UNIVERSIDAD DE PUERTO RICO EN PONCE JUNTA DE SUBASTAS



# SUBSATA UPRP-22-03 REMODELACIÓN DE BAÑOS EN UPR PONCE

Para participar en esta subasta la asistencia a la reunión presubasta es <u>compulsoria</u>. Ésta se celebrará a las 1:30pm del viernes, 28 de enero de 2022 en el Salón 247 del Edificio Ruth Fortuño de la Universidad de Puerto Rico en Ponce.

Todos los participantes deberán presentar evidencia de vacunación contra el COVID19, asistir con mascarilla, mantener el distanciamiento social requerido y cumplir con los protocolos de seguridad establecidos por la institución (ver pliegos de subasta).

Los asistentes **deberán confirmar su asistencia** indicando el nombre y la compañía que representan escribiendo a: <u>militza.dejesus@upr.edu</u> entre el 13 y 27 de enero.

## Subasta UPRP-22-03 Remodelación de Baños en UPR-Ponce

CONDICIONES E INSTRUCCIONES ESPECIALES APLICABLES A LA SOLICITUD DE PROPUESTAS SELLADAS DE CONFORMIDAD CON EL REGLAMENTO SOBRE ADQUISICIÓN DE EQUIPO, MATERIALES Y SERVICIOS NO PERSONALES DE LA UNIVERSIDAD DE PUERTO RICO. CERTIFICACIÓN NÚMERO 30 (2008-2009) DE LA JUNTA DE SÍNDICOS DE LA UNIVERSIDAD DE PUERTO RICO

**Descripción de los bienes o servicios**: Se recibirán propuestas para el proyecto de remodelación de diecinueve (19) baños en la Universidad de Puerto Rico en Ponce.

Las especificaciones técnicas del proyecto de instalación se detallan en los siguientes anejos:

- 1) Certificación de Cumplimiento Ambiental por Exclusión Categórica (3 pp).
- 2) UPR PONCE: Bathroom Remodel: Project Specifications (235 pp).
- 3) UPR Ponce Bathroom renovations (pp 45).

Los términos y condiciones para la remodelación de baños en UPR Ponce son los siguientes:

- 1. Los trabajos deberán realizarse en un término de tiempo razonable el cual será propuesto por el contratista. Cada licitador debe someter un plan de trabajo detallando como las obras podrán realizarse sin interrumpir las operaciones administrativas y académicas. Específicamente, los licitadores deben incluir un narrativo que explique las medidas para controlar ruidos, polvo fugitivo y manejo de escombros o la realización de obras críticas fuera del horario de 7:30am a 4:30 pm de lunes a viernes. La viabilidad del plan de trabajo propuesto, incluyendo el tiempo de culminación, será considerado por la Junta de Subastas como uno de los criterios de selección. El contratista tendrá hasta 30 días adicionales al plan de trabajo propuesto para completar los trabajos en caso de que presenten dificultades adquiriendo los materiales necesarios para finalizar la obra. Los trabajos se conducirán en los turnos que se establezca entre las partes, trabajándose un mínimo de cinco días a la semana, a partir de la fecha de la orden para comenzar. De no completarse la obra en ese término, incluyendo la extensión de treinta días, el proponente pagará la suma de \$100 a la UPR Ponce como daños líquidos convenidos por cada día que tome en terminar la obra en exceso del tiempo estipulado. El importe por dichos daños líquidos será descontado del pago global por la UPR Ponce, disponiéndose que el proponente tendrá derecho a una extensión de tiempo que compense las demoras debido a lluvias o mal tiempo, interrupciones de utilidades u otras causas fortuitas, pero excluyendo la falta de materiales. El contratista deberá reclamar semanalmente las extensiones de tiempo que reclame por las causas antes especificadas indicando el desglose del tiempo perdido y sus causas. Dichas extensiones de tiempo se aprobarán únicamente mediante un Aviso de Cambio debidamente autorizado por el representante de UPR Ponce.
- 2. La suma estipulada como precio del proyecto será satisfecha por la UPR Ponce en pagos parciales, por áreas, previa certificación del proponente y aprobada por el Decano de Administración, siguiendo las recomendaciones del Director de Recursos Físicos de la Universidad de Puerto Rico en Ponce. El proponente presentará facturas certificadas para pago según se estipula en esta sección. El representante de la UPR Ponce dentro, de los veinte días luego de recibida la factura, emitirá una certificación para pago. La UPR Ponce realizará el pago de esta factura en un término no mayor de quince días a partir de la certificación, conforme a las retenciones establecidas. La UPR Ponce retendrá el 10 (diez) porciento de cada factura certificada. Este importe será pagado una vez el proyecto sea aceptado satisfactoriamente.
- 3. El desempeño negligente de sus funciones o el abandono de éstos por el proponente se considerará una violación del contrato otorgado y será causa suficiente para que la UPR

Ponce lo declare terminado y quede relevado de toda obligación y responsabilidad bajo el mismo.

- 4. El proponente asegura que está legalmente autorizado y registrado en su profesión en el Estado Libre Asociado de Puerto Rico y certifica que se encuentra cualificado y con las licencias requeridas para ejecutar el proyecto. Así también, certifica que cuenta con el equipo, mano de obra, organización y financiamiento requerido para llevar a cabo el proyecto.
- 5. El término "proyecto" incluirá todo lo que el proponente venga obligado a realizar para llevar a cabo o completar satisfactoriamente todos sus deberes requeridos en los documentos de este proyecto. El proponente será responsable de tramitar todos los documentos de fianzas, seguros y otros requeridos, suministrar toda labor de supervisión y ejecución, materiales, licencias, suministros, equipos, instalaciones, herramientas y otras utilidades, según requeridos en la subasta.
- 6. La UPR Ponce no será responsable por daños que sufra el proponente causados por interrupciones de luz, agua, actos de fuerza mayor, ni por cierres de la Institución que sean decretados por cualquier causa. La Institución no será responsable del hurto, apropiación ilegal o cualquier acto delictivo que se cometa contra los empleados, agentes y contra la propiedad del proponente. Tampoco será responsable por daños o pérdidas a la propiedad por motivo de incendio, huracán, terremoto, inundaciones y cualquier acto de fuerza mayor.
- 7. La UPR Ponce y el proponente se comprometen a no discriminar por razones de edad, sexo, raza, color, nacimiento, origen o condición social, impedimento físico, creencias políticas o religiosas o status de veteranos en las prácticas de empleo, contratación y sub-contratación, a tenor con la legislación estatal y federal vigente.
- 8. El proponente deberá entregar un Memorando Explicativo que describa su historial empresarial, su capacidad y peritaje técnico, la experiencia y preparación de sus agentes principales y un listado de proyectos realizados en los pasados tres años que incluya: descripción de las obras, costo total de cada proyecto, nombre de la entidad que recibió los servicios con su dirección y teléfonos de contacto. Debe incluir además tres (3) cartas de referencia, con información de contacto, que acrediten la culminación exitosa de proyectos similares realizados durante este periodo de tiempo.
- 9. El proponente entregará estados financieros de la compañía (último año fiscal o natural) al momento de presentar su licitación.
- 10. El proponente no podrá traspasar ni negociar el contrato otorgado a personas o entidad alguna sin el consentimiento expreso de la UPR Ponce. UPR Ponce se reserva el derecho de rescindir el mismo en el momento en que el proponente falle en la ejecución de cualquier servicio especificado en el contrato otorgado o en caso de actos de negligencia, abandono de deberes o incumplimiento. El proponente presentará una lista con la información de las empresas a ser subcontratadas para la realización de la obra.
- 11. Según estipulado en la Orden Ejecutiva OE-2018-033 emitida por el gobernador de Puerto Rico se dispone que todo proyecto de construcción financiado parcial o totalmente con fondos del gobierno de Puerto Rico, sus agencias, instrumentalidades y corporaciones públicas tendrá como condición de su otorgamiento que el contratista pague a los trabajadores que allí laboren un salario mínimo de quince dólares (\$15.00) por hora, así como certificar que el cemento a utilizarse sea producido en Puerto Rico. La Carta Circular número 2018-01 del Departamento del Trabajo y Recursos Humanos establece una guía interpretativa y normas vinculantes en cuanto a la implementación de la OE-2018-033.

- 12. Conforme a la Orden Ejecutiva del Gobernador 2021-062 todo contratista o sus empleados que realicen labores presenciales en la UPR Ponce deberá, excepto las excepciones permitidas, presentar evidencia de vacunación contra el COVID19.
- 13. Cualquier cambio o modificación que las partes acuerden con respecto a los términos y condiciones del contrato otorgado, incluidos los servicios y cuantía, deberá incorporarse al contrato mediante enmienda formal, por escrito, de acuerdo a las normas que rigen la contratación en la UPR Ponce.
- 14. El proponente presentará su propuesta utilizando el formato provisto por la Junta de Subastas de la Universidad de Puerto Rico en Ponce para este propósito (presentación de oferta), la hoja de cotejo, así como todos los documentos requeridos en los pliegos de subasta.

<u>No se aceptarán precios estimados</u> o fórmulas para calcular precios o descripciones de los equipos, materiales o servicios ofrecidos que puedan prestarse a diversas interpretaciones.

La Junta de Subasta no considerará ofertas de licitadores que no hayan cumplido a cabalidad sus compromisos anteriores con la Universidad.

<u>Mientras las ofertas estén bajo consideración</u>, los licitadores, sus representantes u otras partes interesadas se abstendrán de comunicarse por cualquier medio con personal de la Universidad en cuestiones relacionadas con la subasta.

<u>Ningún funcionario o empleado de la Universidad ni los miembros de su familia, se comunicará</u> <u>con los licitadores</u> o con personas ajenas a la Universidad para ofrecer información relacionada con subastas bajo consideración.

**Descripción del proceso de subasta:** La asistencia a la reunión presubasta y recorrido de facilidades es **compulsoria** y se efectuará a la **1:30pm del viernes, 28 de enero** de 2022 en el Salón 247 del Edificio Ruth Fortuño de la Universidad de Puerto Rico en Ponce. Todos los participantes deberán presentar evidencia de estar vacunados contra el COVID19 o presentar una prueba negativa tomada dentro de 72 horas de la reunión, asistir con mascarilla, mantener el distanciamiento social requerido y cumplir con los protocolos de seguridad establecidos por la institución. A toda persona que NO cumpla estos requisitos NO le será permitido acceso a la institución.

Las propuestas se recibirán entre los días **31 de enero de 2022 de 8:30am a 11:45am y de 1:00pm a 4:15pm hasta las 10:45 am del viernes, 25 de febrero de 2022** en la Oficina de Compras ubicada en el Decanato de Administración en UPR Ponce. No se aceptarán propuestas después de la fecha y hora señalada. La Apertura de Ofertas de Subastas se realizará a las **11:00am del viernes, 25 de febrero de 2022** en el Salón 247 del Edificio Ruth Fortuño de la Universidad de Puerto Rico en Ponce.

