5	24.7	--	AS		
2	12.5"	1	3		brown/gray silty clay, trace sand, trace gravel, very tough CLAY (CL)	3	20.9	--	SS		
3	15"	5	4		brown/trace gray silty clay, trace sand, hard CLAY (CL)	4.25	23.3	--	SS		
4	22.5"	8	5		brown/trace gray silty clay, trace sand, trace gravel, hard CLAY (CL)	4.50	--	--	SS		
5	17.5"	14	6		gray very silty clay, trace gravel, hard CLAY (CL-ML)	4.5	17.8	--	SS		
6	19"	14	7		gray silty clay, little sand and gravel, sand & gravel layer, damp, very tough CLAY (CL)	2.75	14.3	--	SS		
			8		gray silt, trace sand, trace gravel, medium dense SILT (ML)	--	--	--	SS		
7	18.5"	14	8								
8	24"	29	9								
			10								
			11								
			12								
			13								
			14								
			15								
			16								
			17								
			18								
			19								
			20								
			21								
			22								
			23								
			24								
			25								

continued



					Christopher B. Burke Engineering, Ltd. Metra, Maywood Station Improvements					Boring No. B-1	
										Project ID: CBE1402	
										Drafter: J. Smith	
										Page: 2 of 8	
Driller: HTI		Drilling Completed: 7/15/2014		Water Level During: Dry							
Drill Rig: CME 75		Surface Elevation: 627.6		Water Level After: Dry							
Sample	Recover y, in	Blow Count	Depth, ft	Graphic Log	Material Description	$Q_p$ tsf	$W_c$ %	$\gamma_d$ pcf	MS	Remarks	
9	24"	17	26		continued						
			27		gray sandy silty clay, little gravel, very tough CLAY (CL)						
			28								
			29								
			30								
EOB											

**Legend:**

- |  |  |
|--|--|
|  Water Level While Sampling   |  Water Level After Drilling |
| $Q_p$ Estimated Unconfined Compressive Strength Based Upon Calibrated Penetrometer Reading, tons/ft <sup>2</sup> | <b>MS</b> Method of Sampling   |
| <b>Wc</b> Moisture Content, %  | <b>SS</b> Split Spoon  |
| $\gamma_d$ Dry Density, pounds/ft <sup>3</sup>   | <b>ST</b> Shelby Tube  |
| <b>WS</b> While Sampling   | <b>HA</b> Hand Auger   |
| <b>WD</b> While Drilling   |  |



Christopher B. Burke Engineering, Ltd.  
Metra, Maywood Station Improvements

Boring No. B-2  
Project ID: CBE1402  
Drafter: J. Smith  
Page: 3 of 8

Driller:		HTI		Drilling Completed:		7/15/2014		Water Level During:		Dry						
Drill Rig:		CME 75		Surface Elevation		626.3		Water Level After:		Dry						
Sample	Recover y. in	BLOW Count	Depth, ft	Graphic Log	Material Description	Q <sub>p</sub> , tsf	W <sub>c</sub> , %	Y <sub>d</sub> , pcf	MS	Remarks						
1			1		5" asphalt 9" stone											
2	4"	4	2		brown/gray sandy silty clay, little gravel, very tough POSSIBLE FILL (CL)	2	18.1	--	AS							
			3													
3	11"	2	4		brown/gray silty clay, trace sand, little gravel, very tough POSSIBLE FILL (CL)	2.25	--	--	SS							
			5													
4	16"	7	6		brown silty clay, trace sand, trace gravel, hard CLAY (CL)	4.25	18.9	--	SS							
			7													
			8													
5	24"	16	9		brown silty clay, trace sand, trace gravel, hard CLAY (CL)	4.50	--	--	SS							
			10													
			11													
6	16.5"	15	12		gray silty clay, trace sand, trace gravel, hard CLAY (CL)	4.5+	14.4	--	SS							
			13													
			14													
			15													
			16													
7	22"	9	17		gray silty clay, trace sand, trace gravel, silt seams, hard CLAY (CL)	4.25	--	--	SS							
			18													
			19													
			20													

Legend:

- Water Level While Sampling
- Q<sub>p</sub> Estimated Unconfined Compressive Strength Based Upon Calibrated Penetrometer Reading, tons/ft<sup>2</sup>
- W<sub>c</sub> Moisture Content, %
- Y<sub>d</sub> Dry Density, pounds/ft<sup>3</sup>
- WS While Sampling
- WD While Drilling

- Water Level After Drilling
- MS Method of Sampling
- SS Split Spoon
- ST Shelby Tube
- HA Hand Auger

cont.



Christopher B. Burke Engineering, Ltd.  
Metra, Maywood Station Improvements

Boring No. B-2  
Project ID: CBE1402  
Drafter: J. Smith  
Page: 4 of 8

Driller:		HTI			Drilling Completed:		7/15/2014		Water Level During:		Dry	
Drill Rig:		CME 75			Surface Elevation		626.3		Water Level After:		Dry	
Sample	Recover y, in	Blow Count	Depth, ft	Graphic Log	Material Description	$Q_p$ tsf	$W_c$ %	$\gamma_d$ pcf	MS	Remarks		
8	20"	15	21 22 23 24 25 26		gray very silty clay, trace sand, trace gravel, hard CLAY (CL-ML)	4.5+	12.2	--	SS			
9	18"	5	27 28 29 30		gray sandy silt, trace gravel, loose SILT (ML)	--	13.7	--	SS			

EOB

**Legend:**

- |            |  |    |                            |
|------------|--|----|----------------------------|
|            | Water Level While Sampling   |    | Water Level After Drilling |
| $Q_p$      | Estimated Unconfined Compressive Strength Based Upon Calibrated Penetrometer Reading, tons/ft <sup>2</sup> | MS | Method of Sampling         |
| $W_c$      | Moisture Content, %  | SS | Split Spoon                |
| $\gamma_d$ | Dry Density, pounds/ft <sup>3</sup>  | ST | Shelby Tube                |
| WS         | While Sampling   | HA | Hand Auger                 |
| WD         | While Drilling   |    |                            |



Christopher B. Burke Engineering, Ltd.  
Metra, Maywood Station Improvements

Boring No. B-3  
Project ID: CBE1402  
Drafter: J. Smith  
Page: 5 of 8

Driller:		HTI		Drilling Completed:		7/15/2014		Water Level During:		Dry	
Drill Rig:		CME 75		Surface Elevation		626.7		Water Level After:		Dry	
Sample	Recover y. in	Blow Count	Depth, ft	Graphic Log	Material Description	$Q_p$ , tsf	$W_c$ , %	$\gamma_d$ , pcf	MS	Remarks	
1			1		5.5" asphalt 9" stone						
2	0	5	2		No Recovery	--	--	--	AS		
3	19.5"	3	3		brown/gray silty clay, trace sand, trace gravel, tough POSSIBLE FILL (CL)	1.75	20.3	--	SS		
4	21"	15	4		brown/trace gray silty clay, trace sand, trace gravel, hard CLAY (CL)	4.5+	17.3	--	SS		
5	19"	18	5		gray/trace brown silty clay, trace sand, trace gravel, hard CLAY (CL)	4.5+	--	--	SS		
6	15.5"	12	6		gray sandy silty clay, trace gravel, trace silt seams, hard CLAY (CL)	4.5+	--	--	SS		
7	16"	17	7		gray silty clay, trace sand, trace gravel, hard CLAY (CL)	4.5+	--	--	SS		

Legend:

- Water Level While Sampling
- $Q_p$  Estimated Unconfined Compressive Strength Based Upon Calibrated Penetrometer Reading, tons/ft<sup>2</sup>
- $W_c$  Moisture Content, %
- $\gamma_d$  Dry Density, pounds/ft<sup>3</sup>
- WS While Sampling
- WD While Drilling

- Water Level After Drilling
- MS Method of Sampling
- SS Split Spoon
- ST Shelby Tube
- HA Hand Auger

cont.



Christopher B. Burke Engineering, Ltd.  
Metra, Maywood Station Improvements

Boring No. B-3  
Project ID: CBE1402  
Drafter: J. Smith  
Page: 6 of 8

Driller: HTI  
Drill Rig: CME 75  
Drilling Completed: 7/15/2014  
Surface Elevation: 626.7  
Water Level During: Dry  
Water Level After: Dry

Sample	Recover y, in	Blow Count	Depth, ft	Graphic Log	Material Description	$Q_p$ , tsf	$W_c$ , %	$\gamma_d$ , pcf	MS	Remarks
8	20.5"	31	21 22 23 24 25		gray silty clay and clayey silt, trace sand, trace gravel, very tough CLAY and SILT (CL-ML)	3.75	10.7	--	SS	
9	19.5"	21	26 27 28 29 30		gray very silty clay, trace sand, trace gravel, hard CLAY (CL)	4.5+	12.4	--	SS	

EOB

**Legend:**

Water Level While Sampling

$Q_p$  Estimated Unconfined Compressive Strength Based Upon Calibrated Penetrometer Reading, tons/ft<sup>2</sup>

$W_c$  Moisture Content, %

$\gamma_d$  Dry Density, pounds/ft<sup>3</sup>

WS While Sampling

WD While Drilling

Water Level After Drilling

MS Method of Sampling

SS Split Spoon

ST Shelby Tube

HA Hand Auger



Christopher B. Burke Engineering, Ltd.  
Metra, Maywood Station Improvements

Boring No. B-4  
Project ID: CBE1402  
Drafter: J. Smith  
Page: 7 of 8

Driller:		HTI		Drilling Completed:		7/15/2014		Water Level During:		Dry	
Drill Rig:		CME 75		Surface Elevation		627.9		Water Level After:		Dry	
Sample	Recover y, in	Blow Count	Depth, ft	Graphic Log	Material Description	Q <sub>p</sub> , tsf	W <sub>c</sub> , %	γ <sub>d</sub> , pcf	MS	Remarks	
1			1		4" concrete 6" gravel						
2	8"	3	2		dark brown/brown/trace black silty clay, little sand, little gravel, tough FILL (CL)	1.5	--	--	AS		
3	20"	7	3		brown/gray silty clay, trace sand, hard CLAY (CL)	4.5	20.7	--	SS		
			4								
4	12"	6	5		brown silty clay, trace sand, trace gravel, hard CLAY (CL)	4.25	--	--	SS		
			6								
			7								
			8								
5	20"	22	9		gray silty clay, trace sand, little gravel, hard CLAY (CL)	4.50	11.1	--	SS		
			10								
			11								
			12								
6	18"	16	13		gray very silty clay, trace sand, trace gravel, hard CLAY (CL)	4.5+	--	--	SS		
			14								
			15								
			16								
7	24"	15	17		gray very silty clay, trace sand, trace gravel, hard CLAY (CL)	4.5+	--	--	SS		
			18								
			19								
			20								

**Legend:**

Water Level While Sampling

**Q<sub>p</sub>** Estimated Unconfined Compressive Strength Based Upon Calibrated Penetrometer Reading, tons/ft<sup>2</sup>

**W<sub>c</sub>** Moisture Content, %

**γ<sub>d</sub>** Dry Density, pounds/ft<sup>3</sup>

**WS** While Sampling

**WD** While Drilling

Water Level After Drilling




**MS** Method of Sampling

**SS** Split Spoon



**ST** Shelby Tube

**HA** Hand Auger

cont.

					Christopher B. Burke Engineering, Ltd. Metra, Maywood Station Improvements		Boring No. B-4			
							Project ID: CBE1402			
							Drafter: J. Smith			
							Page: 8 of 8			
Driller: HTI		Drilling Completed: 7/15/2014		Water Level During: Dry						
Drill Rig: CME 75		Surface Elevation: 627.9		Water Level After: Dry						
Sample	Recover y. in	Blow Count	Depth, ft	Graphic Log	Material Description	Q <sub>p</sub> , tsf	W <sub>c</sub> , %	γ <sub>d</sub> , pcf	MS	Remarks
8	18"	19	21 22 23 24 25		gray silty sandy clay, little gravel, hard and sand and gravel, medium dense CLAY, SAND/GRAVEL	4	--	--	SS	
9	40	11"	26 27 28 29 30		gray silty clay, very tough with sand and rock pieces, dense CLAY, SAND/ROCK	3.75	--	--	SS	
EOB										

**Legend:**

- |   |  |
|---|--|
|  Water Level While Sampling                  |  Water Level After Drilling |
| <b>Q<sub>p</sub></b> Estimated Unconfined Compressive Strength Based Upon Calibrated Penetrometer Reading, tons/ft <sup>2</sup> | <b>MS</b> Method of Sampling   |
| <b>W<sub>c</sub></b> Moisture Content, %  | <b>SS</b> Split Spoon  |
| <b>γ<sub>d</sub></b> Dry Density, pounds/ft <sup>3</sup>  | <b>ST</b> Shelby Tube  |
| <b>WS</b> While Sampling  | <b>HA</b> Hand Auger   |
| <b>WD</b> While Drilling  |  |

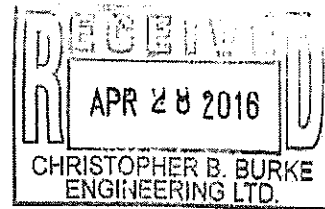
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY  
1021 North Grand Avenue, East; Post Office Box 19276; Springfield, IL 62794-9276

Division of Public Water Supplies

Telephone 217/782-1724

**PUBLIC WATER SUPPLY CONSTRUCTION PERMIT**

SUBJECT: MAYWOOD (Cook County - - 0311830)



Permit Issued to:  
Village President and Board of Trustees  
40 Madison Street  
Maywood, IL 60153

PERMIT NUMBER: 0735-FY2016

DATE ISSUED: April 26, 2016

PERMIT TYPE: Water Main

The issuance of this permit is based on plans and specifications prepared by the engineers/architects indicated, and are identified as follows. This permit is issued for the construction and/or installation of the public water supply improvements described in this document, in accordance with the provisions of the "Environmental Protection Act", Title IV, Sections 14 through 17, and Title X, Sections 39 and 40, and is subject to the conditions printed on the last page of this permit and the ADDITIONAL CONDITIONS listed below.

FIRM: Christopher B. Burke Engineering, Ltd.  
NUMBER OF PLAN SHEETS: 65  
TITLE OF PLANS: "Main St. Maywood Commuter Station"

PROPOSED IMPROVEMENTS:


\*\*\* Install approximately 300 lineal feet of 10 inch diameter and 10 lineal feet of eight (8) inch diameter water main.\*\*\*

ADDITIONAL CONDITIONS:

1. There are no further conditions to this permit.

DCC:CLK

cc: Christopher B. Burke Engineering, Ltd.  
Elgin Regional Office  
Cook County Health Department

  
\_\_\_\_\_  
David C. Cook, P.E.  
Acting Manager Permit Section  
Division of Public Water Supplies



STANDARD CONDITIONS FOR CONSTRUCTION/DEVELOPMENT PERMITS  
ISSUED BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

The Illinois Environmental Protection Agency Act (Illinois Compiled Statutes, Chapter 111-1/2, Section 1039) grants the Environmental Protection Agency authority to impose conditions on permits which it issues.

These standard conditions shall apply to all permits which the Agency issues for construction or development projects which require permits under the Division of Water Pollution Control, Air Pollution Control, Public Water Supplies and Land and Noise Pollution Control. Special conditions may also be imposed by the separate divisions in addition to these standard conditions.