Los licitadores podrán estar presentes durante la Apertura de Ofertas de Subastas (aplicarán los protocolos de prevención contra el COVID19 antes mencionados). Al abrirse las ofertas, los miembros de la Junta presentes y el Secretario verificarán que: (a) todas las ofertas estén firmadas en tinta por el licitador, (b) el nombre de la persona que firma aparezca en letra de molde, (c) se indique en qué calidad firma y el puesto que ocupa en la empresa, (d) aparezcan anotados el nombre, la dirección comercial física y postal, número identificación patronal, el teléfono y el correo electrónico del licitador, de conformidad con lo dispuesto en este Reglamento. Se dará lectura en público de cada oferta y se les dará suficiente tiempo a los licitadores para que, en el salón de apertura o en un sitio designado y en presencia del Secretario de la Junta de Subastas, inspeccionen cada oferta o parte de ella, excepto aquellos documentos que sean considerados confidenciales.

La Junta de Subastas, a su discreción, podrá referir las propuestas a un Comité Evaluador designado por esta. Este comité tendrá la encomienda de evaluar las propuestas siguiendo el

procedimiento establecido en la Certificación Número 30, 2008-2009 de la Junta de Síndicos de la Universidad de Puerto Rico y los parámetros de los pliegos de subasta.

En dicho caso, el Comité Evaluador presentará a la Junta de Subastas sus recomendaciones en torno a la propuesta que mejor sirva los intereses de la Institución. La Junta de Subastas procederá a adjudicar de conformidad a lo establecido en el Artículo 23.H de la referida Certificación Núm. 30. Se notificará mediante correo certificado tanto al licitador seleccionado como a los demás licitadores.

**Instrucciones:** Las ofertas deberán ser entregadas en un sobre sellado. El mismo debe estar identificado de la siguiente forma:

- Nombre del Licitador
- Dirección
- Teléfono
- Correo electrónico
- Nombre de la Subasta (Identificación del Proyecto)
- Fecha y hora de entrega de la propuesta

Toda oferta deberá estar firmada por el proponente o la persona autorizada mediante la Resolución Corporativa emitida por la compañía. Asimismo, el documento deberá tener las iniciales del proponente en todas sus páginas. Los precios cotizados deberán estar garantizados por ciento veinte (120) días a partir del día de la apertura de pliegos.

- a. Si el licitador es una sociedad, su oferta estará firmada en tinta a nombre de dicha sociedad, por un socio o representante autorizado para obligarla.
- b. Si el licitador es una corporación, su oferta estará firmada en tinta con el nombre corporativo seguido de la firma y designación de su Presidente, Secretario u otro oficial autorizado para obligarla.
- c. Los nombres de los firmantes deberán ser mecanografiados o impresos bajo las firmas en tinta. La oferta de una persona que añade a su firma "Presidente", "Secretario", "Agente" u otra designación sin revelar su principal, estará descalificada.

No se aceptarán ofertas por teléfono ni por medios electrónicos.

Si aplica, la oferta debe incluir reclamación de que se aplique al licitador lo dispuesto en la Ley Núm. 14, sustentada con los documentos que evidencien el por ciento de preferencia otorgado por la Junta de Inversión en la Industria Puertorriqueña.

Una oferta abierta prematuramente, por haber sido incorrectamente dirigida será descalificada.

A menos que en el pliego de subasta se solicite o se autorice más de una alternativa, ningún licitador podrá someter más de una oferta, y de así hacerlo, todas las ofertas sometidas por ese licitador serán descalificadas.

En caso de que el licitador invitado no esté en condiciones de cotizar, debe devolver la invitación a la Secretaria de la Junta de Subastas indicando la(s) razón(es) e informando si desea recibir futuras invitaciones.

# Las correcciones o tachaduras en la oferta deberán estar debidamente firmadas con las iniciales por el licitador, en manuscrito, con tinta indeleble. De lo contrario, quedará invalidada la oferta para la(s) partidas(s) correspondiente(s).

<u>Criterios de Evaluación</u>: Los licitadores tendrán que cumplir con los criterios establecidos en los pliegos de subastas, sus anejos y especificaciones técnicas según provistas. Además del precio, se dará especial consideración a la capacidad operacional del licitador para realizar los servicios y trabajos de la subasta bajo consideración; la calidad, garantía, adaptabilidad y compatibilidad de los materiales, efectos, equipos o servicios para los fines deseados; la capacidad económica

del licitador; su pericia, experiencia, reputación e integridad comercial y capacidad para prestar los servicios complementarios que apliquen tales como adiestramiento, mantenimiento, garantía, piezas de repuesto, así como el plan de trabajo y culminación del proyecto propuesto.

<u>El licitador seleccionado deberá</u> presentar evidencia de las cubiertas de seguro desde su contratación hasta el momento en que finalice el contrato. Esta evidencia se requerirá al momento de la firma del contrato.

#### DOCUMENTOS REQUERIDOS AL SOMETER LA OFERTA

- 1. Presentación de oferta (documento adjunto)
- 2. Hoja de Cotejo (documento adjunto)
- 3. Garantía de oferta: La oferta debe venir acompañada por una garantía o fianza de licitación (BID BOND) por la cantidad igual al 5% del valor total de la oferta, pagadero a la Universidad de Puerto Rico. La garantía de oferta tendrá vigencia de noventa (90) días calendario o más, y tendrá que provenir de una compañía de seguros debidamente certificada por el Comisionado de Seguros de Puerto Rico. La proposición que no venga acompañada por esta garantía no será considerada y se devolverá al remitente.
- 4. Certificación vigente del Registro Único de Licitadores de la Administración de Servicios Generales.
- 5. Memorando Explicativo
- 6. Tres cartas de referencia
- 7. Plan de trabajo
- 8. Estados Financieros

# TODA LICITACIÓN QUE NO CONTENGA EN EL SOBRE SELLADO TODOS LOS DOCUMENTOS REQUERIDOS SERÁ DESCUALIFICADA

Conforme al Reglamento sobre Adquisición de Equipos, Materiales y Servicios No Personales de la Universidad de Puerto Rico, CERTIFICACIÓN NÚMERO 30 (2008-2009), la Junta de Subastas no considerará ofertas de licitadores que no hayan cumplido a cabalidad sus compromisos anteriores con la Universidad o con agencias gubernamentales o clientes privados. En caso de incumplimiento, la Junta notificará a la Oficina de Compras para que los participantes sean eliminados del Registro de Licitadores. La Junta de Subastas velará porque los licitadores que reciban la buena pro de la subasta sean personas naturales o jurídicas: (1) de sólida solvencia moral y económica, según se refleje en la presentación de los documentos requeridos y estados financieros; (2) que posean la experiencia y capacidad necesaria demostrada por transacciones similares a la de la subasta; (3) que tengan vigentes las licencias, permisos o franquicias necesarias y requeridas por las leyes y reglamentos aplicables; y (4) que cuando hubieren participado en otras transacciones con la Universidad hayan cumplido a cabalidad con sus obligaciones. Todo solicitante que tenga deuda con cualquier agencia gubernamental, deberá someter copia del plan de pago acordado o entregar documento oficial que certifique el pago total de la deuda.

LA JUNTA DE SUBASTAS SE RESERVA EL DERECHO DE RECHAZAR UNA O TODAS LAS PROPUESTAS Y DE ADJUDICAR LA BUENA-PRO A UN POSTOR QUE NO SEA EL MÁS BAJO EN PRECIO, CUANDO A JUICIO DE ESTA RESPONDA A LOS MEJORES INTERESES DE LA UPR-PONCE.

DOCUMENT	PAGES	FORMAT	AUTHOR
CONSTRUCTION DRAWINGS	235	24 X 36	AYALA RUBIO ARQUITECTURA PSC & CONSULTANT
SPECIFICATIONS	235	8.5 X 11	AYALA RUBIO ARQUITECTURA PSC & CONSULTANT

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#### CONCEDUCTION DOCUMENT CUMMADY

DOCUMENT	PAGES	FORMAT	AUTHOR
CONSTRUCTION DRAWINGS	235	24 X 36	AYALA RUBIO ARQUITECTURA PSC & CONSULTANTS

CONSTRUCTION DOCUMENT SUMMARY			
DOCUMENT	PAGES	FORMAT	AUTHOR
CONSTRUCTION DRAWINGS	235	24 X 36	AYALA RUBIO ARQUITECTURA PSC & CONSULTAN

PROJECT LEAM	
OWNER	
Universidad de Puerto Rico en Ponce	Ave. Santiago de los Caballeros
	Ponce PR 00734
	(787) 844-8181
Dra. Tessie H. Cruz-Rivera - Rectora	
Alberto Gracia Torres - Owner's Representative	(787) 319-3662
Director de Recursos Físicos	alberto.garcia3@upr.edu
ARCHITECTURE	
Ayala Rubio Arquitectura	76 Cristina Ste. 401 Ponce PR 00730

Lic. 15033 PR

Luis Ayala Rubio AIA - Project Architect



# UPR PONCE BATHROOM RENOVATIONS AVE. SANTIAGO DE LOS CABALLEROS PONCE, PUERTO RICO 00734







NOTE REGARDING THE USE OF THESE DOCUMENTS

IFICATIONS AND OTHER

APPROVAL

LAR

CGQ

PERMITS SET

TITLE, PROJECT

TEAM

SUE DATE (M/D/ 2/25/21

**G1** 

UPRB

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HIDDEN LINE LIGHT CONSTRUCTION
CENTER LINE
CENTER LINE REFERENCE
PROPERTY LINE
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BREAK LINE
STRUCTURAL REFERENCE AXIS
MATCH LINE REFERENCE
EXISTING POINT ELEVATION
NEW POINT ELEVATION
ELEVATION LEVEL
EXISTING CONTOUR
ELIMINATED CONTOUR
NEW CONTOUR
RAMP/STAIR LINE
SLOPE LINE
LEVEL CHANGE INDICATOR
DOOR NUMBER
WINDOW TYPE
BUILDING SECTION REFERENCE
BUILDING ELEVATION REFERENCE
MULTIPLE ELEVATION REFERENCE
ROOM NAME AND NUMBER OFFICE

101

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OFFICE

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CLOUD LINE MARKS EXTENT OF REVISION