1. Unless this permit has been extended or it has been voided by a newly issued permit, this permit will expire one year after this date of issuance unless construction or development on this project has started on or prior to that date. (See below)
2. The construction or development of facilities covered by this permit shall be done in compliance with applicable provisions of Federal laws and regulations, the Illinois Environmental Protection Act, and Rules and Regulations adopted the Illinois Pollution Control Board.
3. There shall be no deviations from the approved plans and specifications unless a written request for modification of the project, along with plans and specifications as required, shall have been submitted to the Agency and a supplemental written permit issued.
4. The permittee shall allow any agent duly authorized by the Agency upon the presentation of credentials:
  - a. to enter at reasonable times the permittee's premises where actual or potential effluent, emission or noise sources are located or where any activity is to be conducted pursuant to this permit.
  - b. to have access to and copy at reasonable times any records required be kept under the terms and conditions of this permit.
  - c. to inspect at reasonable times, including during any hours of operation of equipment constructed or operated under this permit, such equipment or monitoring methodology or equipment required to be kept, used, operated, calibrated and maintained under this permit.
  - d. to obtain and remove at reasonable times samples of any discharge or emission of pollutants.
  - e. to enter at reasonable times and utilize any photographic, recording, testing, monitoring or other equipment for the purpose of preserving, testing, monitoring, or recording any activity, discharge, or emission authorized by this permit.
5. The issuance of this permit:
  - a. shall not be considered as in any manner affecting the title of the permits upon which the permitted facilities are to be located;
  - b. does not release the permittee from any liability for damage to person or property caused by or resulting from the construction, maintenance, or operation of the proposed facilities;
  - c. does not release the permittee from compliance with the other applicable statues and regulations of the United States, of the State of Illinois, or with applicable local laws, ordinances and regulations;
  - d. does not take into consideration or attest to the structural stability of any units or parts of the project;
  - e. in no manner implies or suggests that the Agency (or its officers, agents or employees) assumes any liability directly or indirectly for any loss due to damage, installation, maintenance, or operation of the proposed equipment or facility.
6. These standard conditions shall prevail unless modified by special conditions.
7. The Agency may file a complaint with Board of modification, suspension or revocation of a permit:
  - a. upon discovery that the permit application misrepresentation or false statements or that all relevant facts were not disclosed; or
  - b. upon finding that any standard or special conditions have been violated; or
  - c. upon any violation of the Environmental Protection Act or any Rules or Regulation effective thereunder as a result of the construction or development authorized by this permit.

For Division of Public Water Supply Construction Permits, construction on this project, once started, may continue for four years before this permit expires. A request for extension shall be filed at least 90 day prior to the permit expiration date.

10-036

**WATERSHED MANAGEMENT PERMIT**  
**METROPOLITAN WATER RECLAMATION DISTRICT**  
**OF GREATER CHICAGO**  
111 EAST ERIE, CHICAGO, ILLINOIS, 60611

Watershed Management Permit Form

www.mwrd.org

OFFICE COPY

**INSTRUCTIONS FOR COMPLETING PERMIT FORM:** Submit two original signed copies of this permit application (nine pages) and any required WMO schedules listed below; do not leave any blank spaces; use "X" for checking applicable information. Also submit two copies of location map and plans. Address all correspondence to the Local Sewer Systems Section; for any inquiries or assistance, telephone (312) 751-3255.

**NAME AND LOCATION:**

Name of Project (as shown on plans): Main Street - Maywood Commuter Station

Location of Project (street address or with respect to two major streets): Northeast corner of Main Street and 5th Avenue

Municipality (Township, if unincorporated) Village of Maywood

Section 11 (Proviso), Township 39 N, Range 12 E

PIN (include all PINs for project, use additional sheets if more than two): - - - - -

Check type of sewer area for project:  Combined Sewer Area  Separate Sewer Area

- Project Information (Required in all cases) WMO Schedule A (Page 5 of 9)
- Sewer Summary (Required in all cases) WMO Schedule B (Page 6 of 9)
- Sewer Connections (Required in all cases) WMO Schedule C (Page 7 of 9)
- Detention & Stormwater Management Facilities (WMO) WMO Schedule D (3 Pages)
- Detention & Stormwater Management Facilities (Legacy) WMO Schedule D<sub>Legacy</sub> (4 Pages)
- Lift Station and/or Force Main WMO Schedule E (2 Pages)
- Characteristics of Waste Discharge WMO Schedule F (2 Pages)
- Treatment or Pretreatment Facilities WMO Schedule G (2 Pages)
- Hazard Areas (Floodplain / Floodway /Riparian Areas) WMO Schedule H (2 Pages)
- Affidavit Relative to Compliance with Article 7 WMO Schedule J (1 Page)
- Affidavit of Disclosure of Property Interest (Required in all cases) WMO Schedule K (2 Pages)
- Notice of Requirements for Storm Water Detention WMO Schedule L (2 Pages)
- Current Survey of Property Interests (Required in all cases) Exhibit A
- Outfall, Direct Connection, District Owned or Leased Property WMO Schedule O (1 Page)
- Soil Erosion and Sediment Control WMO Schedule P (2 Pages)
- Recording and Maintenance WMO Schedule R (2 Pages)
- Recording Exhibit AM Exhibit R
- Wetlands and Wetland Buffer Areas WMO Schedule W (2 Pages)

LOCAL SEWER SECTION  
16 FEB 11 PM 3:12

Refer to Table 1 of § 201 of Article 2 of Watershed Management Ordinance for applicable Permitting Authority.

**OTHER DOCUMENTS:** Indicate title, number of pages and originator Plans for Main Street - Maywood Commuter Station, 60 Sheets, by Christopher B. Burke Engineering, Ltd.

**NOTE: ATTACH FEE PAYMENT VOUCHER AND PAYMENT IF APPLICABLE**  
**DISTRICT USE ONLY**

Application received: FEB 11 2010 WMO Permit issued: JUN 03 2010 WRP: STICKNEY

Issued by:  DISTRICT  Authorized Municipality

## GENERAL CONDITIONS OF THE PERMIT

1. **Definitions.** The definitions of Appendix A of the Watershed Management Ordinance are incorporated into this Watershed Management Permit by reference. Additionally, the following words and phrases shall be defined as follows:
  - a) **Building and Occupancy Permit.** Building and Occupancy Permit issued by the Municipality.
  - b) **Design Engineer.** A Professional Engineer who prepares plans and specifications for the project, and signs the Watershed Management Permit Application.
  - c) **Inspection Engineer.** A Professional Engineer who inspects the development to ensure compliance with the design plans, specifications, a Watershed Management Permit, and the Watershed Management Ordinance.
  - d) **Permit.** Watershed Management Permit.
  - e) **General Conditions.** General Conditions contained in a Watershed Management Permit.
  - f) **Special Conditions.** Special conditions of this Watershed Management Permit.
2. **Adequacy of Design.** The schedules, plans, specifications and all other data and documents submitted for this Permit are made a part hereof. The Permit shall not relieve the Design Engineer of the sole responsibility for the adequacy of the design. The issuance of this Permit shall not be construed as approval of the concept or construction details of the proposed facilities and shall not absolve the Permittee, Co-Permittee or Design Engineer of their respective responsibilities.
3. **Joint Construction and Operation Permits.** Unless otherwise stated by the Special Conditions, the issuance of this Permit shall be a joint construction and operation permit, provided that the Permittee or Co-Permittee has complied with all General and Special Conditions.
4. **Allowable Discharges.** Discharges into the Sanitary Sewer system constructed under this Permit shall consist of sanitary Sewage only. Unless otherwise stated by the Special Conditions, there shall be no discharge of industrial wastes under this Permit. Stormwater shall not be permitted to enter the Sanitary Sewer system. Without limiting the general prohibition of the previous sentence, roof and footing drains shall not be connected to the Sanitary Sewer system.
5. **Construction Inspection.** All erosion and sediment control facilities, Stormwater Facilities, Detention Facilities, and Qualified Sewer Construction shall be inspected and approved by an Inspection Engineer acting on behalf of the Permittee or the Owner of the

project, or by a duly authorized and competent representative of the Inspection Engineer. No sewer trenches shall be backfilled except as authorized by the Inspection Engineer after having inspected and approved the sewer installation.

6. **Maintenance.** Stormwater Facilities, Detention Facilities, Qualified Sewer Construction, Sanitary Sewer lines, systems or facilities constructed hereunder or serving the facilities constructed hereunder shall be properly maintained and operated at all times in accordance with all applicable requirements. It is understood that the responsibility for maintenance shall run as a joint and several obligation against the Permittee, the Co-Permittee, the property served, the Owner and the operator of the facilities, and said responsibility shall not be discharged nor in any way affected by change of ownership of said property, unless the District has authorized assignment of the permit.
7. **Indemnification.** The Permittee shall be solely responsible for and shall defend, indemnify and hold harmless the Metropolitan Water Reclamation District of Greater Chicago ("District", "MWRD", or "MWRDGC") and its Commissioners, officers, employees, servants, and agents from liabilities of every kind, including losses, damages and reasonable costs, payments and expenses (such as, but not limited to, court costs and reasonable attorneys' fees and disbursements), claims, demands, actions, suits, proceedings, judgments or settlements, any or all of which are asserted by any individual, private entity, or public entity against the District and its Commissioners, officers, employees, servants, or agents and arise out of or are in any way related to the issuance of this Permit. Without limiting the generality of the preceding sentence, the provisions of this paragraph shall extend to indemnify and hold harmless the District and its Commissioners, officers, employees, servants, and agents from any claims or damages arising out of or in connection with the termination or revocation of this Permit.

The Permittee shall be solely responsible for and shall defend, indemnify and hold harmless an Authorized Municipality and its elected officials, officers, employees, servants, and agents from liabilities of every kind, including losses, damages and reasonable costs, payments and expenses (such as, but not limited to, court costs and reasonable attorneys' fees and disbursements), claims, demands, actions, suits, proceedings, judgments or settlements, any or all of which are asserted by any individual, private entity, or public entity against the Authorized Municipality and its elected officials, officers, employees, servants, or agents and arise out of or are in any way related to the issuance of this Permit. Without limiting the generality of the preceding sentence, the provisions of this paragraph shall extend to indemnify and hold harmless the Authorized Municipality and its elected officials, officers, employees,

servants, and agents from any claims or damages arising out of or in connection with the termination or revocation of this Permit.

- 8. **Sewer Construction by District.** Permittee understands and acknowledges that the District has the right and power to construct and extend sewer service facilities and render such services within the area to be served by the project for which this Permit is issued, and that by the District constructing and extending such sewer service facilities and rendering such services, the facilities constructed by the Permittee under this Permit may decrease in value, become useless or of no value whatsoever, the Permittee may also sustain a loss of business, income and profits.

Therefore, by accepting this Permit and acting thereon, the Permittee, for itself, its successors and assigns, does remise, release and forever discharge the District and its Commissioners, officers, employees, servants, and agents of any and all claims whatsoever which Permittee may now have or hereafter acquire and which Permittee's successors and assigns hereafter can, shall, or may have against the District and its Commissioners, officers, employees, servants, and agents for all losses and damages, either direct or indirect, claimed to have been incurred by reason of the construction or extension at any time hereafter by the District of sewer service facilities in the service area contemplated by this Permit, the rendering of such services, which District facilities and services decrease the value of the facilities constructed by the Permittee under this Permit, make same useless or of no value whatsoever, including but not limited to, any and all damages arising under 70 ILCS 2605/19; the taking of private property for public use without due compensation; the interference with the contracts of Permittee; the interference with Permittee's use and enjoyment of its land; and the decrease in value of Permittee's land.

- 9. **Third Parties.** Regarding Qualified Sewer Construction, this Permit does not grant the right or authority to the Permittee: (a) to construct or encroach upon any lands of the District or of any other parties, (b) to construct outside of the territorial boundaries of the District except as allowed under an extraterritorial service agreement, (c) to construct or encroach upon the territorial boundaries of any units of local government within the District, (d) to connect to or discharge into or be served by (directly or indirectly) any sewer or sewer system owned or operated by third parties.
- 10. **Costs.** It is expressly stipulated and clearly understood that the Stormwater Facilities, Detention Facilities, Qualified Sewer Construction, or facilities for which the Permit is issued shall be constructed, operated and maintained at no cost to the District.
- 11. **Other Sewer Construction.** The District reserves

the right, privilege and authority to permit others to reconstruct, change, alter and replace all sewers and appurtenances thereto at the point of connection of any sewerage system to a District interceptor and/or in public right-of-ways of District easements, and to introduce additional Sewage flow through this connection into the intercepting sewer of said District.

- 12. **Change of Use.** This Permit shall be incorporated in the Building and Occupancy Permit for the Building or Buildings served under this Permit. The Owner or occupant of any Building served under this Permit shall not cause, or permit, a change of use of the Building to a use other than that indicated in this Permit without first having obtained a written permission from the Executive Director of the District.
- 13. **Interceptors Overloading.** The District hereby serves notice that its interceptors may flow full and may surcharge, and flooding of the proposed system may occur. The Permittee agrees that the proposed systems shall be constructed, operated and maintained at the sole risk of the Permittee.
- 14. **Transferability.** This Permit may not be assigned or transferred without the written consent of the Executive Director of the District or Enforcement Officer of an Authorized Municipality. However, a Sole Permittee may be required to assign or transfer the Permit when divesting itself of ownership to a third-party and should notify the District prior to such divestment so that the District may determine whether assignment to the new owner is necessary.
- 15. **Termination.** The District has the right to enforce or revoke a Permit issued by either the District or an Authorized Municipality as outlined in Article 12 of the Watershed Management Ordinance.

It is understood and agreed that in the event the Permittee shall default on or fail to perform and carryout any of the covenants, conditions or provisions of this Permit and such default or violation shall continue for sixty (60) days after receipt of notice thereof in writing given by the Executive Director of the District, then it shall be lawful for the District at or after the expiration of said sixty (60) days to declare said Permit terminated. The Permittee agrees that immediately upon receipt of written notice of such termination it will stop all operations, discontinue any discharges and disconnect the sewerage system or facilities constructed under this Permit. If the Permittee fails to do so, the District shall have the right to disconnect said system. The Permittee hereby agrees to pay for any costs incurred by the District for said disconnection.

- 16. **Rights and Remedies.** The various rights and remedies of the District contained in this Permit shall

be construed as cumulative, and no one of them shall be construed as exclusive of any one or more of the others or exclusive of any other rights or remedies allowed by applicable rules, regulations, ordinances and laws. An election by the District to enforce any one or more of its rights or remedies shall not be construed as a waiver of the rights of the District to pursue any other rights or remedies provided under the terms and provisions of this Permit or under any applicable rules, regulations, ordinances or laws.

District and in the presence of the District representative. Upon satisfactory completion of construction, the Permittee and the owner shall submit, or cause to be submitted, a completion certificate and request for approval on the form prescribed by the District. No sewer or other facilities shall be put in service until all the conditions of the Permit have been satisfactorily met.