**REVISION REFERENCE** 

#### SELECTIVE DEMOLITION NOTES

- DOCUMENTS AND THE ARCHITECT'S DESIGN IN ORDER TO CARRY OUT SELECTIVE DEMOLITION WORK IN A MANNER THAT IS CONDUCIVE TO PROPER EXECUTION OF THE PROJECT.
- 2 THE OWNER SHALL HAVE FIRST RIGHT OF REFUSAL OF ALL SALVAGEABLE ITEMS. 3 PROTECT ITEMS NOT BEING REMOVED FROM DAMAGE DURING CONSTRUCTION.
- 4 ALL MATERIALS REMOVED AND NOT REUSED SHALL BECOME THE PROPERTY OF THE CONTRACTOR
- UNLESS OTHERWISE SPECIFICALLY DESIGNATED TO REMAIN THE PROPERTY OF THE OWNER. 5 ALL WALLS INDICATED TO BE REMOVED SHALL BE REMOVED IN THEIR ENTIRETY INCLUDING ALL ELECTRICAL OUTLETS, SWITCHES AND CONDUITS, TELEPHONE OUTLETS, WIRING, MECHANICAL PIPING, BASES AND PLUMBING, ETC.
- 6 REMOVE ALL SURFACE MOUNTED OBJECTS IN AREA OF WORK THAT ARE ABANDONED AND NOT INTENED FOR REUSE. PREPARE SURFACE FOR NEW FINISH.
- 7 COORDINATE ALL PARTIAL DEMOLITION WORK BETWEEN ALL TRADES.
- 8 CONTRACTOR SHALL NOTIFY THE ARCHITECT IF DEMOLITION WORK APPEARS TO AFFECT THE STRUCTURAL INTEGRITY OF THE EXISTING BUILDING BEFORE PROCEEDING. 9 SEE ALSO REFLECTED CEILING PLANS, MECHANICAL SHEETS, & ELECTRICAL SHEETS FOR
- ADDITIONAL DEMOLITION INFORMATION.
- 10 THE CONTRACTOR SHALL BE RESPONSIBLE FOR DAMAGE TO EXISTING MATERIALS TO REMAIN RESULTING FROM WORK UNDER THIS CONTRACT, AND SHALL RESTORE SUCH DAMAGE TO IT'S ORIGINAL CONDITION.
- CONSTRUCTION AREA SHALL BE KEPT CLEAN AND SAFE. DISPOSE OF DEBRIS DAILY AND CLEAN AREAS OF WORK UPON COMPLETION.
- 12 COORDINATE WITH NEIGHBORS IF ANY LABOR REQUIRES DISTURBANCE OF NEIGHBORING PROPERTY.
- DISPOSE OF ALL REFUSE AND CONSTRUCTION DEBRIS IN LEGAL DUMP SITES AND PROVIDE OWNER 13 WITH COPIES OF ALL RECEIPTS. DISPOSAL OF REFUSE AND CONSTRUCTION DEBRIS IN ILLEGAL LOCATIONS WILL BE CONSIDERED A GRAVE OFFENSE AND REASON FOR IMMEDIATE TERMINATION OF CONSTRUCTION CONTRACT. DESECHAR TODOS LOS RESIDUOS Y DESECHOS DE CONSTRUCCIÓN EN SITIOS DE BASURA LEGALES Y PROPORCIONAR AL PROPIETARIO COPIAS DE TODOS LOS RECIBOS. LA ELIMINACIÓN DE DESECHOS Y DESECHOS DE CONSTRUCCIÓN EN UBICACIONES ILEGALES SERÁ CONSIDERADA UNA OFENSA GRAVE Y UNA RAZÓN PARA LA TERMINACIÓN INMEDIATA DEL CONTRATO DE

#### ABBREVIATIONS AIR CONDITIONING A/C

CONSTRUCCIÓN.

NIT
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1 CONTRACTOR MUST BECOME FAMILIAR WITH THE PROJECT, THE INTENTION OF THE CONSTRUCTION

#### **GENERAL NOTES**

- 1 **AUTHORSHIP OF DRAWINGS AND COPYRIGHTS:** DRAWINGS, SPECIFICATIONS AND OTHER DOCUMENTS PREPARED BY AYALA RUBIO ARQUITECTURA AND THE ARCHITECT'S CONSULTANTS ARE INSTRUMENTS OF SERVICE FOR USE SOLELY WITH RESPECT TO THIS PROJECT. AYALA RUBIO ARQUITECTURA AND THE ARCHITECT'S CONSULTANTS SHALL BE DEEMED THE AUTHOR AND OWNER OF SUCH INSTRUMENTS AND SHALL RETAIN ALL COMMON LAW, STATUTORY AND OTHER RESERVED RIGHTS, INCLUDING COPYRIGHTS. ANY REPRODUCTION OF THESE DOCUMENTS WITHOUT THE PERMISSION OR CONSENT OF AYALA RUBIO ARQUITECTURA IS UNLAWFUL AND STRICTLY PROHIBITED.
- 2 COMPONENTS OF THE CONTRACT DOCUMENTS: DRAWINGS, SPECIFICATIONS AND ADDENDA ARE PART OF THE CONTRACT DOCUMENTS FOR THIS PROJECT, WHICH ARE PART OF THE CONSTRUCTION CONTRACT. ONE DOES NOT PRECLUDE THE OTHER IN ANY WAY, INSTEAD, ALL ARE COMPLEMENTARY TO ONE ANOTHER. IN CASE OF DISCREPANCIES, INFORM AND CONSULT ARCHITECT BEFORE PROCEEDING WITH THE WORK.
- 3 **GEOTECHNICAL REPORT**: WHENEVER A GEOTECHNICAL EVALUATION REPORT HAS BEEN MADE PART OF THE BIDDING OR CONTRACT DOCUMENTS, ALL RECOMMENDATIONS INCLUDED IN THE REPORT ARE TO BE FOLLOWED BY THE CONTRACTOR, AS PART OF THE REQUIREMENTS OF THE PROJECT. ANY DISCREPANCIES BETWEEN THE RECOMMENDATIONS FOUND IN THE GEOTECHNICAL EVALUATION REPORT AND THE CONSTRUCTION DRAWINGS SHALL BE REPORTED TO AYALA RUBIO ARQUITECTURA AND THE INSPECTOR OF THE WORKS.
- 4 INTENTION OF THE CONTRACT DOCUMENTS: THE INTENTION OF THE CONTRACT DOCUMENTS IS TO PROVIDE THE CONTRACTOR WITH A SET OF DOCUMENTS THAT AIMS TO BE COMPLETE, CONCISE, COORDINATED AND CORRECT. DUE TO THE COMPLEX NATURE OF THIS TASK, THE DOCUMENTS WILL UNDOUBTEDLY PRESENT INFORMATION THAT DOES NOT STAND UP TO THE INTENDED STANDARD. THE CONTRACTOR IS TO BE AWARE THAT THERE IS NO STRICT HIERARCHY BETWEEN DRAWINGS, DETAILS, DISCIPLINES AND SPECIFICATIONS. WHENEVER AN ITEM IS NOT COORDINATED WITH RELATED INFORMATION, THE CONTRACTOR SHOULD NOTIFY THE ARCHITECT AND ASK FOR MORE INFORMATION REGARDING THE ISSUE BEFORE PROCEEDING WITH CONSTRUCTION.
- 5 **LANGUAGE**: DRAWINGS USE CERTAIN CONVENTIONS FOR THE STYLE OF LANGUAGE AS FOLLOWS: WHEN WORDS ARE ABBREVIATED, THEY SHALL BE UNDERSTOOD AS INDICATED IN THE ABBREVIATIONS LIST INCLUDED WITH THE DOCUMENTS; REQUIREMENTS EXPRESSED IN THE IMPERATIVE MOOD SHALL BE PERFORMED BY THE CONTRACTOR OR AS INDICATED; SINGULAR WORDS SHALL BE INTERPRETED AS PLURAL AND PLURAL WORDS SHALL BE INTERPRETED AS SINGULAR WHERE APPLICABLE AS THE CONTEXT OF THE CONTRACT DOCUMENTS INDICATES; IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO UNDERSTAND THE LANGUAGE USED IN THE DRAWINGS AND SPECIFICATIONS (ES RESPONSABILIDAD DEL CONTRATISTA ENTENDER EL LENGUAJE UTILIZADO EN LOS DIBUJOS Y ESPECIFICACIONES PREPARADOS PARA ESTE PROYECTO).
- GENERAL PROJECT INFORMATION: FOR WORK COVERED BY CONTRACT DOCUMENTS, TYPE OF CONTRACT, PHASING, WORK UNDER OTHER CONTRACTS, OWNER FURNISHED PRODUCTS, USE OF PREMISES, OCCUPANCY REQUIREMENTS, WORK RESTRICTIONS AND SPECIFICATION FORMATS AND CONVENTIONS SEE SPECIFICATIONS DIVISION 1 SECTION 01100 SUMMARY
- 7 WORKER'S COMPENSATION INSURANCE: CONTRACTOR IS RESPONSIBLE FOR OBTAINING WORKER'S COMPENSATION COVERAGE (FONDO DEL SEGURO DEL ESTADO) AND OBTAINING THE CORRECT COVERAGE CERTIFICATION FORMS PREPARED SPECIFICALLY FOR CONSTRUCTION PERMIT PURPOSES. THE CONTRACTOR SHALL SUBMIT SUCH CERTIFICATION FORMS TO AYALA RUBIO ARQUITECTURA PRIOR TO COMMENCING THE WORK. THE CONTRACTOR SHALL RETAIN COPIES OF THE CERTIFICATION WHICH SHALL BE USED TO OBTAIN FINAL CONSTRUCTION PERMITS THROUGH THE PERMITS OFFICE. UPON COMPLETION, IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO OBTAIN CERTIFICATIONS FROM THE CFSE STATING THAT ALL COVERAGE COSTS HAVE BEEN PAID AND THAT THERE IS NO DEBT RELATED TO THE PROJECT. PROPER FORMS REQUIRED FOR THE APPROVAL OF A USE PERMIT (PERMISO DE USO O PERMISO UNICO) SHALL BE OBTAINED AND PROVIDED TO THE ARCHITECT.
- 8 **PUBLIC RESPONSIBILITY INSURANCE:** CONTRACTOR SHALL PROVIDE THE OWNER WITH A WRITTEN ENDORSEMENT OF THE CONTRACTOR'S PUBLIC RESPONSIBILITY INSURANCE POLICY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE OWNER AND VERIFY THE NAME OR NAMES TO WHICH THE ENDORSEMENT SHALL BE MADE TO. PROOF OF SUCH ENDORSEMENT SHALL BE SUBMITTED TO THE ARCHITECT.
- MUNICIPAL CONSTRUCTION TAXES: THE OWNER IS RESPONSIBLE FOR PAYING ALL MUNICIPAL CONSTRUCTION TAXES (ARBITRIOS MUNICIPALES) AND OBTAINING CERTIFICATION FORMS PREPARED SPECIFICALLY FOR CONSTRUCTION PERMIT PURPOSES. THE OWNER SHALL PROVIDE SUCH CERTIFICATION FORMS TO THE ARCHITECT AND THE CONTRACTOR PRIOR TO COMMENCING WORK.
- 10 OTHER MUNICIPAL TAXES: CONTRACTOR IS RESPONSIBLE FOR PAYING MUNICIPAL PATENTS (PATENTE MUNICIPAL) AND OTHER TAXES WHEN AND AS REQUIRED BY THE LOCATION OF THE PROJECT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO OBTAIN INFORMATION REGARDING SUCH PATENTS AND TAXES. THE CONTRACTOR SHALL SUBMIT PROOF OF ALL SUCH PAYMENTS TO THE ARCHITECT.
- 11 CONSTRUCTION PERMITS: CONTRACTOR IS REQUIRED TO POST A COPY OF THE APPROVED CONSTRUCTION PERMIT IN A VISIBLE AND PROTECTED MANNER ON A CONSPICUOUS LOCATION AT THE CONSTRUCTION SITE. AS REQUIRED BY PERMIT AGENCIES, A 2' BY 4' SIGN MOUNTED ON "D-BOARD" VINYL MATERIAL WITH THE REQUIRED INFORMATION WILL BE POSTED. THE INFORMATION AND DESIGN WILL BE PROVIDED BY THE ARCHITECT, AND IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO HAVE THE SIGN PRINTED AND MOUNTED.
- 12 **SUPPORT FACILITIES**: CONTRACTOR IS RESPONSIBLE FOR OBTAINING SUPPORT FACILITIES AS REQUIRED FOR THE WORK, INCLUDING TEMPORARY TOILETS AND REFUSE DISPOSAL CONTAINERS. ALL COSTS PERTAINING TO SUCH INSTALLATIONS AND USAGE SHALL BE PAID BY THE CONTRACTOR.
- 13 **TEMPORARY UTILITIES:** CONTRACTOR IS RESPONSIBLE FOR OBTAINING AND COORDINATING TEMPORARY UTILITY INSTALLATIONS FROM AAA AND AEE, FOR PURPOSES OF CONSTRUCTION AND IN ORDER TO TEST ALL INSTALLED SYSTEMS PRIOR TO FINAL DELIVERY OF THE PROJECT TO THE OWNER.
- 13 **PERMANENT UTILITIES:** CONTRACTOR WILL BE RESPONSIBLE FOR CONVERTING ALL TEMPORARY UTILITY ACCOUNTS INTO PERMANENT ACCOUNTS WITH THE ASSISTANCE OF THE OWNER.
- 14 CONNECTION FEES REQUIRED BY UTILITY COMPANIES: ANY CONNECTION FEES REQUIRED BY AEE, AAA OR OTHER UTILITY AGENCIES AS PAYMENTS FOR TEMPORARY INSTALLATION SHALL BE PAID BY THE CONTRACTOR. FEES AND "APORTACIONES" REQUIRED FOR PERMANENT INSTALLATION OF SERVICES WILL BE COVERED BY THE OWNER.