- 17. **Expiration.** This Permit shall expire if construction has not started within one (1) year from the date of issue. Construction under an expired Permit is deemed construction without a Permit. All construction under this Permit shall be completed within two (2) years after start of construction. If conditions so warrant, an extension may be granted. For publicly financed projects (e.g. special assessments) the one (1) year period indicated will be considered from the date of final court action.
- 18. **Revocation.** In issuing this Permit, the District or Authorized Municipality has relied upon the statements and representations made by the Permittee or his agent. Any incorrect statements or representations shall be cause for revocation of this Permit, and all the rights of the Permittee hereunder shall immediately become null and void.
- 19. **Advance Notice.** The Permittee shall give the District or Authorized Municipality advance notice of at least two working days prior to the following: mobilization and installation of Erosion and Sediment Control Practices; commencement of construction; excavation for Qualified Sewer Construction; Major Stormwater Systems and Detention Facilities under this Permit; and completion of construction. When advance notice is given, the Permittee shall provide the Permit number, municipality and location.
- 20. **Compliance with Plans and Specifications.** All construction shall be in accordance with the plans and specifications submitted for this Permit and made a part hereof. No changes in, or deviation from the plans and specifications which affect capacity, maintenance, design requirements, service area or Permit requirements shall be permitted unless revised plans have been submitted to, and approved by the District or Authorized Municipality. The Permit together with a set of the plans and specifications (revised plans and specifications, if any) shall be kept on the jobsite at all times during construction and until final inspection and approval by the District or Authorized Municipality.
- 21. **Testing and Approval.** All construction under this Permit shall be subject to inspection, testing and approval by the District. All testing shall be made, or caused to be made, by the Permittee at no cost to the

- 22. **Record Drawings.** Before final inspection and approval by the District or an Authorized Municipality, the Permittee shall furnish, or cause to be furnished to the District or an Authorized Municipality, a set of Record drawings and Schedule R for the site stormwater plan, Detention Facilities, Stormwater Facilities, and Qualified Sewer Construction, or a statement that the project was constructed in accordance with the original plans and specifications.
- 23. **Compliance with Rules and Regulations.** The Permittee hereby expressly assumes all responsibilities for meeting the requirements of all applicable rules, regulations, ordinances and laws of Local, State and Federal authorities. Issuance of this Permit shall not constitute a waiver of any applicable requirements.
- 24. **Severability.** The provisions of this Permit are severable, and if any provision of this Permit, or the application of any provision of this Permit, is held invalid, the remaining provisions of this Permit shall continue in full force and effect.
- 25. **Property Rights.** This Permit does not convey any property rights of any sort, or any exclusive privilege.
- 26. **Conflict with Other Conditions.** In the case of conflict between these General Conditions and any other condition(s) in this permit, the more stringent condition(s) shall govern.

OFFICE COPY

**WMO SCHEDULE A  
PROJECT INFORMATION**

Watershed Management Permit No. 16-036

1. NAME OF PROJECT Main Stree- Maywood Commuter Station  
(as shown on the plans)

2. APPURTENANCES (check all applicable items)  
 Siphon       Drop Manholes       Public Lift Station (Submit Sch. E)       Outfalls (Submit Sch. O)  
 Stream Crossing       Direct Connections to District → Describe \_\_\_\_\_

3. RECEIVING SANITARY/COMBINED SEWER SYSTEM  
A. System that project will connect to is:  
 Existing       Proposed /Under Construction → District Permit # \_\_\_\_\_  
List owners of all sewers from project to District interceptor Village of Maywood

4. RECEIVING STORM SEWER SYSTEM TRIBUTARY TO WATERWAY  
A. System that project will connect to is:  
 Existing       Proposed /Under Construction → District Permit # \_\_\_\_\_  
List owners of all sewers from project to waterway \_\_\_\_\_

5. EXISTING LIFT STATION  
 No       Yes → Receiving system includes existing lift station  
If yes, indicate location \_\_\_\_\_

6. FLOOD PROTECTION AREAS  
Does any part of the project area impact the following? (check all applicable items)  
 Floodplain/Floodway/Riparian (Schedule H)       Wetlands/Riparian (Schedule W)

7. SIZE OF PROJECT  
Impervious area within project  
A. Total contiguous ownership      N/A acres      C. Before development 0.266 acres  
B. Development Area      0.4 acres      D. After development 0.4 acres

8. STORMWATER MANAGEMENT  
A. Is project in the service area of an existing District permitted detention facility?  
 No       Yes → District Permit No. \_\_\_\_\_  
B. Is stormwater management provided under this permit?  
 No       Yes → Required by:  District (Submit Sch. D)       Other  
C. Type of stormwater management  
 Runoff Control       Volume Control       Detention Storage

**WMO SCHEDULE B  
SEWER SUMMARY**

Watershed Management Permit No.

**16-036**

PROJECT NAME: Main Street - Maywood Commuter Station

(as shown on the plans)

1. **SEWER SUMMARY**, including all service sewers from the building envelope, stubs and risers:  
 Include sanitary sewers in separate sewer areas and all sewers in combined sewer areas and their tributary type:  
 Sanitary (San), Combined (C), Storm to Combined (SC), Storm to Waterway (SW), or Storm to Volume Control (SVC)

Tributary Type	San	San	SC	SC	SC	Choose one	Choose one
Pipe Size (in.)	8	4	8	8	8		
Total Length (ft.)	17	10	20	38	55		
Min. slope used (%)	0.80	1.0	.56	.56	.56		
Pipe Material *	PVC	CISP	PVC	PVC	PVC		
Total Manholes	2	0	0	0	0		
Total Cleanouts	0	0	0	0	0		
Catch Basin/Inlets	0		2	2	2		

\* Pipe material and joint specifications must be shown on plans. See Technical Guidance Manual for acceptable specifications.

Sewer construction in floodplain:  No  Yes → FPE \_\_\_\_\_ ft.

Identify manholes in floodplain \_\_\_\_\_

Note: All sanitary/combined sewer structures shall have above ground openings located above the FPE or shall be constructed with watertight, bolt down covers/lids.

2. **NATURE OF PROJECT** (Check all that apply)

Brief description \_\_\_\_\_

- Publicly financed  Sewer extension to serve future development  
 Sewer system serving a subdivision  Storm sewers in combined sewer area  
 Off-site trunk sewer to serve subdivision  Service connections to serve buildings (Sch. C)  
 Other \_\_\_\_\_

3. **SEWER EXTENSIONS**

Is any part of the proposed project is designed to service future connections (not included in Schedule C)?  
 If so, then check yes below and submit service area map and estimate of population equivalent to be served.

- NO  YES →  Service area map  
 P.E. estimate submitted

**WMO SCHEDULE C  
SEWER CONNECTIONS**

Watershed Management Permit No.

**16-036**

(FILL OUT ALL SECTIONS THAT APPLY)

**1. BUILDING CONNECTION DATA**

**A. RESIDENTIAL BUILDINGS**

<input type="checkbox"/> Single Family	Total dwelling units *	_____	
	Number of sewer connections *	_____	PE** _____
<input type="checkbox"/> Multi Family	Total dwelling units *	_____	
	Number of sewer connections *	_____	PE** _____

**B. COMMERCIAL & RECREATIONAL BUILDINGS**

<input checked="" type="checkbox"/> Number of sewer connections	_____	PE**	_____
---	-------	------	-------

**C. INDUSTRIAL BUILDINGS**

<input type="checkbox"/> Number of sewer connections	_____	PE**	_____
--	-------	------	-------

\* Each sanitary line exiting a building is a connection

\*\* Population Equivalent (Submit calculations for each connection and total from all connections)

**2. BUILDING USE - (Check all that apply)**

**A. COMMERCIAL & RECREATIONAL**

Describe use of buildings, including principal product(s) or activities Metra Commuter Station.  
Nonresidential building (commercial) building. No rest rooms. 1 janitor sink.

- |   |  |
|---|--|
| <input type="checkbox"/> Food preparation or processing (install grease separator)  | <input type="checkbox"/> Laundromat (install lint basin)     |
| <input type="checkbox"/> Swimming pool (provide pool plans)   | <input type="checkbox"/> Auto service (install triple basin) |
| <input type="checkbox"/> Manufacturing (describe) _____   | <input type="checkbox"/> Auto wash (install mud basin)       |
| <input checked="" type="checkbox"/> Other 1 fix. unit for janitor sink. 1 PE= 5 GPD. Flow rate for sink is based on 40 to 50 psi/avg. Street pressure + 2 GPM |  |

**B. INDUSTRIAL BUILDINGS**

Describe use of buildings, including principal product(s) or activities \_\_\_\_\_

- Sewer connections will receive domestic sewage only
- Industrial waste is produced

**NOTE:** If industrial waste is produced, submit WMO Schedule F & WMO Schedule G and plumbing plans along with flow diagram for pretreatment system.



**WMO SCHEDULE D  
WATERSHED MANAGEMENT FACILITIES**

Name of Project: Main Street - Maywood Commuter Station

**A. DEVELOPMENT INFORMATION**

- 1) Total parcel area: 0.4 acres
- 2) Total development area on the parcel: 0.4 acres

**B. SITE VOLUME CONTROL REQUIREMENTS**

- 1) Existing impervious area of development: 0.4 acres
- 2) Proposed impervious area of development: 0.4 acres
- 3) Gross volume control storage required (0.083 X Line B.2): 0.0332 acre-feet
- 4) Volume control storage allowance. Do site constraints prevent the use of retention-based practices in full?  Yes  No  
 If yes, explain and complete B.4.a, B.4.b, and B.4.c Build. Offsets, Utilities, ROW Limit., Conflict
  - a. Percent reduction in impervious area (B.1 - B.2)/B.1: 0 %
  - b. Volume control storage allowance (Line B.4.a/5%)(0.25)(Line B.3):  
0 acre-feet
  - c. Volume control treated by a flow through practice: 0.0332 acre-feet
- 5) Net volume control storage required (Line B.3 - Line B.4.b - Line B.4.c):  
0 acre-feet
- 6) Volume control storage provided (must be greater than line B.5) : 0.0332 acre-feet

**C. SITE DETENTION REQUIREMENTS**

- 1) Type of stormwater detention facility (check one)
  - Reservoir
  - Parking Lot
  - Offsite Facility
  - Other
  - Specify \_\_\_\_\_
  - Location \_\_\_\_\_
- 2) Release Rate Determination
  - A) Existing conditions 100-year runoff rate for the development: \_\_\_\_\_ cfs  
(if the development contains depressional storage)
  - B) Gross allowable release rate: \_\_\_\_\_ cfs  
(lesser of Line C.2.A or 0.30 x Line A.2)
  - C) Unrestricted release rate: \_\_\_\_\_ cfs  
(assume 0 cfs if equivalent upstream area is being diverted to the detention facility)
  - D) Unrestricted native planting area
    - i. Area: \_\_\_\_\_ acres
    - ii. Reduction in release rate: \_\_\_\_\_ cfs (0.30 x Line C.2.D.i)



WMO SCHEDULE D
WATERSHED MANAGEMENT FACILITIES

E) Net allowable release rate: \_\_\_\_\_ cfs
(Line C.2.B - Line C.2.C - Line C.2.D.ii)

3) Detention Volume Determination
(Submit calculations for items C.3.A through C.3.II)

- a. Methodology
- Nomograph
- Hydrologic model (select modeling software and indicate version)
 - HEC-HMS
 - TR-20
 - WIN TR-20
b. Composite CN for the development:
c. Reduced CN for the development:
d. Time of concentration for the development: minutes
e. Required detention volume at actual release rate: acre-feet
f. Actual detention volume provided at HWL: acre-feet
g. Actual release rate: cfs at HWL ft (NAVD 88)
(h cannot be greater than Line C.2.E)
h. Outlet control structure (provide details and calculations)
 i. Orifice
 1. Type:
 2. Discharge coefficient:
 3. Diameter: in
 4. Orifice invert elevation ft (NAVD 88)
 ii. Weir
 1. Weir length: ft
 2. Weir invert elevation: ft (NAVD 88)

D. UPSTREAM TRIBUTARY AREA

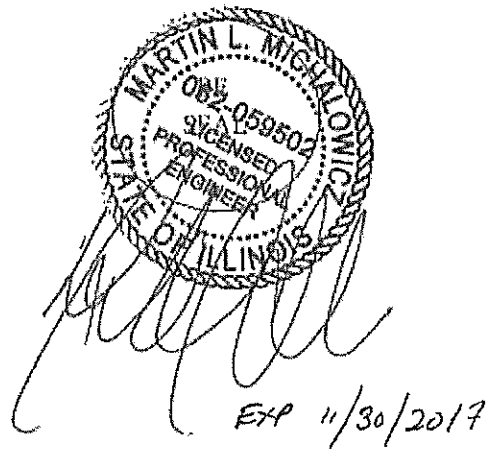
- 1) Upstream tributary drainage area: acres
A) Ratio of upstream tributary area to development area:
B) Composite CN for upstream tributary area:
C) Time of concentration for upstream tributary area: minutes
D) 100-year peak flowrate for upstream tributary area: cfs
E) Detention facility drawdown time: hours



WMO SCHEDULE D
WATERSHED MANAGEMENT FACILITIES

2) Describe bypass system type details: [ ] Overflow weir [ ] Restrictor
Orifice diameter: \_\_\_\_\_ in Orifice invert elevation: \_\_\_\_\_ ft (NAVD 88)
Orifice type and discharge coefficient: \_\_\_\_\_
Weir length: \_\_\_\_\_ ft Weir invert elevation: \_\_\_\_\_ ft (NAVD 88)

Name MARTIN MICHALOWICZ Title PROJECT MANAGER
Signature [Handwritten Signature] Date 6/1/2016
Engineering Firm CHRISTOPHER B. BURKE ENG. LTD.



**WMO SCHEDULE P  
SOIL EROSION AND SEDIMENT CONTROL**

OFFICE COPY

Name of Project: Main Street - Maywood Commuter Station

Type of Development (check one below):

- Single-family home     
  Residential Subdivision     
  Multi-family residential  
 Non-residential     
  Right-of-way     
  Open space

1) Total proposed disturbed area: 0.4 acres

2) Does the site's stormwater discharge directly to:

- Waters of the State   
  Storm Sewer   
  Combined Sewer

If Waters of the State, provide name of receiving water body: \_\_\_\_\_

3) If answer to (1) is  $\geq$  one acre or part of a larger planned common development  $\geq$  one acre, provide IEPA NPDES ILR10 Permit Number\*: \_\_\_\_\_

If ILR10 permit coverage applies, provide a signed copy of ILR10 Notice of Intent (NOI)

\*If all site stormwater discharges, including construction dewatering, drain to a combined sewer system, ILR10 permit coverage is not required

4) Summary of soil erosion and sediment control practices:

		Area Controlled (sq ft)	Permanent (P), Temporary (T), OR Both (B)
Silt fence	_____ (ft)	_____	_____
Entrance/exit control	_____ (quantity)	_____	_____
Vegetative control	_____ (sq ft)	_____	_____
Interceptor ditches	_____ (ft)	_____	_____
Berms	_____ (ft)	_____	_____
Inlet control	3 _____ (quantity)	18,828	T
Sediment basins	_____ (cu yd)	_____	_____
Volume Control Protection	_____ (indicate)	_____	_____
Volume Control Cleaning	_____ (indicate)	_____	_____
Concrete Washout	1 _____ (quantity)	18,828	T
Debris basins	_____ (cu ft)	_____	_____
Desilting basins	_____ (cu ft)	_____	_____
Silt traps	_____ (cu ft)	_____	_____
Mulching and matting	_____ (cu ft/sq ft)	_____	_____
Other	_____ (indicate)	_____	_____

**WMO SCHEDULE P  
SOIL EROSION AND SEDIMENT CONTROL**

OFFICE COPY

5) Do any of the following special circumstances apply?

Yes  No

If yes, check all conditions that apply:

- Floodplain
- Wetland/Buffer
- Riparian Environment
- New Outfall
- MWRD Facility
- Tributary to Lake Michigan
- Volume Control Facility

6) If the answer to (5) is yes, describe how the indicated area(s) will be protected from erosion and sedimentation: \_\_\_\_\_

7) Provide topographical or plan maps of construction area and indicate erosion control practices, including a sequence of major construction activities.

8) Drainage area (above and including construction site): 0.4 acres

9) Slope categories of construction site:

	Area (acres)	Disposition of Collected Sediment
9.1 0 – 2 % Slope	<u>0.4</u>	<u>Contained within site.</u>
9.2 2 – 4 % Slope	_____	_____
9.3 4 – 6 % Slope	_____	_____
9.4 ≥ 6% Slope	_____	_____

10) Check the following conditions that apply:

Erosion control practices identified above will be constructed in accordance with the Illinois Urban Manual, 2012

Plans or specifications for the above referenced erosion control practices are attached

Co-Permittee Mark Lucas Title Village Engineer

Signature *Mark D. Lucas* Date 12-14-15

Company/Agency Village of Maywood

## **SPECIAL CONDITIONS FOR MWRD PERMIT NO 16-036**

1. Construction under this permit consists of qualified sewer construction only.
2. Construction must conform to the soil erosion and sediment control requirements of this permit (Schedule P) and other local and state agencies as necessary.