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2/25/21

**G2** 

CGQ

PERMITS SET

INFORMATION

**GENERAL PROJECT** 

LAR

## **GENERAL LOCATION: PONCE MUNICIPALITY**



LOT AREA: 152801.2869 MC **MUNICIPALITY:** PONCE BARRIO: PLAYA **SUELO:** Ct (70.5%), SNS (29.5%) **ZONING:** D

## LOCATION MAP: SATELLITE PHOTO



**ZONING MAP: PONCE 151 EH.2 12/28/03** 



**FLOOD INSURANCE RATE MAP: 72000C1670J 4/13/18** 





## MULTIPURPOSE BUILDING

BATHROOMS: MP1, MP2, MP3, MP4, TEAMROOMS: T1 & T2

**REFER TO KEY PLAN IN PAGE G6** 

# GENERAL **AUDITORIUM** BUILDING

BATHROOM GA1 NO KEY PLAN PROVIDED REFER TO PAGE T1

# **ACADEMIC BUILDING**

LEVEL 1 BATHROOMS: A1-1, A1-2, A1-3, A1-4, A1-5 & A1-6 **REFER TO KEY PLAN IN PAGE G4** LEVEL 2 BATHROOMS: A2-1, A2-2, A2-3, A2-4, A2-5 & A2-6

**REFER TO KEY PLAN IN PAGE G5** 

## **UPR PONCE CAMPUS**

±185,983 SM LOT AREA (INCLUDING ADDITIONAL PARKING LOTS OUTSIDE OF MAIN PROPERTY)

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PROJECT NUMBER	PROJECT ID	
2045		UPRB

UNIVERSIDAD DE **PUERTO RICO** 



DRAFTING	CGQ	APPROVAL	LAR
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# REGULATORY INFORMATION

2/25/21

**G**3



#### ACADEMIC BUILDING KEY PLAN LEVEL 1 1 SCALE: 1:220



#### NOTES REGARDING PROJECT SCOPE, SAFETY AND PHASING:

1. KEYPLAN IS PROVIDED FOR THE PURPOSE OF LOCATING AND IDENTIFYING BATHROOMS TO BE REMODELED. 2. KEYPLAN DRAWING IS BASED ON ORIGINAL CONSTRUCTION DRAWINGS AND DOES NOT REFLECT ACTUAL CONDITIONS OF BUILDING. MINOR ADDITIONS AND ALTERATIONS HAVE BEEN IMPLEMENTED BUT ARE NOT SHOWN. 3. ALL WORK INCLUDED IN PROJECT IS LIMITED TO INTERIORS OF BATHROOMS INDICATED, INCLUDING DOORWAYS TO THE BATHROOMS THEMSELVES, UNLESS OTHERWISE INDICATED. 4. IN THE CASE THAT WORK IS TO PROCEED WHILE BUILDING IS IN USE, CONTRACTOR WILL COORDINATE WITH OWNER AND PROJECT INSPECTOR, IN ORDER TO CLEARLY MARK WORK AREAS AND PROVIDE MEASURES FOR THE SAFETY OF BUILDING OCCUPANTS. 5. PROJECT PHASING, IF ANY, IS TO BE COORDINATED WITH OWNER.



CERTIFICACION



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2/25/21

**G4** 

ACADEMIC BUILDING KEY PLAN LEVEL 1



#### ACADEMIC BUILDING KEY PLAN LEVEL 2 1 SCALE: 1:220



#### NOTES REGARDING PROJECT SCOPE, SAFETY AND PHASING:

1. KEYPLAN IS PROVIDED FOR THE PURPOSE OF LOCATING AND IDENTIFYING BATHROOMS TO BE REMODELED. 2. KEYPLAN DRAWING IS BASED ON ORIGINAL CONSTRUCTION DRAWINGS AND DOES NOT REFLECT ACTUAL CONDITIONS OF BUILDING. MINOR ADDITIONS AND ALTERATIONS HAVE BEEN IMPLEMENTED BUT ARE NOT SHOWN. 3. ALL WORK INCLUDED IN PROJECT IS LIMITED TO INTERIORS OF BATHROOMS INDICATED, INCLUDING DOORWAYS TO THE BATHROOMS THEMSELVES, UNLESS OTHERWISE INDICATED. 4. IN THE CASE THAT WORK IS TO PROCEED WHILE BUILDING IS IN USE, CONTRACTOR WILL COORDINATE WITH OWNER AND PROJECT INSPECTOR, IN ORDER TO CLEARLY MARK WORK AREAS AND PROVIDE MEASURES FOR THE SAFETY OF BUILDING OCCUPANTS. 5. PROJECT PHASING, IF ANY, IS TO BE COORDINATED WITH OWNER.



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#### EX CON: MULTIPURPOSE BLDG: KEY PLAN 1 SCALE: 1/8" = 1'-0"

#### NOTES REGARDING PROJECT SCOPE, SAFETY AND PHASING:

1. KEYPLAN IS PROVIDED FOR THE PURPOSE OF LOCATING AND IDENTIFYING BATHROOMS TO BE REMODELED. 2. KEYPLAN DRAWING IS BASED ON ORIGINAL CONSTRUCTION DRAWINGS AND DOES NOT REFLECT ACTUAL CONDITIONS OF BUILDING. MINOR ADDITIONS AND ALTERATIONS HAVE BEEN IMPLEMENTED BUT ARE NOT SHOWN. 3. ALL WORK INCLUDED IN PROJECT IS LIMITED TO INTERIORS OF BATHROOMS INDICATED, INCLUDING DOORWAYS TO THE BATHROOMS THEMSELVES, UNLESS OTHERWISE INDICATED. 4. IN THE CASE THAT WORK IS TO PROCEED WHILE BUILDING IS IN USE, CONTRACTOR WILL COORDINATE WITH OWNER AND PROJECT INSPECTOR, IN ORDER TO CLEARLY MARK WORK AREAS AND PROVIDE MEASURES FOR THE SAFETY OF BUILDING OCCUPANTS. 5. PROJECT PHASING, IF ANY, IS TO BE COORDINATED WITH OWNER.



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RAFTING APPROVAL CGQ

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PERMITS SET

MULTIPURPOSE BUILDING KEY PLAN

2/25/21

**G6** 

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#### **TYPICAL EXISTING CONDITION FLOOR PLAN VIEW**

NOTES ABOUT DEMOLITION FILLS:

**DEMOLITION FILL - WALLS:** INDICATES PORTIONS OF REINFORCED CONCRETE AND CONCRETE BLOCK WALLS TO BE DEMOLISHED.

**DEMOLITION FILL - SANITARY FIXTURES: INDICATES THOSE ITEMS THAT WILL NOT BE REPLACED OR** ITEMS THAT WILL BE RELOCATED. REFER TO ARCHITECTURAL AND PLUMBING PLANS TO DETERMINE WHICH FIXTURES ARE TO BE RELOCATED (REQUIRING RELOCATION OF ROUGH-IN PLUMBING ELEMENTS), WHICH FIXTURES ARE TO BE REALIGNED OR MOVED SLIGHTLY TO CONFORM WITH SPACING REQUIREMENTS (NOT REQUIRING RELOCATION OF ROUGH-IN ELEMENTS, AND WHICH FIXTURES ARE TO BE ELIMINATED COMPLETELY. NOTE THAT ALL EXISTING FIXTURES ARE TO BE REPLACED WITH NEW FIXTURES.

NOTE THAT DEMOLITION FILLS HAVE NOT BEEN APPLIED TO FINISHES, BATHROOM PARTITIONS, ACCESSORIES, SANITARY FIXTURES AND ELECTRICAL APPURTENANCES EVEN IF SUCH ELEMENTS ARE TO BE DEMOLISHED, ELIMINATED OR REMOVED.

DEMOLITION NOTES APPLICABLE TO ALL SPACES:

CONCRETE FLOOR SLAB: AT GROUND LEVEL SPACES, DEMOLISH PORTIONS OF CONCRETE FLOOR SLAB AS REQUIRED BY CHANGES TO SANITARY FIXTURE LAYOUT. REFER TO ARCHITECTURAL DRAWINGS AND PLUMBING DETAILS TO CONFIRM REQUIREMENTS FOR EACH BATHROOM. PROCEED WITH EFFICIENCY AND INSPECT CONDITIONS DURING CUTTING TO CONFIRM LOCATION OF PLUMBING TO BE MODIFIED.

**EXTERIOR REINFORCED CONCRETE WALLS:** SAW-CUT OPENINGS FOR NEW WINDOWS AS INDICATED. SAW-CUT FROM EXTERIOR FIRST TO MINIMIZE IMPACT TO EXISTING EXPOSED CONCRETE WALLS AND FINISH.

BATHROOM. STEEL DOORS AND FRAMES: REMOVE ALL STEEL DOORS AND FRAMES EXCEPT AS INDICATED.

CONCRETE BLOCK WALLS: DEMOLISH EXISTING CONCRETE BLOCK WALLS AS INDICATED FOR EACH

WIDEN DOOR OPENINGS AS REQUIRED FOR EACH PARTICULAR SPACE. SALVAGE DOOR LEAFS AS PER OWNER'S REQUIREMENTS. DOOR THRESHOLD: REMOVE EXISTING MARBLE FLOOR THRESHOLD BY SAW-CUTTING AT EDGE

BETWEEN THRESHOLD AND HALLWAY FLOOR. HALLWAY FLOOR FINISH TO BE PROTECTED DURING CONSTRUCTION AND REMAIN UNDISTURBED. FLOOR FINISH: REMOVE EXISTING CERAMIC MOSAIC TILE FLOOR FINISH AND ANY OTHER FLOOR

FINISH TYPE THAT MIGHT EXIST. WALL FINISH: REMOVE EXISTING CERAMIC MOSAIC TILE WALL FINISH.