# ENGINEERING CERTIFICATIONS

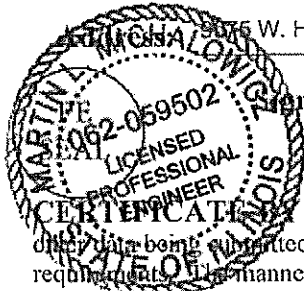
Watershed Management Permit No. \_\_\_\_\_

**10-036**

**CERTIFICATE BY DESIGN ENGINEER:** I hereby certify that the project described herein has been designed in accordance with the requirements set forth in this application and all applicable ordinances, rules, regulations, local, state and federal laws, and design criteria of the issuing authority; that the storm drainage and sanitary sewer system designed for this project are proper and adequate; that where the design involves one or more connections to an existing local sewer system, the capacity of said system has been examined and the system is found to be adequate to transport the stormwater and/or wastewater that will be added through the proposed sewer without violating any provisions of the Illinois Environmental Protection Act or the rules and regulations thereunder.

Comments, if any: \_\_\_\_\_

Engineering Firm: Christopher B. Burke Engineering, Ltd. Telephone: (847) 823 - 0500



Name: Martin W. Higgins City: Rosemont Zip: 60018

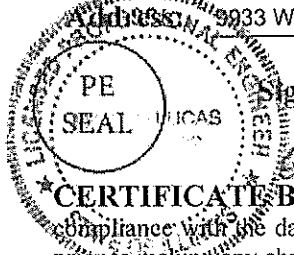
Signature: [Handwritten Signature] Date: 2/10/16  
(Name and Title)

**CERTIFICATE BY MUNICIPAL OR SYSTEM ENGINEER:** The application and the drawings, together with other data being submitted with this application, have been examined by me and are found to be in compliance with all applicable requirements. The manner of drainage is satisfactory and proper in accordance with all state and local requirements, including but not limited to the Watershed Management Ordinance. The existing local sewer system to which the project discharges has been examined and the system is found to be adequate to transport the stormwater and/or wastewater that will be added through the proposed sewer without violating any provisions of the Illinois Environmental Protection Act or the rules and regulations thereunder.

I hereby certify that the project area is within the municipal corporate limits.  YES  NO

Owner of Local Sewer System: \_\_\_\_\_

Municipal Engineer: Hancock Engineering Company Telephone: 708-865-0300

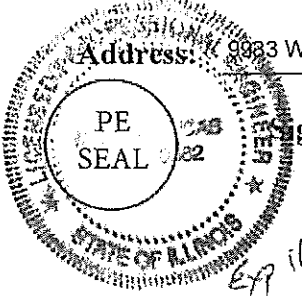


Address: 9933 W. Roosevelt Road City: Westchester Zip: 60154

Signature: [Handwritten Signature] Date: 12.15.15  
(Name and Title)

**CERTIFICATE BY INSPECTION ENGINEER:** I hereby certify that construction of the project will be in substantial compliance with the data and the plans submitted with this application; that approval will be obtained from the issuing authority prior to making any changes that would affect capacity, maintenance, design requirements, service area or the Permit requirements; that a set of RECORD drawings, signed and sealed by the undersigned Engineer will be furnished to the District or an Authorized Municipality before testing and approval by the District or Authorized Municipality of the completed work.

Engineering Firm: Hancock Engineering Company Telephone: 708-865-0300



Address: 9933 W. Roosevelt Road City: Westchester Zip: 60154

Signature: [Handwritten Signature] Date: 12.15.15  
(Name and Title)

**SPECIAL CONDITIONS**

Watershed Management Permit No. 16-036

This Permit is issued subject to the General Conditions and the attached Special Conditions.

If Permit is granted:

- Please return two (2) copies of the Permit to the Permittee; or
- Please mail one (1) copy to Permittee and one (1) copy to the person designated below:

Name: Martin Michalowicz, PE

Address: Christopher B. Burke Engineering, 9575 Higgins Road, Suite 600, Rosemont, IL 60018

OFFICE COPY

**CERTIFICATE BY APPLICANTS:** We have read and thoroughly understand the conditions and requirements of this Permit application, and agree to conform to the Permit conditions and other applicable requirements of the District. It is understood that construction hereunder, after the Permit is granted, shall constitute acceptance by the applicants of any Special Conditions that may be placed hereon by the District or an Authorized Municipality. It is further understood that this application shall not constitute a Permit until it is approved, signed and returned by the Director of Engineering of the District or Enforcement Officer of an Authorized Municipality.

PERMITTEE	CO-PERMITTEE
<p>The project area is within municipal corporate limits.</p> <p><input checked="" type="checkbox"/> Yes   <input type="checkbox"/> No   <input type="checkbox"/> Not Applicable</p>	<p>(Co-Permittee is Property Owner)</p> <p>Title to property is held in a land trust: <input type="checkbox"/> Yes   <input type="checkbox"/> No</p> <p>If yes, Co-Permittee shall be beneficiary with Power of Direction</p>
Municipality <u>Village of Maywood</u>	Owner _____
Address <u>40 Madison Street</u>	Address _____
City <u>Maywood</u> Zip <u>60153</u>	City _____      Zip _____
Signature	Signature _____
Name <u>David Myers</u> (Print)	Name _____ (Print)
Title <u>Assistant Village Manager</u>	Title _____
Date <u>12-14-15</u> Phone <u>708-450-4429</u>	Date _____      Phone _____

REVIEW AND APPROVAL BY THE DISTRICT OR AUTHORIZED MUNICIPALITY	
Reviewed by:	Date <u>MAY 31 2016</u>
(Local Sewer Systems) or (Professional Engineer)	
Approved for Issue Approved by:	Date <u>6/3/2016</u>
(For the Director of Engineering) or (Enforcement Officer)	



State of Illinois  
Department of Transportation  
Bureau of Local Roads and Streets

SPECIAL PROVISION  
FOR  
INSURANCE

Effective: February 1, 2007  
Revised: August 1, 2007

All references to Sections or Articles in this specification shall be construed to mean specific Section or Article of the Standard Specifications for Road and Bridge Construction, adopted by the Department of Transportation.

The Contractor shall name the following entities as additional insured under the Contractor's general liability insurance policy in accordance with Article 107.27:

Village of Maywood

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The entities listed above and their officers, employees, and agents shall be indemnified and held harmless in accordance with Article 107.26.

## COARSE AGGREGATE QUALITY (BDE)

Effective: July 1, 2015

Revise Article 1004.01(b) of the Standard Specifications to read:

"(b) Quality. The coarse aggregate shall be according to the quality standards listed in the following table.

COARSE AGGREGATE QUALITY				
QUALITY TEST	CLASS			
	A	B	C	D
Na <sub>2</sub> SO <sub>4</sub> Soundness 5 Cycle, ITP 104 <sup>1/</sup> , % Loss max.	15	15	20	25 <sup>2/</sup>
Los Angeles Abrasion, ITP 96 <sup>11/</sup> , % Loss max.	40 <sup>3/</sup>	40 <sup>4/</sup>	40 <sup>5/</sup>	45
Minus No. 200 (75 µm) Sieve Material, ITP 11	1.0 <sup>6/</sup>	---	2.5 <sup>7/</sup>	---
Deleterious Materials <sup>10/</sup>				
Shale, % max.	1.0	2.0	4.0 <sup>8/</sup>	---
Clay Lumps, % max.	0.25	0.5	0.5 <sup>8/</sup>	---
Coal & Lignite, % max.	0.25	---	---	---
Soft & Unsound Fragments, % max.	4.0	6.0	8.0 <sup>8/</sup>	---
Other Deleterious, % max.	4.0 <sup>9/</sup>	2.0	2.0 <sup>8/</sup>	---
Total Deleterious, % max.	5.0	6.0	10.0 <sup>8/</sup>	---
Oil-Stained Aggregate <sup>10/</sup> , % max	5.0	---	---	

1/ Does not apply to crushed concrete.

2/ For aggregate surface course and aggregate shoulders, the maximum percent loss shall be 30.

3/ For portland cement concrete, the maximum percent loss shall be 45.

4/ Does not apply to crushed slag or crushed steel slag.

5/ For hot-mix asphalt (HMA) binder mixtures, except when used as surface course, the maximum percent loss shall be 45.

6/ For crushed aggregate, if the material finer than the No. 200 (75 µm) sieve consists of the dust from fracture, essentially free from clay or silt, this percentage may be increased to 2.5.

7/ Does not apply to aggregates for HMA binder mixtures.

8/ Does not apply to Class A seal and cover coats.

9/ Includes deleterious chert. In gravel and crushed gravel aggregate, deleterious chert shall be the lightweight fraction separated in a 2.35 heavy media separation. In crushed stone aggregate, deleterious chert shall be the lightweight fraction separated in a 2.55 heavy media separation. Tests shall be run according to ITP 113.

10/ Test shall be run according to ITP 203.

11/ Does not apply to crushed slag.

All varieties of chert contained in gravel coarse aggregate for portland cement concrete, whether crushed or uncrushed, pure or impure, and irrespective of color, will be classed as chert and shall not be present in the total aggregate in excess of 25 percent by weight (mass).

Aggregates used in Class BS concrete (except when poured on subgrade), Class PS concrete, and Class PC concrete (bridge superstructure products only, excluding the approach slab) shall contain no more than two percent by weight (mass) of deleterious materials. Deleterious materials shall include substances whose disintegration is accompanied by an increase in volume which may cause spalling of the concrete."

80360

## CONSTRUCTION AIR QUALITY – DIESEL RETROFIT (BDE)

Effective: June 1, 2010

Revised: November 1, 2014

The reduction of emissions of particulate matter (PM) for off-road equipment shall be accomplished by installing retrofit emission control devices. The term "equipment" refers to diesel fuel powered devices rated at 50 hp and above, to be used on the jobsite in excess of seven calendar days over the course of the construction period on the jobsite (including rental equipment).

Contractor and subcontractor diesel powered off-road equipment assigned to the contract shall be retrofitted using the phased in approach shown below. Equipment that is of a model year older than the year given for that equipment's respective horsepower range shall be retrofitted:

Effective Dates	Horsepower Range	Model Year
June 1, 2010 <sup>1/</sup>	600-749	2002
	750 and up	2006
June 1, 2011 <sup>2/</sup>	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006
June 1, 2012 <sup>2/</sup>	50-99	2004
	100-299	2003
	300-599	2001
	600-749	2002
	750 and up	2006

1/ Effective dates apply to Contractor diesel powered off-road equipment assigned to the contract.

2/ Effective dates apply to Contractor and subcontractor diesel powered off-road equipment assigned to the contract.

The retrofit emission control devices shall achieve a minimum PM emission reduction of 50 percent and shall be:

- a) Included on the U.S. Environmental Protection Agency (USEPA) *Verified Retrofit Technology List* (<http://www.epa.gov/cleandiesel/verification/verif-list.htm>), or verified by the California Air Resources Board (CARB) (<http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>); or
- b) Retrofitted with a non-verified diesel retrofit emission control device if verified retrofit emission control devices are not available for equipment proposed to be used on the project, and if the Contractor has obtained a performance certification from the retrofit

device manufacturer that the emission control device provides a minimum PM emission reduction of 50 percent.

Note: Large cranes (Crawler mounted cranes) which are responsible for critical lift operations are exempt from installing retrofit emission control devices if such devices adversely affect equipment operation.

Diesel powered off-road equipment with engine ratings of 50 hp and above, which are unable to be retrofitted with verified emission control devices or if performance certifications are not available which will achieve a minimum 50 percent PM reduction, may be granted a waiver by the Department if documentation is provided showing good faith efforts were made by the Contractor to retrofit the equipment.

Construction shall not proceed until the Contractor submits a certified list of the diesel powered off-road equipment that will be used, and as necessary, retrofitted with emission control devices. The list(s) shall include (1) the equipment number, type, make, Contractor/rental company name; and (2) the emission control devices make, model, USEPA or CARB verification number, or performance certification from the retrofit device manufacturer. Equipment reported as fitted with emissions control devices shall be made available to the Engineer for visual inspection of the device installation, prior to being used on the jobsite.

The Contractor shall submit an updated list of retrofitted off-road construction equipment as retrofitted equipment changes or comes on to the jobsite. The addition or deletion of any diesel powered equipment shall be included on the updated list.

If any diesel powered off-road equipment is found to be in non-compliance with any portion of this special provision, the Engineer will issue the Contractor a diesel retrofit deficiency deduction.

Any costs associated with retrofitting any diesel powered off-road equipment with emission control devices shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed. The Contractor's compliance with this notice and any associated regulations shall not be grounds for a claim.

### **Diesel Retrofit Deficiency Deduction**

When the Engineer determines that a diesel retrofit deficiency exists, a daily monetary deduction will be imposed for each calendar day or fraction thereof the deficiency continues to exist. The calendar day(s) will begin when the time period for correction is exceeded and end with the Engineer's written acceptance of the correction. The daily monetary deduction will be \$1,000.00 for each deficiency identified.

The deficiency will be based on lack of diesel retrofit emissions control.

If a Contractor accumulates three diesel retrofit deficiency deductions for the same piece of equipment in a contract period, the Contractor will be shutdown until the deficiency is corrected.

Such a shutdown will not be grounds for any extension of the contract time, waiver of penalties, or be grounds for any claim.

80261

## DISADVANTAGED BUSINESS ENTERPRISE PARTICIPATION (DBE)

Effective: September 1, 2000

Revised: July 2, 2016

FEDERAL OBLIGATION. The Department of Transportation, as a recipient of federal financial assistance, is required to take all necessary and reasonable steps to ensure nondiscrimination in the award and administration of contracts. Consequently, the federal regulatory provisions of 49 CFR Part 26 apply to this contract concerning the utilization of disadvantaged business enterprises. For the purposes of this Special Provision, a disadvantaged business enterprise (DBE) means a business certified by the Department in accordance with the requirements of 49 CFR Part 26 and listed in the Illinois Unified Certification Program (IL UCP) DBE Directory.

STATE OBLIGATION. This Special Provision will also be used by the Department to satisfy the requirements of the Business Enterprise for Minorities, Females, and Persons with Disabilities Act, 30 ILCS 575. When this Special Provision is used to satisfy state law requirements on 100 percent state-funded contracts, the federal government has no involvement in such contracts (not a federal-aid contract) and no responsibility to oversee the implementation of this Special Provision by the Department on those contracts. DBE participation on 100 percent state-funded contracts will not be credited toward fulfilling the Department's annual overall DBE goal required by the US Department of Transportation to comply with the federal DBE program requirements.

CONTRACTOR ASSURANCE. The Contractor makes the following assurance and agrees to include the assurance in each subcontract that the Contractor signs with a subcontractor.

The Contractor, subrecipient, or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of contracts funded in whole or in part with federal or state funds. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

- (a) Withholding progress payments;
- (b) Assessing sanctions;
- (c) Liquidated damages; and/or
- (d) Disqualifying the Contractor from future bidding as non-responsible.

OVERALL GOAL SET FOR THE DEPARTMENT. As a requirement of compliance with 49 CFR Part 26, the Department has set an overall goal for DBE participation in its federally assisted contracts. That goal applies to all federal-aid funds the Department will expend in its federally assisted contracts for the subject reporting fiscal year. The Department is required to make a

good faith effort to achieve the overall goal. The dollar amount paid to all approved DBE companies performing work called for in this contract is eligible to be credited toward fulfillment of the Department's overall goal.

CONTRACT GOAL TO BE ACHIEVED BY THE CONTRACTOR. This contract includes a specific DBE utilization goal established by the Department. The goal has been included because the Department has determined that the work of this contract has subcontracting opportunities that may be suitable for performance by DBE companies. The determination is based on an assessment of the type of work, the location of the work, and the availability of DBE companies to do a part of the work. The assessment indicates that, in the absence of unlawful discrimination, and in an arena of fair and open competition, DBE companies can be expected to perform 17.00 % of the work. This percentage is set as the DBE participation goal for this contract. Consequently, in addition to the other award criteria established for this contract, the Department will only award this contract to a bidder who makes a good faith effort to meet this goal of DBE participation in the performance of the work. A bidder makes a good faith effort for award consideration if either of the following is done in accordance with the procedures set for in this Special Provision:

- (a) The bidder documents that enough DBE participation has been obtained to meet the goal or,
- (b) The bidder documents that a good faith effort has been made to meet the goal, even though the effort did not succeed in obtaining enough DBE participation to meet the goal.

DBE LOCATOR REFERENCES. Bidders shall consult the IL UCP DBE Directory as a reference source for DBE-certified companies. In addition, the Department maintains a letting and item specific DBE locator information system whereby DBE companies can register their interest in providing quotes on particular bid items advertised for letting. Information concerning DBE companies willing to quote work for particular contracts may be obtained by contacting the Department's Bureau of Small Business Enterprises at telephone number (217) 785-4611, or by visiting the Department's website at:

<http://www.idot.illinois.gov/doing-business/certifications/disadvantaged-business-enterprise-certification/il-ucp-directory/index>.

BIDDING PROCEDURES. Compliance with this Special Provision is required prior to the award of the contract and the failure of the low bidder to comply will render the bid not responsive.

In order to assure the timely award of the contract, the low bidder shall submit:

- (a) The bidder shall submit a DBE Utilization Plan on completed Department forms SBE 2025 and 2026.
  - (1) The final Utilization Plan must be submitted within five calendar days after the date of the letting in accordance with subsection (a)(2) of Bidding Procedures.



- (2) To meet the five day requirement, the bidder may send the Utilization Plan electronically by scanning and sending to [DOT.DBE.UP@illinois.gov](mailto:DOT.DBE.UP@illinois.gov) or faxing to (217) 785-1524. The subject line must include the bid Item Number and the Letting date. The Utilization Plan should be sent as one .pdf file, rather than multiple files and emails for the same Item Number. It is the responsibility of the bidder to obtain confirmation of email or fax delivery.

Alternatively, the Utilization Plan may be sent by certified mail or delivery service within the five calendar day period. If a question arises concerning the mailing date of a Utilization Plan, the mailing date will be established by the U.S. Postal Service postmark on the certified mail receipt from the U.S. Postal Service or the receipt issued by a delivery service when the Utilization Plan is received by the Department. It is the responsibility of the bidder to ensure the postmark or receipt date is affixed within the five days if the bidder intends to rely upon mailing or delivery to satisfy the submission day requirement. The Utilization Plan is to be submitted to:

Illinois Department of Transportation  
Bureau of Small Business Enterprises  
Contract Compliance Section  
2300 South Dirksen Parkway, Room 319  
Springfield, Illinois 62764

The Department will not accept a Utilization Plan if it does not meet the five day submittal requirement and the bid will be declared not responsive. In the event the bid is declared not responsive due to a failure to submit a Utilization Plan or failure to comply with the bidding procedures set forth herein, the Department may elect to cause the forfeiture of the penal sum of the bidder's proposal guaranty, and may deny authorization to bid the project if re-advertised for bids. The Department reserves the right to invite any other bidder to submit a Utilization Plan at any time for award consideration.

- (b) The Utilization Plan shall indicate that the bidder either has obtained sufficient DBE participation commitments to meet the contract goal or has not obtained enough DBE participation commitments in spite of a good faith effort to meet the goal. The Utilization Plan shall further provide the name, telephone number, and telefax number of a responsible official of the bidder designated for purposes of notification of Utilization Plan approval or disapproval under the procedures of this Special Provision.
- (c) The Utilization Plan shall include a DBE Participation Commitment Statement, Department form SBE 2025, for each DBE proposed for the performance of work to achieve the contract goal. For bidding purposes, submission of the completed SBE 2025 forms, signed by the DBEs and scanned or faxed to the bidder will be acceptable as long as the original is available and provided upon request. All elements of information indicated on the said form shall be provided, including but not limited to the following:

- (1) The names and addresses of DBE firms that will participate in the contract;
- (2) A description, including pay item numbers, of the work each DBE will perform;
- (3) The dollar amount of the participation of each DBE firm participating. The dollar amount of participation for identified work shall specifically state the quantity, unit price, and total subcontract price for the work to be completed by the DBE. If partial pay items are to be performed by the DBE, indicate the portion of each item, a unit price where appropriate and the subcontract price amount;
- (4) DBE Participation Commitment Statements, form SBE 2025, signed by the bidder and each participating DBE firm documenting the commitment to use the DBE subcontractors whose participation is submitted to meet the contract goal;
- (5) If the bidder is a joint venture comprised of DBE companies and non-DBE companies, the Utilization Plan must also include a clear identification of the portion of the work to be performed by the DBE partner(s); and,
- (6) If the contract goal is not met, evidence of good faith efforts; the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor is selected over a DBE for work on the contract.

GOOD FAITH EFFORT PROCEDURES. The contract will not be awarded until the Utilization Plan submitted by the apparent successful bidder is approved. All information submitted by the bidder must be complete, accurate and adequately document that enough DBE participation has been obtained or document that good faith efforts of the bidder, in the event enough DBE participation has not been obtained, before the Department will commit to the performance of the contract by the bidder. The Utilization Plan will be approved by the Department if the Utilization Plan documents sufficient commercially useful DBE work to meet the contract goal or the bidder submits sufficient documentation of a good faith effort to meet the contract goal pursuant to 49 CFR Part 26, Appendix A. The Utilization Plan will not be approved by the Department if the Utilization Plan does not document sufficient DBE participation to meet the contract goal unless the apparent successful bidder documented in the Utilization Plan that it made a good faith effort to meet the goal. This means that the bidder must show that all necessary and reasonable steps were taken to achieve the contract goal. Necessary and reasonable steps are those which, by their scope, intensity and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if they were not successful. The Department will consider the quality, quantity, and intensity of the kinds of efforts that the bidder has made. Mere *pro forma* efforts, in other words, efforts done as a matter of form, are not good faith efforts; rather, the bidder is expected to have taken genuine efforts that would be reasonably expected of a bidder actively and aggressively trying to obtain DBE participation sufficient to meet the contract goal.

- (a) The following is a list of types of action that the Department will consider as part of the evaluation of the bidder's good faith efforts to obtain participation. These listed factors

are not intended to be a mandatory checklist and are not intended to be exhaustive. Other factors or efforts brought to the attention of the Department may be relevant in appropriate cases, and will be considered by the Department.

- (1) Soliciting through all reasonable and available means (e.g. attendance at pre-bid meetings, advertising and/or written notices) the interest of all certified DBE companies that have the capability to perform the work of the contract. The bidder must solicit this interest within sufficient time to allow the DBE companies to respond to the solicitation. The bidder must determine with certainty if the DBE companies are interested by taking appropriate steps to follow up initial solicitations.
- (2) Selecting portions of the work to be performed by DBE companies in order to increase the likelihood that the DBE goals will be achieved. This includes, where appropriate, breaking out contract work items into economically feasible units to facilitate DBE participation, even when the prime Contractor might otherwise prefer to perform these work items with its own forces.
- (3) Providing interested DBE companies with adequate information about the plans, specifications, and requirements of the contract in a timely manner to assist them in responding to a solicitation.
- (4) a. Negotiating in good faith with interested DBE companies. It is the bidder's responsibility to make a portion of the work available to DBE subcontractors and suppliers and to select those portions of the work or material needs consistent with the available DBE subcontractors and suppliers, so as to facilitate DBE participation. Evidence of such negotiation includes the names, addresses, and telephone numbers of DBE companies that were considered; a description of the information provided regarding the plans and specifications for the work selected for subcontracting; and evidence as to why additional agreements could not be reached for DBE companies to perform the work.
  - b. A bidder using good business judgment would consider a number of factors in negotiating with subcontractors, including DBE subcontractors, and would take a firm's price and capabilities as well as contract goals into consideration. However, the fact that there may be some additional costs involved in finding and using DBE companies is not in itself sufficient reason for a bidder's failure to meet the contract DBE goal, as long as such costs are reasonable. Also the ability or desire of a bidder to perform the work of a contract with its own organization does not relieve the bidder of the responsibility to make good faith efforts. Bidders are not, however, required to accept higher quotes from DBE companies if the price difference is excessive or unreasonable. In accordance with subsection (c)(6) of the above Bidding Procedures, the documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.

- (5) Not rejecting DBE companies as being unqualified without sound reasons based on a thorough investigation of their capabilities. The bidder's standing within its industry, membership in specific groups, organizations, or associations and political or social affiliations (for example union vs. non-union employee status) are not legitimate causes for the rejection or non-solicitation of bids in the bidder's efforts to meet the project goal.
  - (6) Making efforts to assist interested DBE companies in obtaining bonding, lines of credit, or insurance as required by the recipient or Contractor.
  - (7) Making efforts to assist interested DBE companies in obtaining necessary equipment, supplies, materials, or related assistance or services.
  - (8) Effectively using the services of available minority/women community organizations; minority/women contractors' groups; local, state, and federal minority/women business assistance offices; and other organizations as allowed on a case-by-case basis to provide assistance in the recruitment and placement of DBE companies.
- (b) If the Department determines that the apparent successful bidder has made a good faith effort to secure the work commitment of DBE companies to meet the contract goal, the Department will award the contract provided that it is otherwise eligible for award. If the Department determines that the bidder has failed to meet the requirements of this Special Provision or that a good faith effort has not been made, the Department will notify the responsible company official designated in the Utilization Plan that the bid is not responsive. The notification shall include a statement of reasons for the determination. If the Utilization Plan is not approved because it is deficient as a technical matter, unless waived by the Department, the bidder will be notified and will be allowed no more than a five calendar day period in order to cure the deficiency.
- (c) The bidder may request administrative reconsideration of a determination adverse to the bidder within the five working days after the receipt of the notification date of the determination by delivering the request to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764 (Telefax: (217) 785-1524). Deposit of the request in the United States mail on or before the fifth business day shall not be deemed delivery. The determination shall become final if a request is not made and delivered. A request may provide additional written documentation or argument concerning the issues raised in the determination statement of reasons, provided the documentation and arguments address efforts made prior to submitting the bid. The request will be forwarded to the Department's Reconsideration Officer. The Reconsideration Officer will extend an opportunity to the bidder to meet in person in order to consider all issues of documentation and whether the bidder made a good faith effort to meet the goal. After the review by the Reconsideration Officer, the bidder will be sent a written decision within ten working days after receipt of the request for consideration, explaining the basis for finding that the bidder did or did not meet the goal or make adequate good faith efforts to do so. A final decision by the Reconsideration

Officer that a good faith effort was made shall approve the Utilization Plan submitted by the bidder and shall clear the contract for award. A final decision that a good faith effort was not made shall render the bid not responsive.

CALCULATING DBE PARTICIPATION. The Utilization Plan values represent work anticipated to be performed and paid for upon satisfactory completion. The Department is only able to count toward the achievement of the overall goal and the contract goal the value of payments made for the work actually performed by DBE companies. In addition, a DBE must perform a commercially useful function on the contract to be counted. A commercially useful function is generally performed when the DBE is responsible for the work and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. The Department and Contractor are governed by the provisions of 49 CFR Part 26.55(c) on questions of commercially useful functions as it affects the work. Specific counting guidelines are provided in 49 CFR Part 26.55, the provisions of which govern over the summary contained herein.

- (a) DBE as the Contractor: 100 percent goal credit for that portion of the work performed by the DBE's own forces, including the cost of materials and supplies. Work that a DBE subcontracts to a non-DBE does not count toward the DBE goals.
- (b) DBE as a joint venture Contractor: 100 percent goal credit for that portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work performed by the DBE's own forces.
- (c) DBE as a subcontractor: 100 percent goal credit for the work of the subcontract performed by the DBE's own forces, including the cost of materials and supplies, excluding the purchase of materials and supplies or the lease of equipment by the DBE subcontractor from the prime Contractor or its affiliates. Work that a DBE subcontractor in turn subcontracts to a non-DBE does not count toward the DBE goal.
- (d) DBE as a trucker: 100 percent goal credit for trucking participation provided the DBE is responsible for the management and supervision of the entire trucking operation for which it is responsible. At least one truck owned, operated, licensed, and insured by the DBE must be used on the contract. Credit will be given for the following:
  - (1) The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the contract.
  - (2) The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE who leases trucks from a non-DBE is entitled to credit only for the fee or commission is receives as a result of the lease arrangement.
- (e) DBE as a material supplier:

- (1) 60 percent goal credit for the cost of the materials or supplies purchased from a DBE regular dealer.
- (2) 100 percent goal credit for the cost of materials of supplies obtained from a DBE manufacturer.
- (3) 100 percent credit for the value of reasonable fees and commissions for the procurement of materials and supplies if not a DBE regular dealer or DBE manufacturer.

CONTRACT COMPLIANCE. Compliance with this Special Provision is an essential part of the contract. The Department is prohibited by federal regulations from crediting the participation of a DBE included in the Utilization Plan toward either the contract goal or the Department's overall goal until the amount to be applied toward the goals has been paid to the DBE. The following administrative procedures and remedies govern the compliance by the Contractor with the contractual obligations established by the Utilization Plan. After approval of the Utilization Plan and award of the contract, the Utilization Plan and individual DBE Participation Statements become part of the contract. If the Contractor did not succeed in obtaining enough DBE participation to achieve the advertised contract goal, and the Utilization Plan was approved and contract awarded based upon a determination of good faith, the total dollar value of DBE work calculated in the approved Utilization Plan as a percentage of the awarded contract value shall become the amended contract goal. All work indicated for performance by an approved DBE shall be performed, managed, and supervised by the DBE executing the DBE Participation Commitment Statement.

- (a) NO AMENDMENT. No amendment to the Utilization Plan may be made without prior written approval from the Department's Bureau of Small Business Enterprises. All requests for amendment to the Utilization Plan shall be submitted to the Department of Transportation, Bureau of Small Business Enterprises, Contract Compliance Section, 2300 South Dirksen Parkway, Room 319, Springfield, Illinois 62764. Telephone number (217) 785-4611. Telefax number (217) 785-1524.
- (b) CHANGES TO WORK. Any deviation from the DBE condition-of-award or contract plans, specifications, or special provisions must be approved, in writing, by the Department as provided elsewhere in the Contract. The Contractor shall notify affected DBEs in writing of any changes in the scope of work which result in a reduction in the dollar amount condition-of-award to the contract. Where the revision includes work committed to a new DBE subcontractor, not previously involved in the project, then a Request for Approval of Subcontractor, Department form BC 260A or AER 260A, must be signed and submitted. If the commitment of work is in the form of additional tasks assigned to an existing subcontract, then a new Request for Approval of Subcontractor shall not be required. However, the Contractor must document efforts to assure that the existing DBE subcontractor is capable of performing the additional work and has agreed in writing to the change.