**BATHROOM PARTITIONS:** REMOVE ALL BATHROOM PARTITIONS

BATHROOM ACCESSORIES: REMOVE ALL BATHROOM ACCESSORIES AND SALVAGE AS PER OWNER'S **REQUIREMENTS** 

**PLUMBING FIXTURES:** REMOVE ALL PLUMBING FIXTURES AND SALVAGE AS PER OWNER'S REQUIREMENTS. COVER AND PROTECT ALL SANITARY PIPES WHEN REMOVING FIXTURES TO MAKE SURE THAT NO FOREIGN MATTER RESULTING FROM DEMOLITION ACTIVITIES FALLS INTO PIPING. ROUGH-IN PLUMBING ITEMS: REMOVE ALL EXPOSED ROUGH-IN ITEMS SUCH AS LAVATORY AND TOILET COLD WATER VALVES. COORDINATE WITH OTHER CONSTRUCTION ACTIVITIES TO DISRUPT WATER SERVICE AS COORDINATED WITH OWNER.

FLOOR DRAINS AND FLOOR REGISTER COVERS: REMOVE ALL FLOOR DRAINS AND FLOOR REGISTER COVERS. PROTECT OPENINGS TO MAKE SURE THAT NO FOREIGN MATTER RESULTING FROM DEMOLITION ACTIVITIES FALLS INTO PIPING. REMOVE BRASS ELEMENTS DRAINS WITH CARE SO AS TO NOT DAMAGE EXISTING PVC PIPING. IF POSSIBLE BY CONDITIONS OF EACH ITEM, AND ALLOWED BY OWNER, REPLACE DRAIN AND REGISTER COVERS WITH NEW COVERS AND REFURBISH BRASS BASES/RECEPTACLES TO ALMOST NEW CONDITION.

FLOOR SANITARY REGISTER COVERS: TREAT SANITARY REGISTER COVERS AS INDICATED FOR

IN PROJECT.

INSPECTOR.

EXPOSED EXHAUST DUCTWORK: DUCTWORK AND SUPPORT ELEMENTS OR FRAMING SHALL BE REMOVED AS INDICATED. **LIGHT FIXTURES:** REMOVE ALL EXISTING LIGHT FIXTURES. ELECTRICAL CONDUITS AND CABLE ABOVE CEILING IS TO BE INSPECTED TO ASCERTAIN CONDITIONS AND USED FOR INSTALLATION OF NEW LIGHT FIXTURES. SALVAGE GRILLE MATERIAL AS REQUIRED BY OWNER.



# **TYPICAL SANITARY** FIXTURE TO BE RELOCATED OR ELIMNINATED **REMOVAL OF FRAMES AND** -PARTIAL DEMOLITION OF ALL ACCESSORIES TO BE ELIMINATED

### **TYPICAL EXISTING CONDITION RCP VIEW**

**DEMOLITION NOTES APPLICABLE TO ALL SPACES - CEILING ELEMENTS:** 

**GYPSUM BOARD CEILING FINISH:** REMOVE ALL GYPSUM BOARD CEILING FINISH MATERIAL WITHOUT DAMAGING EXISTING SUPPORT FRAMING. IT IS ASSUMED FROM FIELD OBSERVATIONS AND ORIGINAL CONSTRUCTION PLANS THAT ALL CEILING FINISHES WERE BUILT WITH GYPSUM BOARD. IN CASE OF CEILING SURFACES BUILT WITH CEMENTITIOUS BOARD, PROCEED IN SAME FASHION.

**CEMENT PLASTER CEILING FINISH:** CEMENT PLASTER CEILING FINISH FOUND IN BATHROOMS AND TEAMROOMS IN MULTIPURPOSE BUILDING SHALL BE THOROUGHLY CLEANED USING PRESSURED WATER, TAKING CARE NOT TO DAMAGE MECHANICAL AND ELECTRICAL APPURTENANCES REMAINING

**EXPOSED PLUMBING:** WATER AND SANITARY PIPING EXPOSED WHEN REMOVING CEILING FINISH SHALL BE TREATED WITH CARE AND MODIFIED ONLY AS INDICATED IN PLUMBING DRAWINGS. ANY EXTRAORDINARY CONDITIONS WILL BE DOCUMENTED AND NOTIFIED TO OWNER AND PROJECT

**EXHAUST GRILLES:** REMOVE ALL EXISTING EXHAUST GRILLES AND PORTIONS OF EXISTING EXHAUST DUCTWORK ABOVE CEILING THAT MAY INTERFERE WITH INSTALLATION OF NEW CEILING FINISHES. COVER OR CLOSE REMAINING OPENINGS TO DUCTWORK USING RODENT AND INSECT PROOF MATERIALS MATCHING EXISTING. DUCTWORK SHOULD BE ASSUMED TO BE PART OF A WORKING ASSEMBLY AS NEARBY SMALLER BATHROOMS WITH NO NATURAL VENTILATION REQUIRE A WORKING EXHAUST SYSTEM. SALVAGE GRILLE MATERIAL AS REQUIRED BY OWNER.

CEILING FANS: REMOVE ALL EXISTING CEILING FANS AND SALVAGE AS REQUIRED BY OWNER.

#### NOTES ABOUT EXISTING FIRE ALARM SYSTEM:

EXISTING FIRE ALARM ELEMENTS SHALL REMAIN UNDISTURBED AS PRACTICALLY POSSIBLE BY THE REQUIREMENTS OF THE PROJECT. WHEN A FIRE ALARM ELEMENT IS LOCATED ON A CONCRETE BLOCK WALL TO BE DEMOLISHED, THE FIRE ALARM ELEMENT SHALL BE CAREFULLY DETACHED FROM THE WALL AND REATTACHED WHEN WALL MODIFICATIONS ARE COMPLETE AND WALL FINISHES ARE APPLIED. CHANGES TO CEILING SURFACES SHALL BE CONSTRUCTED TAKING INTO CONSIDERATION THESE REQUIREMENTS FOR THE PROTECTION OF FIRE ALARM ELEMENTS.

#### NOTES APPLICABLE TO DRAWING NOTATION:

**NOTES:** NOTES PROVIDED AS PART OF TYPICAL FLOOR PLANS, REFLECTED CEILING PLANS (RCP) AND ELEVATIONS APPLY TO ALL CONDITIONS, ELEMENTS AND SPACES INCLUDED IN THE PROJECT EXCEPT AS NOTED. IN EACH PARTICULAR DRAWING, ADDITIONAL NOTES MAY INDICATE CONDITIONS WHICH APPLY TO THAT PARTICULAR SPACE.

DIMENSIONS: DIMENSIONS FOR EXISTING CONDITIONS SHOULD BE CONSIDERED APPROXIMATE. ALL VALUES HAVE BEEN ROUNDED TO THE NEAREST INCH FOR CLARITY

DIMENSIONS MARKED "MIN" OR "MINIMUM" AND "MAX" OR "MAXIMUM": ESPECIALLY FOR ADA OR ACCESSIBILITY RELATED ISSUES, DIMENSIONS MARKED AS MINIMUM OR MAXIMUM MUST BE FOLLOWED EXACTLY AS INDICATED SO AS TO COMPLY WITH ADA STANDARDS.

TYPICAL EXISTING CONDITION ELEVATION VIEWS

SECTION OF EXISTING

TO BE DEMOLISHED

CONCRETE BLOCK WALL





SCALE: 3/8" = 1'-0"





**AR-2** 





#### GENERAL:

- 1. ALL STRUCTURES HAVE BEEN DESIGNED ACCORDING TO FINAL BEHAVIOR AND CONDITIONS. HOWEVER, DURING ITS ERECTION, CERTAIN CONDITIONS CAN ARISE FOR WHICH THE BEHAVIOR OF THE STRUCTURE HAS NOT BEEN CONTEMPLATED. THE CONTRACTOR SHALL PROVIDE AT ALL TIME ADEQUATE SHORING AND RESHORING UNTIL THE DESIGN CONDITIONS HAVE BEEN MET. IF THERE IS ANY DOUBT DURING ANY PHASE OF THE CONSTRUCTION, CONSULT AND/OR NOTIFY THE STRUCTURAL DESIGNER.
- CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING FIELD CONDITIONS PRIOR TO STARTING CONSTRUCTION. IF ANY DISCREPANCY ARISES IN THE STRUCTURAL AND ARCHITECTURAL PLANS THE ARCHITECTS AND ENGINEERS SHALL BE NOTIFIED IMMEDIATELY.
- CONTRACTOR MUST PROVIDE, SET AND VERIFY DIMENSIONS AND LOCATION OF ALL ANCHORS, INSERTS BOLTS, SLEEVES, CONDUITS, ETC., SHOWN OR NOTED IN ARCHITECTURAL AND/OR ELECTRICAL, MECHANICAL AND PLUMBING PLANS.

#### REINFORCED MASONRY:

- ALL BLOCK WALLS SHALL BE ANCHORED TO THE FLOOR GROUND SLAB BY MEANS OF #3 BARS HOOKED A MINIMUM OF 6 INCHES INTO THE SLAB AND SPACED A MINIMUM OF 16 IN. OR #4 BARS HOOKED A MINIMUM OF 8 INCHES INTO THE SLAB AND SPACED A MINIMUM OF 32 INCHES, UNLESS OTHERWISE CALLED FOR IN THE DRAWINGS.
- 2. ALL INTERIOR AND EXTERIOR BLOCK WALLS SHALL BE RENFORCED WITH "DUR-O-WAL" TRUSS OR APPROVED MATERIAL HAVING EQUAL EFFECTIVE AREA OF STEEL, MORTAR BOND AND APPLICABLE BUILDING CODE APPROVAL. MATERIAL SHALL BE MANUFACTURED FROM UNCOATED NO. 8 GAGE WIRE CONFORMING TO THE REQUIREMENTS OF ASTM-A-32 OR SIMILAR. "DUR-O-WAL" TRUSS SHALL BE INSTALLED EVERY OTHER BLOCK COURSE.
- THE DESIGN COMPRESSIVE STRENGTH OF CONCRETE MASONRY SHALL BE 1500 P.S.I. (ASTM C-90, 2 CELL, GRADE N., TYPE 1).
- 4. CONCRETE MASONRY UNITS SHALL BE LAID WITH FULL MORTAR BEDDING.
- CONCRETE MASONRY UNITS SHALL BE LAID IN A RUNNING BOND, STAGGERED PATTERN.
- HORIZONTAL JOINT REINFORCEMENT SHALL BE MASONRY REINFORCEMENT GAUGE 9 REGULAR MILL GALVANIZED FINISH.

#### MATERIALS:

- ALL DETAILS, SECTIONS AND NOTES SHOWN ON DRAWINGS ARE INTENDED TO BE TYPICAL AND SHALL APPLY TO SIMILAR SITUATIONS ELSEWHERE UNLESS OTHERWISE NOTED.
- IN CASE OF DOUBT IN THE INTERPRETATION OF ANY ASPECT OF THESE STRUCTURAL DRAWINGS AND/OR SPECIFICATIONS, THE DESIGNER SHALL BE CONSULTED.