- (c) SUBCONTRACT. The Contractor must provide DBE subcontracts to IDOT upon request. Subcontractors shall ensure that all lower tier subcontracts or agreements with DBEs to supply labor or materials be performed in accordance with this Special Provision.
- (d) ALTERNATIVE WORK METHODS. In addition to the above requirements for reductions in the condition of award, additional requirements apply to the two cases of Contractor-initiated work substitution proposals. Where the contract allows alternate work methods which serve to delete or create underruns in condition of award DBE work, and the Contractor selects that alternate method or, where the Contractor proposes a substitute work method or material that serves to diminish or delete work committed to a DBE and replace it with other work, then the Contractor must demonstrate one of the following:
- (1) That the replacement work will be performed by the same DBE (as long as the DBE is certified in the respective item of work) in a modification of the condition of award; or
  - (2) That the DBE is aware that its work will be deleted or will experience underruns and has agreed in writing to the change. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so; or
  - (3) That the DBE is not capable of performing the replacement work or has declined to perform the work at a reasonable competitive price. If this occurs, the Contractor shall substitute other work of equivalent value to a certified DBE or provide documentation of good faith efforts to do so.
- (e) TERMINATION AND REPLACEMENT PROCEDURES. The Contractor shall not terminate or replace a DBE listed on the approved Utilization Plan, or perform with other forces work designated for a listed DBE except as provided in this Special Provision. The Contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the Contractor obtains the Department's written consent as provided in subsection (a) of this part. Unless Department consent is provided for termination of a DBE subcontractor, the Contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the DBE in the Utilization Plan.

As stated above, the Contractor shall not terminate or replace a DBE subcontractor listed in the approved Utilization Plan without prior written consent. This includes, but is not limited to, instances in which the Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm. Written consent will be granted only if the Bureau of Small Business Enterprises agrees, for reasons stated in its concurrence document, that the Contractor has good cause to terminate or replace the DBE firm. Before transmitting to the Bureau of Small Business Enterprises any request to terminate and/or substitute a DBE subcontractor, the Contractor shall give notice in writing to the DBE subcontractor,

with a copy to the Bureau, of its intent to request to terminate and/or substitute, and the reason for the request. The Contractor shall give the DBE five days to respond to the Contractor's notice. The DBE so notified shall advise the Bureau and the Contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Bureau should not approve the Contractor's action. If required in a particular case as a matter of public necessity, the Bureau may provide a response period shorter than five days.

For purposes of this paragraph, good cause includes the following circumstances:

- (1) The listed DBE subcontractor fails or refuses to execute a written contract;
- (2) The listed DBE subcontractor fails or refuses to perform the work of its subcontract in a way consistent with normal industry standards. Provided, however, that good cause does not exist if the failure or refusal of the DBE subcontractor to perform its work on the subcontract results from the bad faith or discriminatory action of the prime contractor;
- (3) The listed DBE subcontractor fails or refuses to meet the prime Contractor's reasonable, nondiscriminatory bond requirements;
- (4) The listed DBE subcontractor becomes bankrupt, insolvent, or exhibits credit unworthiness;
- (5) The listed DBE subcontractor is ineligible to work on public works projects because of suspension and debarment proceedings pursuant 2 CFR Parts 180, 215 and 1200 or applicable state law.
- (6) You have determined that the listed DBE subcontractor is not a responsible contractor;
- (7) The listed DBE subcontractor voluntarily withdraws from the projects and provides to you written notice of its withdrawal;
- (8) The listed DBE is ineligible to receive DBE credit for the type of work required;
- (9) A DBE owner dies or becomes disabled with the result that the listed DBE subcontractor is unable to complete its work on the contract;
- (10) Other documented good cause that compels the termination of the DBE subcontractor. Provided, that good cause does not exist if the prime Contractor seeks to terminate a DBE it relied upon to obtain the contract so that the prime Contractor can self-perform the work for which the DBE contractor was engaged or so that the prime Contractor can substitute another DBE or non-DBE contractor after contract award.



When a DBE is terminated, or fails to complete its work on the Contract for any reason the Contractor shall make a good faith effort to find another DBE to substitute for the original DBE to perform at least the same amount of work under the contract as the terminated DBE to the extent needed to meet the established Contract goal. The good faith efforts shall be documented by the Contractor. If the Department requests documentation under this provision, the Contractor shall submit the documentation within seven days, which may be extended for an additional seven days if necessary at the request of the Contractor. The Department shall provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

- (f) PAYMENT RECORDS. The Contractor shall maintain a record of payments for work performed to the DBE participants. The records shall be made available to the Department for inspection upon request. After the performance of the final item of work or delivery of material by a DBE and final payment therefore to the DBE by the Contractor, but not later than thirty calendar days after payment has been made by the Department to the Contractor for such work or material, the Contractor shall submit a DBE Payment Agreement on Department form SBE 2115 to the Resident Engineer. If full and final payment has not been made to the DBE, the DBE Payment Agreement shall indicate whether a disagreement as to the payment required exists between the Contractor and the DBE or if the Contractor believes that the work has not been satisfactorily completed. If the Contractor does not have the full amount of work indicated in the Utilization Plan performed by the DBE companies indicated in the Utilization Plan and after good faith efforts are reviewed, the Department may deduct from contract payments to the Contractor the amount of the goal not achieved as liquidated and ascertained damages. The Contractor may request an administrative reconsideration of any amount deducted as damages pursuant to subsection (h) of this part.
- (g) ENFORCEMENT. The Department reserves the right to withhold payment to the Contractor to enforce the provisions of this Special Provision. Final payment shall not be made on the contract until such time as the Contractor submits sufficient documentation demonstrating achievement of the goal in accordance with this Special Provision or after liquidated damages have been determined and collected.
- (h) RECONSIDERATION. Notwithstanding any other provision of the contract, including but not limited to Article 109.09 of the Standard Specifications, the Contractor may request administrative reconsideration of a decision to deduct the amount of the goal not achieved as liquidated damages. A request to reconsider shall be delivered to the Contract Compliance Section and shall be handled and considered in the same manner as set forth in paragraph (c) of "Good Faith Effort Procedures" of this Special Provision, except a final decision that a good faith effort was not made during contract performance to achieve the goal agreed to in the Utilization Plan shall be the final administrative decision of the Department. The result of the reconsideration process is not administratively appealable to the U.S. Department of Transportation.

## EQUAL EMPLOYMENT OPPORTUNITY (BDE)

Effective: April 1, 2015

FEDERAL AID CONTRACTS. Revise the following section of Check Sheet #1 of the Recurring Special Provisions to read:

### "EQUAL EMPLOYMENT OPPORTUNITY

In the event of the Contractor's noncompliance with the provisions of this Equal Employment Opportunity Clause, the Illinois Human Rights Act, or the Illinois Department of Human Rights Rules and Regulations, the Contractor may be declared ineligible for future contracts or subcontracts with the State of Illinois or any of its political sub-divisions or municipal corporations, and the contract may be cancelled or voided in whole or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulation.

During the performance of this Contract, the Contractor agrees as follows:

- (1) That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status, or an unfavorable discharge from military service; and further that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such underutilization.
- (2) That, if it hires additional employees in order to perform this contract or any portion hereof, it will determine the availability (according to the Illinois Department of Human Rights Rules and Regulations) of minorities and women in the area(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not underutilized.
- (3) That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status or an unfavorable discharge from military service.
- (4) That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the Contractor's obligations under the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations. If any labor organization or representative fails or refuses to cooperate with the Contractor in its efforts to comply with such Act and Rules and Regulations, the

Contractor will promptly so notify the Illinois Department of Human Rights and IDOT and will recruit employees from other sources when necessary to fulfill its obligations thereunder.

- (5) That it will submit reports as required by the Illinois Department of Human Rights Rules and Regulations, furnish all relevant information as may from time to time be requested by the Illinois Department of Human Rights or IDOT, and in all respects comply with the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations.
- (6) That it will permit access to all relevant books, records, accounts, and work sites by personnel of IDOT and the Illinois Department of Human Rights for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations.
- (7) That it will include verbatim or by reference the provisions of this clause in every subcontract it awards under which any portion of the contract obligations are undertaken or assumed, so that the provisions will be binding upon the subcontractor. In the same manner as with other provisions of this contract, the Contractor will be liable for compliance with applicable provisions of this clause by subcontractors; and further it will promptly notify IDOT and the Illinois Department of Human Rights in the event any subcontractor fails or refuses to comply with these provisions. In addition, the Contractor will not utilize any subcontractor declared by the Illinois Human Rights Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations."

STATE CONTRACTS. Revise Section II of Check Sheet #5 of the Recurring Special Provisions to read:

## "II. EQUAL EMPLOYMENT OPPORTUNITY

In the event of the Contractor's noncompliance with the provisions of this Equal Employment Opportunity Clause, the Illinois Human Rights Act or the Illinois Department of Human Rights Rules and Regulations, the Contractor may be declared ineligible for future contracts or subcontracts with the State of Illinois or any of its political sub-divisions or municipal corporations, and the contract may be cancelled or voided in whole or in part, and such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulation.

During the performance of this Contract, the Contractor agrees as follows:

1. That it will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status, or an unfavorable discharge from military service; and further

that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such underutilization.

2. That, if it hires additional employees in order to perform this contract or any portion hereof, it will determine the availability (according to the Illinois Department of Human Rights Rules and Regulations) of minorities and women in the area(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not underutilized.
3. That, in all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, sexual orientation, marital status, order of protection status, national origin or ancestry, citizenship status, age, physical or mental disability unrelated to ability, military status, or an unfavorable discharge from military service.
4. That it will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining or other agreement or understanding, a notice advising such labor organization or representative of the Contractor's obligations under the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations. If any labor organization or representative fails or refuses to cooperate with the Contractor in its efforts to comply with such Act and Rules and Regulations, the Contractor will promptly so notify the Illinois Department of Human Rights and IDOT and will recruit employees from other sources when necessary to fulfill its obligations thereunder.
5. That it will submit reports as required by the Illinois Department of Human Rights Rules and Regulations, furnish all relevant information as may from time to time be requested by the Illinois Department of Human Rights or IDOT, and in all respects comply with the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations.
6. That it will permit access to all relevant books, records, accounts and work sites by personnel of IDOT and the Illinois Department of Human Rights for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and the Illinois Department of Human Rights Rules and Regulations.
7. That it will include verbatim or by reference the provisions of this clause in every subcontract it awards under which any portion of the contract obligations are undertaken or assumed, so that the provisions will be binding upon the subcontractor. In the same manner as with other provisions of this contract, the Contractor will be liable for compliance with applicable provisions of this clause by subcontractors; and further it will promptly notify IDOT and the Illinois Department of Human Rights in the event any subcontractor fails or refuses to comply with these provisions. In addition, the Contractor will not utilize any subcontractor declared by the Illinois Human Rights

Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.”

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## ERRATA FOR THE 2016 STANDARD SPECIFICATIONS (BDE)

Effective: April 1, 2016

- Page 84 Article 204.02. In the seventh line of the first paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)".
- Page 90 Article 205.06. In the first sentence of the third paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)".
- Page 91 Article 205.06. In the first sentence of the fourth paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)", and in the second sentence change "AASHTO T 224" to "Illinois Modified AASHTO T 99 (Annex A1)".
- Page 91 Article 205.06. In the second line of the fifth paragraph change "AASHTO T 191" to "Illinois Modified AASHTO T 191".
- Page 91 Article 205.06. In the sixth line of the eighth paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)".
- Page 148 Article 302.09. In the second sentence of the fifth paragraph change "AASHTO T 191" to "Illinois Modified AASHTO T 191", and in the third sentence change "AASHTO T 99" to "Illinois Modified AASHTO T 99".
- Page 152 Article 310.09. In the second sentence of the second paragraph change "AASHTO T 191" to "Illinois Modified AASHTO T 191", and in the third sentence change "AASHTO T 99" to "Illinois Modified AASHTO T 99".
- Page 155 Article 311.05(a). In the first sentence of the fifth paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)", and in the second sentence change "AASHTO T 224" to "Illinois Modified AASHTO T 99 (Annex A1)".
- Page 155 Article 311.05(a). In the second line of the sixth paragraph change "AASHTO T 191" to "Illinois Modified AASHTO T 191".
- Page 163 Article 351.05(a). In the second sentence of the fifth paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)", and in the third sentence change "AASHTO T 224" to "Illinois Modified AASHTO T 99 (Annex A1)".
- Page 163 Article 351.05(a). In the second line of the sixth paragraph change "AASHTO T 191" to "Illinois Modified AASHTO T 191".
- Page 169 Article 352.11. In the second sentence of the fourth paragraph change "AASHTO T 191" to "Illinois Modified AASHTO T 191", and in the third sentence change "AASHTO T 134 (Method B)" to "Illinois Modified AASHTO T 134 (Method B)".

Page 169 Article 352.12. In the first sentence of the first paragraph change "AASHTO T 22" to "Illinois Modified AASHTO T 22", and in the second sentence change "AASHTO T 134 (Method B)" to "Illinois Modified AASHTO T 134 (Method B)".

Page 196 Article 406.07(a). After the footnotes in Table 1 - Minimum Roller Requirements for HMA add the following:

"EQUIPMENT DEFINITION

- V<sub>s</sub> - Vibratory roller, static mode, minimum 125 lb/in. (2.2 kg/mm) of roller width. Maximum speed = 3 mph (5 km/h) or 264 ft/min (80 m/min). If the vibratory roller does not eliminate roller marks, its use shall be discontinued and a tandem roller, adequately ballasted to remove roller marks, shall be used.
- V<sub>d</sub> - Vibratory roller, dynamic mode, operated at a speed to produce not less than 10 impacts/ft (30 impacts/m).
- P - Pneumatic-tired roller, max. speed 3 1/2 mph (5.5 km/h) or 308 ft/min (92 m/min). The pneumatic-tired roller shall have a minimum tire pressure of 80 psi (550 kPa) and shall be equipped with heat retention shields. The self-propelled pneumatic-tired roller shall develop a compression of not less than 300 lb (53 N) nor more than 500 lb (88 N) per in. (mm) of width of the tire tread in contact with the HMA surface.
- T<sub>B</sub> - Tandem roller for breakdown rolling, 8 to 12 tons (7 to 11 metric tons), 250 to 400 lb/in. (44 to 70 N/mm) of roller width, max. speed = 3 1/2 mph (5.5 km/h) or 308 ft/min (92 m/min).
- T<sub>F</sub> - Tandem roller for final rolling, 200 to 400 lb/in. (35 to 70 N/mm) of roller width with minimum roller width of 50 in. (1.25 m). Ballast shall be increased if roller marks are not eliminated. Ballast shall be decreased if the mat shoves or distorts.
- 3W- Three wheel roller, max. speed = 3 mph (5 km/h) or 264 ft/min (80 m/min), 300 to 400 lb/in. (53 to 70 N/mm) of roller width. The three-wheel roller shall weigh 10 to 12 tons (9 to 11 metric tons)."

Page 331 Article 505.04(p). Under Range of Clearance in the first table change "in. x 10<sup>-6</sup>" to "in. x 10<sup>-3</sup>".

Page 444 Article 542.03. In the Notes in Table IIIB add "CPP Corrugated Polypropylene (CPP) pipe with smooth interior".

- Page 445 Article 542.03. In the fourth column in Table IIIB (metric) change the heading for Type 5 pipe from "CPE" to "CPP".
- Page 445 Article 542.03. In the Notes in Table IIIB (metric) change "PE Polyethylene (PE) pipe with a smooth interior" to "CPP Corrugated Polypropylene (CPP) pipe with smooth interior".
- Page 449 Article 542.04(f)(2). In the third line of the second paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)".
- Page 544 Article 639.03. In the first sentence of the first paragraph change "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, Traffic Signals," to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,"".
- Page 546 Article 640.03. In the first sentence of the first paragraph change "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals"".
- Page 548 Article 641.03. In the first sentence of the first paragraph change "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaire and Traffic Signals," to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,"".
- Page 621 Article 727.03. In the first sentence of the third paragraph change "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals" to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals"".
- Page 629 Article 734.03(a). In the fourth line of the second paragraph change "AASHTO T 99 (Method C)" to "Illinois Modified AASHTO T 99 (Method C)".
- Page 649 Article 801.02. In the first sentence of the first paragraph change "AASHTO's Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals"".
- Page 742 Article 1003.04(c). Under Gradation in the table change "(see Article 1003.02(c))" to "(see Article 1003.01(c))".
- Page 755 Article 1004.03(b). Revise the third sentence of the first paragraph to read "For Class A (seal or cover coat), and other binder courses, the coarse aggregate shall be Class C quality or better."