SECTION-B









BLOCK WALLTYPICAL TIE COLUMN DETAIL



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**AR-4** 





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MKD	INT/	TYPE	DOOR													FRAME				LD	HDWR SET	REMARKS
	EXT		DESCRIPTION	LOCATION		ONSTRUCTION	ONSTRUCTION		NOMINAL SIZE		GLASS			INSERT	CONSTRU	CTION		MATERIAL	. DETAIL			
					L	EAFS MATERIAL	FINISH	COLOR	WIDTH	HEIGHT	THICK.	TYPE	THICK.	COLOR	ТҮРЕ	MATERIAL	FINISH	COLOR	1			
ACADEMIC BLDG. ALL DOORS	INT	1	FLUSH SWING DOOR SINGLE LEAF	ACADEMIC BLDG. LEVEL 1: A1-1, A1-2, A1-3, A1-4, A1-5 & A1-6 LEVEL 2: A2-1, A2-2, A2-3, A2-4, A2-5 & A2-6	6 NR 1	STEEL	PAINTED	T.B.C.	36"	96"	1 3/4"				LOUVER, PRIVACY TYPE	STEEL	PAINTED	T.B.C.	STONE	SEE DRAWING	HWR-1	REPLACE EXIST DOOR. PROVIDE AND ADJACENT
MULTIPURPOSE BLDG. BATHROOM DOORS	INT	2	FLUSH SWING DOOR SINGLE LEAF	MULTIPURPOSE BLDG.: MP1, MP2, MP3 & MP4	NR 1	STEEL	PAINTED	T.B.C.	36"	84"	1 3/4"				LOUVER, PRIVACY TYPE	STEEL	PAINTED	T.B.C.	STONE	SEE DRAWING	HWR-1	REPLACE EXIST OPENING AND A INSTALLATION
MULTIPURPOSE BLDG. TEAMROOM DOORS	INT	3	FLUSH SWING DOOR DOUBLE LEAF ASYMMETRICAL	MULTIPURPOSE BLDG.: T1 & T2	NR 2	STEEL	PAINTED	T.B.C.	60"	83"	1 3/4"				LOUVER, PRIVACY TYPE	STEEL	PAINTED	T.B.C.	STONE	SEE DRAWING	HWR-2	REPLACE EXIST OPENING AND A INSTALLATION

DOOR HARDWARE SCHEDULE																																			
TYPE	DOOR HARDWARE															REMARKS																			
	TYPICAL DESCRIPTION	TYPICAL	EGRESS																																
		LOCATION		HINGES		SLIDING HDWR.	LEVER LOCK	LO	CK FUNCTION			POCKET LOCK	T DOOR	ELECTRICAL			DEAD B	OLT	DOOR BOLT	FLUSH SAFETY BOLTS CATCH	PEEPHOLE W COVER	E PANIC		E	CLOSER		STOP / H	IOLDER		KICK PLAT	E	PUSH PLATES	PULL PLATES		
				BALL BEARING	BALL BEARING SECURITY		CYLINDRICAL	MORTISE EN	TRANCE STORE	ROOM PASSAGE	PRIVACY	KEYED	PRIVACY	LEVER W CARD KEY OR FINGERPRINT ACCESS	STRIKE	MAGNETIC	KEY ON ONE SIDE	KEY ONE ON SIDE BOTH SIDES	E ED	ON 2ND DOOR LEAF		KEYED TRIM OUTSIDI	NON- KEYED TRIM OUTSIDE		SURFACE MOUNTED	OVERHEAD CONCEALED	WALL STOP & HOLDER	WALL FLOOR FLOOR STOP STOP & STOP HOLDER	DOOR MOUNTED	OUTSIDE	INSIDE				
HRW-1	FLUSH SWING DOOR - SINGLE LEAF	BATHROOMS	YES	3														$\checkmark$							1		1					OUTSIDE	INSIDE	PROVIDE HIGH TRAFFIC H DUTY DOOR CLOSET SUIT	IEAVY- FED FOR
HRW-2	FLUSH SWING DOOR - DOUBLE LEAF	TEAMROOMS	YES	6														$\checkmark$		TOP & BOTT OM					1		1					INSIDE	OUTSIDE	INSTITUTIONAL BUILDING COMPLIANT	3, ADA



TYPICAL DOOR ELEVATIONS SCALE: 1/2" = 1'-0"

STEEL FRAME HEAD DETAIL

3

NOT TO SCALE

2

STEEL FRAME JAMB DETAIL

**4** 

NOT TO SCALE

WINDOW	SCHEDUL	.E

MKD	WINDOW							FABRICATION							REMARKS				
	DESCRIPTION	TYPICAL LOCATION	OPENING DIMENSIONS		UNIT	UNIT DIMENSIONS		FRAME		GLASS		DETAILS							
			WIDTH	HEIGHT	QTY PER OPENING	WIDTH	HEIGHT	THICK.	MATERIAL	FINISH	COLOR	TYPE	THICK.	COLOR	ELEVATION	I HEAD	JAMB	SILL	
WA	EXISTING OPERABLE METAL LOUVER WINDOW	ACADEMIC BLDG. LEVEL 1: A1-1, A1-2, A1-3, A1-4 & A1-6 LEVEL 2: A2-1, A2-2, A2-3, A2-4 & A2-6	6'-4" TYP.	2'-10 TYP.	1	6'-4" TYP.	2'-10 TYP.	4"	ALUM	PAINTED	T.B.C.				SEE DR	AWINGS			EXISTING UNITS TO BE REFURBISHED ON SITE: COLOR), REMOVE INTERIOR AND EXTERIOR CA COMMERCIAL GRADE PRODUCT INSIDE. INSIDE
WB	OPERABLE METAL LOUVER WINDOW	ACADEMIC BLDG. LEVEL 1: A1-5 LEVEL 2: A2-5	4'-1/2"	2'-0"	2	2'-0"	2'-0"	4"	ALUM	PAINTED	T.B.C.				SEE DR	AWINGS			PROVIDE NEW WINDOWS SAME TYPE AS EXISTI
WC	OPERABLE METAL LOUVER WINDOW	MULTIPURPOSE BUILDING: T1 & T2	11'-9"	3'-1"	4	2'-11"	3'-1"	4"	ALUM	PAINTED	T.B.C.				SEE DR	AWINGS			PROVIDE NEW WINDOWS SAME TYPE AS EXISTI
WD	OPERABLE METAL LOUVER WINDOW	ACADEMIC BLDG. LEVEL 1: A1-5 LEVEL 2: A2-5	7'-10"	3'-1"	3	2'-7"	3'-1"	4"	ALUM	PAINTED	T.B.C.				SEE DR	AWINGS			PROVIDE NEW WINDOWS SAME TYPE AS EXISTI





STONE THRESHOLD DETAIL AT DOOR

6

NOT TO SCALE

## **TYPICAL WINDOW ELEVATIONS**

SCALE: 1/2" = 1'-0"

RKS
ACE EXISTING BY WIDENING OPENING FOR NEW PROVIDE 2 1/2" CLEARANCE BETWEEN OPENING .DJACENT WALL FOR PROPER CLOSER INSTALLATION
ACE EXISTING. PROVIDE 2 1/2" CLEARANCE BETWEEN ING AND ADJACENT WALL FOR PROPER CLOSER LLATION
ACE EXISTING, PROVIDE 2 1/2" CLEARANCE BETWEEN ING AND ADJACENT WALL FOR PROPER CLOSER

: CLEAN, SPRAY PAINT I(INSIDE AND OUTSIDE) AND REPLACE 2 OPERATORS (SAME AULKING AND REAPPLY USING WEATHERPROOF PRODUCT OUTSIDE AND E CAULKING MATERIAL COLOR MUST MATCH TILE GROUT AS MUCH AS POSSIBLE. ING (TYPE A)

ING (TYPE A) TO REPLACE EXISTING LOUVERS (INVERTED "Y" TYPE)

0 1' 2'

ING (TYPE A) TO REPLACE EXISTING LOUVERS (INVERTED "Y" TYPE)





7



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**DOOR & WINDOW** SCHEDULES &

DETAILS

SSUE DATE (M/D/Y)

2/25/21

**AR-6** 

#### FINISH SCHEDULE

NO.	ROOM NAME	FLOOR	APROX. FLOOR AREA (SF)	WAINSCOT	APROX. WAINSCOT AREA (SF)	APROX. LENGTH OF WAINSCOT (F)	WALL
ACADE		-			1		1
A1-1	MEN'S BATHROOM	CERAMIC TILE: DALTILE MOSAICS	157.0	CERAMIC TILE: DALTILE WALL	301.7	46.5	
A1-2	WOMEN'S BATHROOM	(DOT-MOUNTED) (12" X 24" SHEET	130.0	WALL TILE (6" X 18" X 3/8" THICK)	269.8	41.5	
A1-3	MEN'S BATHROOM	X 1/4" THICK) MATTE FINISH,	200.0	SEMI-GLOSS FINISH, COLOR	356.4	54.8	
A1-4	WOMEN'S BATHROOM	(2), UNSANDED GROUT JOINT 1/8"	200.0	UNSANDED GROUT JOINT 1/16"	356.4	54.8	
A1-5	MEN'S BATHROOM	ARCHITECT	201.0	ARCHITECT. PROVIDE TILE EDGE	361.3	55.6	1
A1-6	WOMEN'S BATHROOM		155.0		306.0	47.1	
A2-1	MEN'S BATHROOM		157.0	CHROME ANODIZED ALUMINUM	301.7	46.4	
A2-2	WOMEN'S BATHROOM		130.0	-OR APPROVED SIMILAR.	269.8	41.5	
A2-3	MEN'S BATHROOM	_	200.0		377.0	58	
A2-4	WOMEN'S BATHROOM	22	200.0		381.9	58.8	
A2-5	MEN'S BATHROOM		201.0		361.3	55.6	
A2-6	WOMEN'S BATHROOM		155.0		306.0	47.1	
MULTIP	PURPOSE BUILDING				1		1
MP1	MEN'S BATHROOM	SAME AS ABOVE	221.0	SAME AS ABOVE	1,421.9	218.8	SAME AS A
MP2	WOMEN'S BATHROOM		204.0		1,293.5	198.9	1
MP3	MEN'S BATHROOM	_	206.0	1	1,464.0	225.3	
MP4	WOMEN'S BATHROOM	_	229.0	1	1,456.0	224	
T1	HOME TEAM ROOM		599.0	1	3,120.0	480	
T2	VISITOR'S TEAM ROOM	_	570.0	1	3,256.0	501.5	
GENER	AL AUDITORIUM BUILDING						Į
GA1	UNISEX BATHROOM	SAME TYPE AS ABOVE, COLOR MATTE ARCHITECTURAL GRAY 0709 (2), UNSANDED GROUT JOINT 1/16" COLOR TO BE CHOSEN BY ARCHITECT	19.0	SAME TYPE AS ABOVE, COLOR ARCHITECTURAL GRAY 0109 (2), UNSANDED GROUT JOINT 1/16" COLOR TO BE CHOSEN BY ARCHITECT. PROVIDE TILE EDGE PROFILE AT TOP OF WAINSCOT SAME AS ABOVE.	106.1	16.3	SAME AS A
TOTAL	S		4,134.0		16,066.8	2,472.5	

FINISH SCHEDULE NOTES:

1. ALL INFORMATION REGARDING FLOOR AREA, WAINSCOT AREA AND LENGTH OF WAINSCOT HAS BEEN CALCULATED USING THESE DRAWINGS, AND SHOULD ONLY BE USED AS AN AS APPROXIMATE MEASURE. CONTRACTORS ARE RESPONSIBLE FOR CONFIRMING AND OBTAINING THEIR OWN DATA FROM DRAWINGS OR SITE VISITS FOR BIDDING AND CONSTRUCTION PURPOSES. ARA WILL NOT ASSUME RESPONSIBILITY FOR TAKE-OFF AMOUNTS WHICH MAY INDICATE A DIFFERENCE FROM ACTUAL AMOUNTS 2. REFER TO DETAIL DRAWINGS AND SPECIFICATIONS FOR MORE INFORMATION ON INDICATED FINISHES.

3. ALL TILE FINISHES TO BE INSTALLED IN PATTERNS INDICATED IN DRAWINGS.



	CEILING	REMARKS
PLASTER, PAINTED SS FINISH	GYPSUM BOARD PANEL MOISTURE RESISTANT (GREEN BOARD), PAINTED, SEMI-GLOSS FINISH. MOUNT ON EXISTING FRAMING.	
ABOVE	SAME AS ABOVE	
ABOVE	SAME AS ABOVE	

# **AR-7**

SUE DATE (M/D/ 2/25/21

ARCHITECTURAL FINISHES SCHEDULES & DETAILS

PERMITS SET

APPROVAL RAFTING CGQ

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BATHROOM ACCESSORY SCHEDULE													
MKD	DESCRIPTION						WALL MOUNTING			ONS		REMARKS	
	ITEM	LOCATION	MANUFACTURER MODEL		MATERIAL	FINISH	SURFACE SEMI	RECESSED	WIDTH	DEPTH	HEIGHT	1	
1	SURFACE-MOUNTED SOAP DISPENSER - CLASSIC SERIES	ALL BATHROOMS AND TEAMROOMS	BOBRICK	B-2111	STAINLESS STEEL	SATIN	1		4 3/4"	3 1/2"	8 1/8"	40 OZ CONTAINER	
2-A	GLASS MIRROR WITH WELDED STAINLESS STEEL ANGLE FRAME	ALL BATHROOMS AND TEAMROOMS	BOBRICK	B-290 1830	STAINLESS STEEL FRAME	SATIN	1		18"	3/4"	30"		
2-В	GLASS MIRROR WITH STAINLESS STEEL CHANNEL FRAME & SHELF	BATHROOM IN GENERAL AUDITORIUM BUILDING	BOBRICK	B-292 1836	STAINLESS STEEL FRAME	SATIN	1		18"	3/4"	36"		
3	TOILET AND SHOWER COMPARTMENT GRAB BARS	ALL ACCESSIBLE STALLS IN BATHROOMS AND TEAMROOMS: ONE PER STALL AT LATERAL WALL	BOBRICK	B-5806 x 42	STAINLESS STEEL	SATIN	1		42"		3 1/4"	1.25" Ø	
		SAME AS ABOVE, ONE PER STALL AT REAR WALL	BOBRICK	B-5806 x 36	STAINLESS STEEL	SATIN	1	:	36"		3 1/4"		
	HORIZONTAL SHOWER COMPARTMENT GRAB BAR	ACCESSIBLE SHOWERS IN MULTIPURPOSE BUILDINGS: ONE AT REAR WALL	BOBRICK	B-5806 x 48	STAINLESS STEEL	SATIN	1		48"		3 1/4"	1.5" Ø	
4		ACCESSIBLE SHOWERS IN MULTIPURPOSE BUILDINGS: ONE AT LATERAL WALL	BOBRICK	B-5806 x 24	STAINLESS STEEL	SATIN	√		24"		3 1/4"		
5	SURFACE-MOUNTED MULTI-ROLL TOILET TISSUE DISPENSER	ALL BATHROOMS AND TEAMROOMS	BOBRICK	B-2888	STAINLESS STEEL	SATIN	1		6 1/16"	11"	5 15/16"		
6	XLERATOR HAND DRYER	ALL BATHROOMS AND TEAMROOMS EXCEPT GENERAL AUDITORIUM BATHROOM	EXCEL DRYER INC.	XL-BW		WHITE THERMOSET (BMC)	1		11 3/4"	6 11/16"	12 11/16"	115 V, 15 Amp, 1725 Watts, 50/60 Hz, Single Phase, cULus Listed	
7	SURFACE-MOUNTED ROLL PAPER TOWEL DISPENSER	ALL BATHROOMS AND TEAMROOMS	BOBRICK	B-72860	DARK TRANSLUSCENT GREY RESIN	GLOSS FINISH	√		12 7/16"	9 1/8"	15 11/16"		
8	CLOTHES HOOK	BATHROOM AND TEAMROOM TOILET STALLS IN ALL BATHROOMS AND TEAMROOMS	BOBRICK	B-233	STAINLESS STEEL	SATIN	1		1 1/4"	1 1/8"	2 1/4"	CONFIRM COMPATIBILITY FOR TOILET STALL DOOR INSTALLATION	
	HEAVY-DUTY SHOWER CURTAIN ROD WITH CONCEALED MOUNTING	TEAMROOM ACCESSIBLE SHOWER	BOBRICK	B-6107 x 60	STAINLESS STEEL	SATIN	1		60"	1 3/8"	1 3/8"	PROVIDE BOBRICK SHOWER CURTAIN (204-3 72" FOR	
9		TEAMROOM SHOWERS	BOBRICK	B-6107 x 36	STAINLESS STEEL	SATIN	√		36"	1 3/8"	1 3/8"	ACCESSIBLE SHOWER) (204-2 42" FOR REGULAR SHOWER) AND BOBRICK SHOWER CURTAIN HOOKS (204-1) FOR EACH STALL	
10	REVERSIBLE FOLDING SHOWER SEAT	TEAMROOM ACCESSIBLE SHOWERS	BOBRICK	B-5181	SOLID PHENOLIC	IVORY COLORED		:	33"	22 5/16"	31 1/4"		
11	KOALA CARE PRODUCTS VERTICAL STAINLESS STEEL SURFACE- MOUNTED BABY CHANGING STATION	AS INDICATED FOR BATHROOMS IN ACADEMIC (2) & MULTIPURPOSE (2) BUILDINGS - 4 UNITS TOTAL	BOBRICK	KB311-SSWM	STAINLESS STEEL EXTERIOR FINISH	SATIN	1		26 7/32"	6 25/32" CLOSED 32 27/32" OPEN	41 5/16″		
12	FLOOR-STANDING WASTE RECEPTACLE WITH OPEN TOP	ALL BATHROOMS EXCEPT GENERAL AUDITORIUM BATHROOM	BOBRICK	B-2280	STAINLESS STEEL WITH VINYL WALL BUMPER & RUBBER FEET	SATIN			14 7/8"	14 7/8"	29-1/4″	21 GAL CAPACITY	

BATHROOM ACCESSORY SCHEDULE NOTES: 1. NONE.



TOILET COMP. OVERHEAD BRACING



**BATHROOM ACCESORIES** NOT TO SCALE

WALL HUNG URINAL SCREEN ELEVATION



3

NOT TO SCALE

NOT TO SCALE







4





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6

ADA COMPLIANT GRAB BAR INST. DETAIL FOR SOLID WALL NOT TO SCALE

















CERTIFICACION

Yo, **Luis Ayala Rubio, arquitecto licenciado 1503** certifico que soy el profesional que diseñó estos planos y las especificaciones complementatarias. También certifico que entiendo que dichos planos y

spuesto en la Ley

ciones aplicables de los Rea

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PROJECT PHASE

SSUE DATE (M/D/Y 2/25/21

A1-2

PERMITS SET

ACADEMIC BUILDING BATHROOM A1-2 (WOMEN'S)













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DRAFTING

PROJECT PHAS

SSUE DATE (M/D/Y 2/25/21

A1-6

CGQ

PERMITS SET

ACADEMIC BUILDING LEVEL 1 BATHROOM 1-6 (WOMEN'S)









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e julio de 1978, según enr

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14 de 8 de enero de 2004, segun enmenueros, conocida como la "Ley para la Inversión por la Industria Puertorriqueña" y con la Ley Núm. 96 de 6

cuálquier decaráción falsa o falsificación de los hechos que se haya producido por desconocimie por negligencia ya sea por mi, mis agentes o empleados, o por otras personas con mi conocimiento, e hacen responsable de cualquier acción judicial y disciplinaria por la OGPe.

uesto en la Ley

es aplicables de los Re























SSUE DATE (M/D/Y 2/25/21

ACADEMIC BUILDING LEVEL 2 BATHROOM 2-2 (WOMEN'S)

























**EX CON: BATHROOM MP1 ELEVATIONS EX CON: BATHI** SCALE: 3/8" = 1'-0"





SUE DATE (M/D/ 2/25/21

EX CON: MULTIPURPOSE BLDG BATHROOM MP1 (MEN'S)

PERMITS SET

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RENOVATIONS UPR PONCE BATHROOM F



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## PROP: BATHROOM MP1 FLOOR PLAN 1









SSUE DATE (M/D/ 2/25/21

PROPOSED: MULTIPURPOSE BLDG BATHROOM MP1 (MEN'S)

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1

**EX CON: BATHROOM MP2 FLOOR PLAN** SCALE: 3/8" = 1'-0"



 $(\mathbf{2})$ 





#### EX CON: BATHROOM MP2 REFLECTED CEILING PLAN SCALE: 3/8" = 1'-0"





2



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EX CON: MULTIPURPOSE BLDG BATHROOM MP2 (WOMEN'S)

MP2-EX

PROJECT PHA

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LAR



# 1

### PROP: BATHROOM MP2 FLOOR PLAN SCALE: 3/8" = 1'-0"







#### PROP: BATHROOM MP2 REFLECTED CEILING PLAN SCALE: 3/8" = 1'-0"

 $\checkmark$ 



2 4



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UPR PONCE BATHROOM F

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PERMITS SET

PROPOSED: MULTIPURPOSE BLDG BATHROOM MP2 (WOMEN'S)

PROJECT PHA

SUE DATE (M

2/25/21

MP2-P

PRO JECT OW UNIVERSIDAD DE PUERTO RICO

NOTE REGARDING THE USE OF THESE DOCUMENTS:




### EX CON: BATHROOM MP3 FLOOR PLAN SCALE: 3/8" = 1'-0"









# 2 EX CON: BATHROOM MP3 REFLECTED CEILING PLAN SCALE: 3/8" = 1'-0"

## EXISTING LIGHT FIXTURES

2' 4'

 $\rightarrow$ 

-

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\_\_\_\_

2/25/21 MP3-EX

SSUE DATE (M/D/Y

EX CON: MULTIPURPOSE BLDG BATHROOM MP3 (WOMEN'S)

PERMITS SET

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UPR PONCE BATHROOM F

RENOVATIONS

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### PROP: BATHROOM MP3 FLOOR PLAN SCALE: 3/8" = 1'-0"



2'





2 PROP: BATHROOM MP3 REFLECTED CEILING PLAN SCALE: 3/8" = 1'-0"

0 2' 4'



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PERMITS SET

PROPOSED: MULTIPURPOSE BLDG BATHROOM MP3 (WOMEN'S)

PROJECT PHAS

SSUE DATE (M/D/Y 2/25/21

MP3-P

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EX CON: BATHROOM MP4 FLOOR PLAN SCALE: 3/8" = 1'-0"







# EXISTING ELECTRICAL WIRE

EXISTING GYPSUM BOARD SHAFT WITH ELECTRICAL — PANEL 

-

0 2' 4'

1

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EX CON:

SSUE DATE (M/D/Y 2/25/21

PERMITS SET

MULTIPURPOSE BLDG BATHROOM MP4 (MEN'S)

MP4-EX





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2'









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0 2' 4'

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2/25/21

0 2' 4' 6'