- Page 809 Article 1020.04(e). In the third line of the first paragraph change "ITP SCC-3" to "ITP SCC-4".
- Page 945 Article 1069.05. In the first sentence of the tenth paragraph change ""Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals"" to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals"".
- Page 961 Article 1070.04(b)(1). In the third sentence of the first paragraph change ""Standard Specifications of Structural Supports for Highway Signs, Luminaires and Traffic Signals" published by AASHTO" to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals"".
- Page 989 Article 1077.01. In the second sentence of the first paragraph change "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, as published by AASHTO" to "AASHTO "LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals"".
- Page 1121 Article 1103.13(a). In the first line of the first paragraph change "Bridge Deck Approach Slabs." to "Bridge Deck and Approach Slabs.".

80364

**HOT-MIX ASPHALT - DENSITY TESTING OF LONGITUDINAL JOINTS (BDE)**

Effective: January 1, 2010

Revised: April 1, 2016

Description. This work shall consist of testing the density of longitudinal joints as part of the quality control/quality assurance (QC/QA) of hot-mix asphalt (HMA). Work shall be according to Section 1030 of the Standard Specifications except as follows.

Quality Control/Quality Assurance (QC/QA). Delete the second and third sentence of the third paragraph of Article 1030.05(d)(3) of the Standard Specifications.

Add the following paragraphs to the end of Article 1030.05(d)(3) of the Standard Specifications:

“Longitudinal joint density testing shall be performed at each random density test location. Longitudinal joint testing shall be located at a distance equal to the lift thickness or a minimum of 4 in. (100 mm), from each pavement edge. (i.e. for a 5 in. (125 mm) lift the near edge of the density gauge or core barrel shall be within 5 in. (125 mm) from the edge of pavement.) Longitudinal joint density testing shall be performed using either a correlated nuclear gauge or cores.

- a. Confined Edge. Each confined edge density shall be represented by a one-minute nuclear density reading or a core density and shall be included in the average of density readings or core densities taken across the mat which represents the Individual Test.
- b. Unconfined Edge. Each unconfined edge joint density shall be represented by an average of three one-minute density readings or a single core density at the given density test location and shall meet the density requirements specified herein. The three one-minute readings shall be spaced 10 ft (3 m) apart longitudinally along the unconfined pavement edge and centered at the random density test location.”

Revise the Density Control Limits table in Article 1030.05(d)(4) of the Standard Specifications to read:

“Mixture Composition	Parameter	Individual Test (includes confined edges)	Unconfined Edge Joint Density Minimum
IL-4.75	Ndesign = 50	93.0 – 97.4% <sup>1/</sup>	91.0%
IL-9.5	Ndesign = 90	92.0 – 96.0%	90.0%
IL-9.5,IL-9.5L	Ndesign < 90	92.5 – 97.4%	90.0%
IL-19.0	Ndesign = 90	93.0 – 96.0%	90.0%
IL-19.0, IL-19.0L	Ndesign < 90	93.0 <sup>2/</sup> – 97.4%	90.0%
SMA	Ndesign = 50 & 80	93.5 – 97.4%	91.0%”

80246

## **PROGRESS PAYMENTS (BDE)**

Effective: November 2, 2013

Revise Article 109.07(a) of the Standard Specifications to read:

“(a) Progress Payments. At least once each month, the Engineer will make a written estimate of the quantity of work performed in accordance with the contract, and the value thereof at the contract unit prices. The amount of the estimate approved as due for payment will be vouchered by the Department and presented to the State Comptroller for payment. No amount less than \$1000.00 will be approved for payment other than the final payment.

Progress payments may be reduced by liens filed pursuant to Section 23(c) of the Mechanics’ Lien Act, 770 ILCS 60/23(c).

If a Contractor or subcontractor has defaulted on a loan issued under the Department’s Disadvantaged Business Revolving Loan Program (20 ILCS 2705/2705-610), progress payments may be reduced pursuant to the terms of that loan agreement. In such cases, the amount of the estimate related to the work performed by the Contractor or subcontractor, in default of the loan agreement, will be offset, in whole or in part, and vouchered by the Department to the Working Capital Revolving Fund or designated escrow account. Payment for the work shall be considered as issued and received by the Contractor or subcontractor on the date of the offset voucher. Further, the amount of the offset voucher shall be a credit against the Department’s obligation to pay the Contractor, the Contractor’s obligation to pay the subcontractor, and the Contractor’s or subcontractor’s total loan indebtedness to the Department. The offset shall continue until such time as the entire loan indebtedness is satisfied. The Department will notify the Contractor and Fund Control Agent in a timely manner of such offset. The Contractor or subcontractor shall not be entitled to additional payment in consideration of the offset.

The failure to perform any requirement, obligation, or term of the contract by the Contractor shall be reason for withholding any progress payments until the Department determines that compliance has been achieved.”

80328

**RAILROAD PROTECTIVE LIABILITY INSURANCE (5 and 10) (BDE)**

Effective: January 1, 2006

Description. Railroad Protective Liability and Property Damage Liability Insurance shall be carried according to Article 107.11 of the Standard Specifications, except the limits shall be a minimum of \$5,000,000 combined single limit per occurrence for bodily injury liability and property damage liability with an aggregate limit of \$10,000,000 over the life of the policy. A separate policy is required for each railroad unless otherwise noted.

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NAMED INSURED & ADDRESS	NUMBER & SPEED OF PASSENGER TRAINS	NUMBER & SPEED OF FREIGHT TRAINS
Union Pacific Railroad Company Finance/Insurance Mail Stop 1870 1400 Douglas Street Omaha, NE 68179	-0-	65 trains/day @ 70 mph
DOT/AAR No.: 173998Y RR Division: Suburban	RR Mile Post: 10.57 RR Sub-Division: Geneva	
For Freight/Passenger Information Contact: Sean Collier For Insurance Information Contact: Sean Collier		Phone: 312-496-4726 Phone: 312-496-4726
Northeast Illinois Regional Commuter Corporation Railroad 547 W. Jackson Bld. Suite 1100 Chicago, IL 60661	60 trains/day @ 79 mph	-0-
DOT/AAR No.: 173998Y RR Division: Suburban (UP-W)	RR Mile Post: 10.57 RR Sub-Division: Geneva	
For Freight/Passenger Information Contact: Marilyn Schlismann For Insurance Information Contact: Marilyn Schlismann		Phone: 312-322-7093 Phone: 312-322-7093

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Approval of Insurance. The original and one certified copy of each required policy shall be submitted to the following address for approval:

Illinois Department of Transportation  
Bureau of Design and Environment  
2300 South Dirksen Parkway, Room 326  
Springfield, Illinois 62764

The Contractor will be advised when the Department has received approval of the insurance from the railroad(s). Before any work begins on railroad right-of-way, the Contractor shall submit to the Engineer evidence that the required insurance has been approved by the railroad(s). The Contractor shall also provide the Engineer with the expiration date of each required policy.

Basis of Payment. Providing Railroad Protective Liability and Property Damage Liability Insurance will be paid for at the contract unit price per Lump Sum for RAILROAD PROTECTIVE LIABILITY INSURANCE.

80157

## STEEL COST ADJUSTMENT (BDE) (RETURN FORM WITH BID)

Effective: April 2, 2004

Revised: July 1, 2015

Description. Steel cost adjustments will be made to provide additional compensation to the Contractor, or a credit to the Department, for fluctuations in steel prices when optioned by the Contractor. The bidder shall indicate on the attached form whether or not this special provision will be part of the contract and submit the completed form with his/her bid. Failure to submit the form or failure to indicate contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment.

Types of Steel Products. An adjustment will be made for fluctuations in the cost of steel used in the manufacture of the following items:

Metal Piling (excluding temporary sheet piling)  
Structural Steel  
Reinforcing Steel

Other steel materials such as dowel bars, tie bars, mesh reinforcement, guardrail, steel traffic signal and light poles, towers and mast arms, metal railings (excluding wire fence), and frames and grates will be subject to a steel cost adjustment when the pay items they are used in have a contract value of \$10,000 or greater.

The adjustments shall apply to the above items when they are part of the original proposed construction, or added as extra work and paid for by agreed unit prices. The adjustments shall not apply when the item is added as extra work and paid for at a lump sum price or by force account.

Documentation. Sufficient documentation shall be furnished to the Engineer to verify the following:

- (a) The dates and quantity of steel, in lb (kg), shipped from the mill to the fabricator.
- (b) The quantity of steel, in lb (kg), incorporated into the various items of work covered by this special provision. The Department reserves the right to verify submitted quantities.

Method of Adjustment. Steel cost adjustments will be computed as follows:

$$SCA = Q \times D$$

Where: SCA = steel cost adjustment, in dollars  
Q = quantity of steel incorporated into the work, in lb (kg)  
D = price factor, in dollars per lb (kg)

$$D = MPI_M - MPI_L$$

Where:  $MPI_M$  = The Materials Cost Index for steel as published by the Engineering News-Record for the month the steel is shipped from the mill. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

$MPI_L$  = The Materials Cost Index for steel as published by the Engineering News-Record for the month prior to the letting for work paid for at the contract price; or for the month the agreed unit price letter is submitted by the Contractor for extra work paid for by agreed unit price,. The indices will be converted from dollars per 100 lb to dollars per lb (kg).

The unit weights (masses) of steel that will be used to calculate the steel cost adjustment for the various items are shown in the attached table.

No steel cost adjustment will be made for any products manufactured from steel having a mill shipping date prior to the letting date.

If the Contractor fails to provide the required documentation, the method of adjustment will be calculated as described above; however, the  $MPI_M$  will be based on the date the steel arrives at the job site. In this case, an adjustment will only be made when there is a decrease in steel costs.

Basis of Payment. Steel cost adjustments may be positive or negative but will only be made when there is a difference between the  $MPI_L$  and  $MPI_M$  in excess of five percent, as calculated by:

$$\text{Percent Difference} = \{(MPI_L - MPI_M) \div MPI_L\} \times 100$$

Steel cost adjustments will be calculated by the Engineer and will be paid or deducted when all other contract requirements for the items of work are satisfied. Adjustments will only be made for fluctuations in the cost of the steel as described herein. No adjustment will be made for changes in the cost of manufacturing, fabrication, shipping, storage, etc.

The adjustments shall not apply during contract time subject to liquidated damages for completion of the entire contract.

**Attachment**

Item	Unit Mass (Weight)
Metal Piling (excluding temporary sheet piling)	
Furnishing Metal Pile Shells 12 in. (305 mm), 0.179 in. (3.80 mm) wall thickness)	23 lb/ft (34 kg/m)
Furnishing Metal Pile Shells 12 in. (305 mm), 0.250 in. (6.35 mm) wall thickness)	32 lb/ft (48 kg/m)
Furnishing Metal Pile Shells 14 in. (356 mm), 0.250 in. (6.35 mm) wall thickness)	37 lb/ft (55 kg/m)
Other piling	See plans
Structural Steel	See plans for weights (masses)
Reinforcing Steel	See plans for weights (masses)
Dowel Bars and Tie Bars	6 lb (3 kg) each
Mesh Reinforcement	63 lb/100 sq ft (310 kg/sq m)
Guardrail	
Steel Plate Beam Guardrail, Type A w/steel posts	20 lb/ft (30 kg/m)
Steel Plate Beam Guardrail, Type B w/steel posts	30 lb/ft (45 kg/m)
Steel Plate Beam Guardrail, Types A and B w/wood posts	8 lb/ft (12 kg/m)
Steel Plate Beam Guardrail, Type 2	305 lb (140 kg) each
Steel Plate Beam Guardrail, Type 6	1260 lb (570 kg) each
Traffic Barrier Terminal, Type 1 Special (Tangent)	730 lb (330 kg) each
Traffic Barrier Terminal, Type 1 Special (Flared)	410 lb (185 kg) each
Steel Traffic Signal and Light Poles, Towers and Mast Arms	
Traffic Signal Post	11 lb/ft (16 kg/m)
Light Pole, Tenon Mount and Twin Mount, 30 - 40 ft (9 - 12 m)	14 lb/ft (21 kg/m)
Light Pole, Tenon Mount and Twin Mount, 45 - 55 ft (13.5 - 16.5 m)	21 lb/ft (31 kg/m)
Light Pole w/Mast Arm, 30 - 50 ft (9 - 15.2 m)	13 lb/ft (19 kg/m)
Light Pole w/Mast Arm, 55 - 60 ft (16.5 - 18 m)	19 lb/ft (28 kg/m)
Light Tower w/Luminaire Mount, 80 - 110 ft (24 - 33.5 m)	31 lb/ft (46 kg/m)
Light Tower w/Luminaire Mount, 120 - 140 ft (36.5 - 42.5 m)	65 lb/ft (97 kg/m)
Light Tower w/Luminaire Mount, 150 - 160 ft (45.5 - 48.5 m)	80 lb/ft (119 kg/m)
Metal Railings (excluding wire fence)	
Steel Railing, Type SM	64 lb/ft (95 kg/m)
Steel Railing, Type S-1	39 lb/ft (58 kg/m)
Steel Railing, Type T-1	53 lb/ft (79 kg/m)
Steel Bridge Rail	52 lb/ft (77 kg/m)
Frames and Grates	
Frame	250 lb (115 kg)
Lids and Grates	150 lb (70 kg)



Return With Bid

**ILLINOIS DEPARTMENT  
OF TRANSPORTATION**

**OPTION FOR  
STEEL COST ADJUSTMENT**

The bidder shall submit this completed form with his/her bid. Failure to submit the form or properly complete contract number, company name, and sign and date the form shall make this contract exempt of steel cost adjustments for all items of steel. Failure to indicate "Yes" for any item of work will make that item of steel exempt from steel cost adjustment. After award, this form, when submitted shall become part of the contract.

**Contract No.:** \_\_\_\_\_

**Company Name:** \_\_\_\_\_

**Contractor's Option:**

Is your company opting to include this special provision as part of the contract plans for the following items of work?

- |  |     |                          |
|--|-----|--------------------------|
| Metal Piling   | Yes | <input type="checkbox"/> |
| Structural Steel   | Yes | <input type="checkbox"/> |
| Reinforcing Steel  | Yes | <input type="checkbox"/> |
| Dowel Bars, Tie Bars and Mesh Reinforcement                | Yes | <input type="checkbox"/> |
| Guardrail  | Yes | <input type="checkbox"/> |
| Steel Traffic Signal and Light Poles, Towers and Mast Arms | Yes | <input type="checkbox"/> |
| Metal Railings (excluding wire fence)                      | Yes | <input type="checkbox"/> |
| Frames and Grates  | Yes | <input type="checkbox"/> |

**Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

80127

## **STEEL SLAG IN TRENCH BACKFILL (BDE)**

Effective: January 1, 2016

Revise the second sentence of Article 1003.01(a)(8) of the Standard Specifications to read:

“Crushed steel slag shall be the nonmetallic product which is developed in a molten condition simultaneously with steel in an open hearth, basic oxygen, or electric arc furnace.”

Revise Article 1003.04(a) of the Standard Specifications to read:

“(a) Description. The fine aggregate shall consist of sand, stone sand, chats, wet bottom boiler slag, slag sand, or granulated slag sand. Crushed concrete sand, construction and demolition debris sand, and steel slag sand produced from an electric arc furnace may be used in lieu of the above for trench backfill.”

80362

**TRAINING SPECIAL PROVISIONS (BDE)** This Training Special Provision supersedes Section 7b of the Special Provision entitled "Specific Equal Employment Opportunity Responsibilities," and is in implementation of 23 U.S.C. 140(a).

As part of the contractor's equal employment opportunity affirmative action program, training shall be provided as follows:

The contractor shall provide on-the-job training aimed at developing full journeyman in the type of trade or job classification involved. The number of trainees to be trained under this contract will be **1**. In the event the contractor subcontracts a portion of the contract work, he shall determine how many, if any, of the trainees are to be trained by the subcontractor, provided however, that the contractor shall retain the primary responsibility for meeting the training requirements imposed by this special provision. The contractor shall also insure that this Training Special Provision is made applicable to such subcontract. Where feasible, 25 percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training.

The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within the reasonable area of recruitment. Prior to commencing construction, the contractor shall submit to the Illinois Department of Transportation for approval the number of trainees to be trained in each selected classification and training program to be used. Furthermore, the contractor shall specify the starting time for training in each of the classifications. The contractor will be credited for each trainee employed by him on the contract work who is currently enrolled or becomes enrolled in an approved program and will be reimbursed for such trainees as provided hereinafter.

Training and upgrading of minorities and women toward journeyman status is a primary objective of this Training Special Provision. Accordingly, the contractor shall make every effort to enroll minority trainees and women (e.g. by conducting systematic and direct recruitment through public and private sources likely to yield minority and women trainees) to the extent such persons are available within a reasonable area of recruitment. The contractor will be responsible for demonstrating the steps that he has taken in pursuance thereof, prior to a determination as to whether the contractor is in compliance with this Training Special Provision. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training, whether a member of a minority group or not.

No employee shall be employed as a trainee in any classification in which he has successfully completed a training course leading to journeyman status or in which he has been employed as a journeyman. The contractor should satisfy this requirement by including appropriate questions in the employee application or by other suitable means. Regardless of the method used the contractor's records should document the findings in each case.

The minimum length and type of training for each classification will be as established in the training program selected by the contractor and approved by the Illinois Department of Transportation and the Federal Highway Administration. The Illinois Department of Transportation and the Federal Highway Administration shall approve a program, if it is reasonably calculated to meet the equal employment opportunity obligations of the contractor and to qualify the average trainee for journeyman status in the classification concerned by the end of the training period. Furthermore, apprenticeship programs registered with the U.S. Department of Labor, Bureau of Apprenticeship and Training, or with a State apprenticeship agency recognized by the Bureau and training programs approved by not necessarily sponsored by the U.S. Department of Labor, Manpower Administration, Bureau of Apprenticeship and Training shall also be considered acceptable provided it is being administered in a manner consistent with the equal employment obligations of Federal-aid highway construction contracts. Approval or acceptance of a training program shall be obtained from the State prior to commencing work on the classification covered by the program. It is the intention of these provisions that training is to be provided in the construction crafts rather than clerk-typists or secretarial-type positions. Training is permissible in lower level management positions such as office engineers, estimators, timekeepers, etc., where the training is oriented toward construction applications. Training in the laborer classification may be permitted provided that significant and meaningful training is provided and approved by the Illinois Department of Transportation and the Federal Highway Administration. Some offsite training is permissible as long as the training is an integral part of an approved training program and does not comprise a significant part of the overall training.

Except as otherwise noted below, the contractor will be reimbursed 80 cents per hour of training given an employee on this contract in accordance with an approved training program. As approved by the Engineer, reimbursement will be made for training of persons in excess of the number specified herein. This reimbursement will be made even though the contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement. Reimbursement for offsite training indicated above may only be made to the contractor where he does one or more of the following and the trainees are concurrently employed on a Federal-aid project; contributes to the cost of the training, provides the instruction to the trainee or pays the trainee's wages during the offsite training period.

No payment shall be made to the contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyman, is caused by the contractor and evidences a lack of good faith on the part of the contractor in meeting the requirement of this Training Special Provision. It is normally expected that a trainee will begin his training on the project as soon as feasible after start of work utilizing the skill involved and remain on the project as long as training opportunities exist in his work classification or until he has completed his training program.

It is not required that all trainees be on board for the entire length of the contract. A contractor will have fulfilled his responsibilities under this Training Special Provision if he has provided acceptable training to the number of trainees specified. The number trained shall be determined on the basis of the total number enrolled on the contract for a significant period.

Trainees will be paid at least 60 percent of the appropriate minimum journeyman's rate specified in the contract for the first half of the training period, 75 percent for the third quarter of the training period, and 90 percent for the last quarter of the training period, unless apprentices or trainees in an approved existing program are enrolled as trainees on this project. In that case, the appropriate rates approved by the Departments of Labor or Transportation in connection with the existing program shall apply to all trainees being trained for the same classification who are covered by this Training Special Provision.

The contractor shall furnish the trainee a copy of the program he will follow in providing the training. The contractor shall provide each trainee with a certification showing the type and length of training satisfactorily complete.

The contractor will provide for the maintenance of records and furnish periodic reports documenting his performance under this Training Special Provision.

METHOD OF MEASUREMENT The unit of measurement is in hours.

BASIS OF PAYMENT This work will be paid for at the contract unit price of 80 cents per hour for TRAINEES. The estimated total number of hours, unit price and total price have been included in the schedule of prices.

20338

## WARM MIX ASPHALT (BDE)

Effective: January 1, 2012

Revised: April 1, 2016

Description. This work shall consist of designing, producing and constructing Warm Mix Asphalt (WMA) in lieu of Hot Mix Asphalt (HMA) at the Contractor's option. Work shall be according to Sections 406, 407, 408, 1030, and 1102 of the Standard Specifications, except as modified herein. In addition, any references to HMA in the Standard Specifications, or the special provisions shall be construed to include WMA.

WMA is an asphalt mixture which can be produced at temperatures lower than allowed for HMA utilizing approved WMA technologies. WMA technologies are defined as the use of additives or processes which allow a reduction in the temperatures at which HMA mixes are produced and placed. WMA is produced by the use of additives, a water foaming process, or combination of both. Additives include minerals, chemicals or organics incorporated into the asphalt binder stream in a dedicated delivery system. The process of foaming injects water into the asphalt binder stream, just prior to incorporation of the asphalt binder with the aggregate.

Approved WMA technologies may also be used in HMA provided all the requirements specified herein, with the exception of temperature, are met. However, asphalt mixtures produced at temperatures in excess of 275 °F (135 °C) will not be considered WMA when determining the grade reduction of the virgin asphalt binder grade.

### Equipment.

Revise the first paragraph of Article 1102.01 of the Standard Specifications to read:

**"1102.01 Hot-Mix Asphalt Plant.** The hot-mix asphalt (HMA) plant shall be the batch-type, continuous-type, or dryer drum plant. The plants shall be evaluated for prequalification rating and approval to produce HMA according to the current Bureau of Materials and Physical Research Policy Memorandum, "Approval of Hot-Mix Asphalt Plants and Equipment". Once approved, the Contractor shall notify the Bureau of Materials and Physical Research to obtain approval of all plant modifications. The plants shall not be used to produce mixtures concurrently for more than one project or for private work unless permission is granted in writing by the Engineer. The plant units shall be so designed, coordinated and operated that they will function properly and produce HMA having uniform temperatures and compositions within the tolerances specified. The plant units shall meet the following requirements."

Add the following to Article 1102.01(a) of the Standard Specifications.

"(11) Equipment for Warm Mix Technologies.

- a. Foaming. Metering equipment for foamed asphalt shall have an accuracy of  $\pm 2$  percent of the actual water metered. The foaming control system shall be electronically interfaced with the asphalt binder meter.

- b. Additives. Additives shall be introduced into the plant according to the supplier's recommendations and shall be approved by the Engineer. The system for introducing the WMA additive shall be interlocked with the aggregate feed or weigh system to maintain correct proportions for all rates of production and batch sizes."

#### Mix Design Verification.

Add the following to Article 1030.04 of the Standard Specifications.

"(e) Warm Mix Technologies.

- (1) Foaming. WMA mix design verification will not be required when foaming technology is used alone (without WMA additives). However, the foaming technology shall only be used on HMA designs previously approved by the Department.
- (2) Additives. WMA mix designs utilizing additives shall be submitted to the Engineer for mix design verification."

#### Construction Requirements.

Revise the second paragraph of Article 406.06(b)(1) of the Standard Specifications to read:

"The HMA shall be delivered at a temperature of 250 to 350 °F (120 to 175 °C).  
WMA shall be delivered at a minimum temperature of 215 °F (102 °C)."

#### Basis of Payment.

This work will be paid at the contract unit price bid for the HMA pay items involved. Anti-strip will not be paid for separately, but shall be considered as included in the cost of the work.

80288

## WEEKLY DBE TRUCKING REPORTS (BDE)

Effective: June 2, 2012

Revised: April 2, 2015

The Contractor shall submit a weekly report of Disadvantaged Business Enterprise (DBE) trucks hired by the Contractor or subcontractors (i.e. not owned by the Contractor or subcontractors) that are used for DBE goal credit.

The report shall be submitted to the Engineer on Department form "SBE 723" within ten business days following the reporting period. The reporting period shall be Monday through Sunday for each week reportable trucking activities occur.

Any costs associated with providing weekly DBE trucking reports shall be considered as included in the contract unit prices bid for the various items of work involved and no additional compensation will be allowed.

80302



**GRANULAR BACKFILL FOR STRUCTURES**

Effective: April 19, 2012

Revised: October 30, 2012

Revise Section 586 of the Standard Specifications to read:

**SECTION 586. GRANULAR BACKFILL FOR STRUCTURES**

**586.01 Description.** This work shall consist of furnishing, transporting and placing granular backfill for abutment structures.

**586.02 Materials.** Materials shall be according to the following.

Item	Article/Section
(a) Fine Aggregate.....	1003.04
(b) Coarse Aggregates .....	1004.05

**CONSTRUCTION REQUIREMENTS**

**586.03 General.** This work shall be done according to Article 502.10 except as modified below. The backfill volume shall be backfilled, with granular material as specified in Article 586.02, to the required elevation as shown in the contract plans. The backfill volume shall be placed in convenient lifts for the full width to be backfilled. Unless otherwise specified in the contract plans, mechanical compaction will not be required. A deposit of gravel or crushed stone placed behind drain holes shall not be required. All drains not covered by geocomposite wall drains or other devices to prevent loss of backfill material shall be covered by sufficient filter fabric material meeting the requirements of Section 1080 and Section 282 with either 6 or 8 oz/sq yd (200 or 270 g/sq m) material allowed, with free edges overlapping the drain hole by at least 12 in. (300 mm) in all directions.

The granular backfill shall be brought to the finished grade as shown in the contract plans. When concrete is to be cast on top of the granular backfill, the Contractor, subject to approval of the Engineer, may prepare the top surface of the fill to receive the concrete as he/she deems necessary for satisfactory placement at no additional cost to the Department.

**586.04 Method of Measurement.** This work will be measured for payment as follows.

- (a) Contract Quantities. The requirements for the use of contract quantities shall conform to Article 202.07(a).
- (b) Measured Quantities. This work will be measured for payment in place and the volume computed in cubic yards (cubic meters). The volume will be determined by the method of average end areas behind the abutment.

**586.05 Basis of Payment.** This work will be paid for at the contract unit price per cubic yard (cubic meter) for GRANULAR BACKFILL FOR STRUCTURES.

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## REQUIRED CONTRACT PROVISIONS FEDERAL-AID CONSTRUCTION CONTRACTS

- I. General
- II. Nondiscrimination
- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

### ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

#### I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

#### II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

**1. Equal Employment Opportunity:** Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

**2. EEO Officer:** The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

**3. Dissemination of Policy:** All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

**4. Recruitment:** When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

**5. Personnel Actions:** Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If

the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

## **6. Training and Promotion:**

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

**7. Unions:** If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

**8. Reasonable Accommodation for Applicants / Employees with Disabilities:** The contractor must be familiar with the requirements for and comply with the Americans with Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

**9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment:** The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

#### **10. Assurance Required by 49 CFR 26.13(b):**

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

**11. Records and Reports:** The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

#### **III. NONSEGREGATED FACILITIES**

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color,

religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

#### **IV. Davis-Bacon and Related Act Provisions**

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

##### **1. Minimum wages**

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b.(1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

## 2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such

action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

## 3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee ( e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

#### 4. Apprentices and trainees

##### a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

##### b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

##### d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

**5. Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

**6. Subcontracts.** The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

**7. Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for

debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

**8. Compliance with Davis-Bacon and Related Act requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

**9. Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

#### **10. Certification of eligibility.**

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

#### **V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT**

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

**1. Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

**2. Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

**3. Withholding for unpaid wages and liquidated damages.** The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such

contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

**4. Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

#### **VI. SUBLETTING OR ASSIGNING THE CONTRACT**

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.



4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

## **VII. SAFETY: ACCIDENT PREVENTION**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

## **VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

## **IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.

2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

## **X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION**

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

### **1. Instructions for Certification – First Tier Participants:**

a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.

b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.

c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded,"

as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

\* \* \* \* \*

## **2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:**

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with

commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

### **2. Instructions for Certification - Lower Tier Participants:**

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the

certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

\* \* \* \* \*

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

\* \* \* \* \*

**XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING**

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

## Contract Provision - Cargo Preference Requirements

In accordance with Title 46 CFR § 381.7 (b), the contractor agrees—

“(1) To utilize privately owned United States-flag commercial vessels to ship at least 50 percent of the gross tonnage (computed separately for dry bulk carriers, dry cargo liners, and tankers) involved, whenever shipping any equipment, material, or commodities pursuant to this contract, to the extent such vessels are available at fair and reasonable rates for United States-flag commercial vessels.

(2) To furnish within 20 days following the date of loading for shipments originating within the United States or within 30 working days following the date of loading for shipments originating outside the United States, a legible copy of a rated, ‘on-board’ commercial ocean bill-of-lading in English for each shipment of cargo described in paragraph (b) (1) of this section to both the Contracting Officer (through the prime contractor in the case of subcontractor bills-of-lading) and to the Division of National Cargo, Office of Market Development, Maritime Administration, Washington, DC 20590.

(3) To insert the substance of the provisions of this clause in all subcontracts issued pursuant to this contract.”

Provisions (1) and (2) apply to materials or equipment that are acquired solely for the project. The two provisions do not apply to goods or materials that come into inventories independent of the project, such as shipments of Portland cement, asphalt cement, or aggregates, when industry suppliers and contractors use these materials to replenish existing inventories.

**MINIMUM WAGES FOR FEDERAL AND FEDERALLY  
ASSISTED CONSTRUCTION CONTRACTS**

This project is funded, in part, with Federal-aid funds and, as such, is subject to the provisions of the Davis-Bacon Act of March 3, 1931, as amended (46 Sta. 1494, as amended, 40 U.S.C. 276a) and of other Federal statutes referred to in a 29 CFR Part 1, Appendix A, as well as such additional statutes as may from time to time be enacted containing provisions for the payment of wages determined to be prevailing by the Secretary of Labor in accordance with the Davis-Bacon Act and pursuant to the provisions of 29 CFR Part 1. The prevailing rates and fringe benefits shown in the General Wage Determination Decisions issued by the U.S. Department of Labor shall, in accordance with the provisions of the foregoing statutes, constitute the minimum wages payable on Federal and federally assisted construction projects to laborers and mechanics of the specified classes engaged on contract work of the character and in the localities described therein.

General Wage Determination Decisions, modifications and supersedes decisions thereto are to be used in accordance with the provisions of 29 CFR Parts 1 and 5. Accordingly, the applicable decision, together with any modifications issued, must be made a part of every contract for performance of the described work within the geographic area indicated as required by an applicable DBRA Federal prevailing wage law and 29 CFR Part 5. The wage rates and fringe benefits contained in the General Wage Determination Decision shall be the minimum paid by contractors and subcontractors to laborers and mechanics.