MP4-P







SSUE DATE (M) 2/25/21

EX CON: MULTIPURPOSE BLDG TEAMROOM 1 FLOOR PLAN & RCP

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#### PROP CON: T1 TEAMROOM FLOOR PLAN 1 SCALE: 3/8" = 1'-0"



2 SCALE: 3/8" = 1'-0"

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# T1-P1

SSUE DATE (M/D/ 2/25/21

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planos y especificaciones se con lo dispuesto en la Ley N

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#### **PROP: T1 TEAMROOM ELEVATIONS** 1 SCALE: 3/8" = 1'-0"





















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SCALE: 3/8" = 1'-0"





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EX CON: MULTIPURPOSE BLDG TEAMROOM 2 FLOOR PLAN & RCP

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# PROP: T2 TEAMROOM FLOOR PLAN



### PROP: T2 TEAMROOM REFLECTED CEILING PLAN **2 PROP: T2 TEAN** SCALE: 3/8" = 1'-0"



SSUE DATE (M/D/ 2/25/21

PROPOSED: MULTIPURPOSE BLDG TEAMROOM 2 FLOOR PLAN & RCP

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### **PROP: T1 TEAMROOM ELEVATIONS** SCALE: 3/8" = 1'-0" 1



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1'-2"

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SSUE DATE (M/D/Y) 2/25/21

GENERAL AUDITORIUM BLDG BATHROOM

PERMITS SET

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SAN	SANITARY EQUIPMENT SCHEDULE									
MKD	FIXTURE	TYPICAL LOCATION	MANUFACTURER	PRODUCT ID	TYPE / MODEL	COLOR	REMARKS			
P1	WATER CLOSET (TOILET)	BATHROOMS & TEAMROOMS	AMERICAN 2854.1111.020 STANDARD		1.1 GPF MADERA ADA SYSTEM WITH EVERCLEAN & MANUAL FLUSH VALVE	WHITE	PROVIDE WAX RING, TOILET SCREWS, CONNECTOR AND ESCUTCHEON AS RECOMMENDED BY			
					CORRESPONDING SEAT FOR AMERICAN STANDARD MADERA TOILET	BLACK	MANUFACTURER			
<b>P2</b>	LAVATORY	BATHROOMS & TEAMROOMS	AMERICAN STANDARD	0321.026.020	DECLYN WALL MOUNTED SINK	WHITE	PROVIDE DRAIN, TRAP, FAUCET CONNECTOR, ESCUTCHEON AND OTHER HARDWARE AS			
			AMERICAN STANDARD	1340.119.002	PILLAR TAP METERING FAUCET WITH EXTENDED SPOUT, 0.5 GPM	POLISHED CHROME	RECOMMENDED BY MANUFACTURER			
<b>P</b> 3	URINAL	BATHROOMS & TEAMROOMS	AMERICAN STANDARD	6590.503	WASHBROOK 0.125 GPF WASHOUT TOP SPUD URINAL WITH MANUAL FLUSH VALVE SYSTEM	WHITE				
<b>P</b> 4	SHOWER	TEAMROOMS	DELTA	R10000-MF	MULTICHOICE® 1/2 IN. UNIVERSAL MIXING THERMOSTATIC ROUGH-IN VALVE					
			DELTA	T11800	3-SETTING SHOWER HANDLE DIVERTER TRIM KIT IN POLISHED CHROME	POLISHED CHROME				
			DELTA	061011A	COMMERCIAL 30-DEGREE INSTITUTIONAL SHOWERHEAD	POLISHED CHROME				
			ZURN	FD2254-PV2-FMT	2" PVC ADJUSTABLE SHOWER DRAIN WITH 4 1/4" ROUND STRAINER, FULL METAL TOP, AND 2" PVC HUB OUTLET	POLISHED CHROME				

SANITARY EQUIPMENT SCHEDULE NOTES:

1. CONTRACTOR WILL VERIFY WITH EQUIPMENT SUPPLIER SUITABILITY OF ALL EQUIPMENT TO WORK WITH RELATED ITEMS.

2. CONTRACTOR TO SUPPLY ALL ROUGH-IN EQUIPMENT AS INDICATED AND AS REQUIRED FOR THE COMPLETE INSTALLATION OF ALL SANITARY EQUIPMENT. 3. ALL EXPOSED ROUGH-IN PARTS SHALL BE METAL, POLISHED CHROME. PVC EXPOSED PARTS ARE NOT ACCEPTABLE.

SANI	TARY FIXTURE INVENTORY: EXISTIN	IG CO	NDITION	VS.	PROPOS	ED					
RM #	M # ROOM		T	LAVA	TORY	URIN	۹L	SHOW	SHOWER		
		EX	PROP	EX	PROP	EX	PROP	EX	PROP		
A1-1	ACADEMIC BLDG. BATHROOM MEN'S	3	2	3	2	4	3				
A1-2	ACADEMIC BLDG. BATHROOM WOMEN'S	3	3	4	2						
A1-3	ACADEMIC BLDG. BATHROOM MEN'S	4	3	3	3	4	4				
A1-4	ACADEMIC BLDG. BATHROOM WOMEN'S	3	5	6	4						
A1-5	ACADEMIC BLDG. BATHROOM MEN'S	3	3	3	3	4	4				
A1-6	ACADEMIC BLDG. BATHROOM WOMEN'S	3	4	4	3						
A2-1	ACADEMIC BLDG. BATHROOM MEN'S	3	2	3	2	4	3				
A2-2	ACADEMIC BLDG. BATHROOM WOMEN'S	3	3	4	2						
A2-3	ACADEMIC BLDG. BATHROOM MEN'S	4	3	3	3	4	3				
A2-4	ACADEMIC BLDG. BATHROOM WOMEN'S	4	5	6	4						
A2-5	ACADEMIC BLDG. BATHROOM MEN'S	4	3	3	3	4	4				
A2-6	ACADEMIC BLDG. BATHROOM WOMEN'S	3	4	4	2						
ACADEMIC BUILDING SUBTOTAL		40	40	46	33	24	21				
MP-1	MULTIPURPOSE BLDG. BATHROOM WOMEN'S	5	5	5	5						
MP-2	MULTIPURPOSE BLDG. BATHROOM MEN'S	2	2	5	4	3	3				
MP-3	MULTIPURPOSE BLDG. BATHROOM WOMEN'S	3	3	3	2						
MP-4	MULTIPURPOSE BLDG. BATHROOM MEN'S	2	2	2	2	1	2				
T1	MULTIPURPOSE BLDG. TEAMROOM 1	3	5	3	4	2	2	3	3		
T2	MULTIPURPOSE BLDG. TEAMROOM 2	3	5	4	4	3	2	3	3		
MULTIPURPOSE BUILDING SUBTOTAL		18	22	22	21	9	9	6	6		
GA1	AUDITORIUM BLDG. BATHROOM	1	1	1	1						
GENEF	AL AUDITORIUM BLDG SUBTOTAL	1	1	1	1						
PROJE	CT TOTAL	59	63	69	55	33	30	6	6		

P-1
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SSUE DATE (M/D/Y 2/25/21

TYPICAL PLUMBING DETAILS & NOTES

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CONSULTAN

LIGHTING AND FAN SCHEDULE

LIGH	LIGHTING AND FAN SCHEDOLE														
MKD.	TYPICAL LOCATION / PURPOSE / GENERAL DESCRIPTION	LOCATION	PRODUCT DESCRIPTION			GRADE		MOUNTING			ТҮРЕ				REMARKS
			MANUFACTURER	MODEL	CATALOG	INTERIOR	EXTERIOR	SURFACE	RECESSED	PENDANT	LANDSCAPE	WALL	CEILING	COVE	
L1	EXIT INDICATOR	MULTIPURPOSE BUILDING: TEAMROOM HALLWAY - REPLACE EXISTING	LITHONIA	Contractor Select EXG and EXR LED Exit Sign	EXR LED M6	INTERIOR		SURFACE					CEILING		
L2	EMERGENCY LIGHTING	ACADEMIC AND MULTIPURPOSE BUILDINGS: ONE PER BATHROOM AND TEAMROOM - CONNECT TO EXISTING LIGHTING CIRCUIT	LITHONIA	Contractor Select EU2L LED Unit	EU2L M12	INTERIOR		SURFACE					CEILING		
L3	LUMINAIRE LED VERTEX CLF7 VANDAL RESISTANT	ACADEMIC AND MULTIPURPOSE BUILDINGS: REPLACE ALL EXISTING CEILING MOUNTED LIGHT FIXTURES AND PROVIDE ADDITIONAL UNITS TO COMPLY WITH PROPOSED LIGHTING LAYOUT AS INDICATED IN DRAWINGS - CONNECT TO EXISTING LIGHTING CIRCUI	LITHONIA LUMINAIRE LED	VERTEX CLF7 2FT	25" L, NON-DIMMING DRIVER, 3500K, 120 VOLT, CLEAR PRISMATIC LENS, WHITE FINISH	INTERIOR		SURFACE					CEILING		
L4	LED CEILING FLUSH MOUNT - STAIRWAYS	MULTIPURPOSE BUILDINGS: REPLACE ALL EXISTING CEILING MOUNTED LIGHT FIXTURES AND PROVIDE ADDITIONAL UNITS TO COMPLY WITH PROPOSED LIGHTING LAYOUT AS INDICATED IN DRAWINGS - CONNECT TO EXISTING LIGHTING CIRCUIT	LITHONIA LUMINAIRE LED	VERTEX CLF7 4FT	48" L, NON-DIMMING DRIVER, 3500K, 120 VOLT, CLEAR PRISMATIC LENS, WHITE FINISH	INTERIOR		SURFACE					CEILING		
L5	LED WALL MOUNTED LUMINAIRE FOR INDIVIDUAL BATHROOM	GENERAL AUDITORIUM BATHROOM		TO BE CHOSEN BY ARCHITECT \$75 ALLOWANCE				SURFACE				WALL			MOUNTS ABOVE MIRROR REPLACING EXISTING UNIT
F1	WALL MOUNTED ELECTRIC FAN	MULTIPURPOSE BUILDINGS: PROVIDE TWO UNITS PER TEAMROOM INSTALLED AT WALLS ON OPPOSITE SIDE OF ROOM - CONNECT TO EXISTING CIRCUIT	BIG ASS FANS	AIREYE 24"	120 V, 1/3 HP MOTOR, OSHA COMPLIANT WTEEL WIRE CAGE. PROVIDE OCCUPANCY SENSOR AND WALL MOUNT.	INTERIOR COMMERCIA	AL .	SURFACE				WALL			INSTALL AT 10' HIGH. CONFIRM ON SITE WITH ARCHITECT.

**LIGHTING SCHEDULE NOTES:** 1. REFER TO REFLECTED CEILING DRAWINGS FOR QUANTITIES AND LOCATIONS.

GENERAL NOTES:

- 1 MINIMUM SIZE CONDUIT TO BE 3/4" DIAMETER PVC ALL EXPOSED CONDUITS SHALL BE RIGID GALVANIZED STEEL.
- 2 MINIMUM SIZE CONDUCTOR TO BE #12 THHN COPPER STRANDED.
- 3 NO 2" X 4" BOXES ALLOWED. MINIMUM SIZE BOX TO BE 4"x 4"x 2-1/8" BOXES OR AS SHOWN ON PLANS. ALL TO BE READILY ACCESSIBLE.
- 4 NO "UF" TYPE CONDUCTOR ALLOWED. ALL DROPS TO FIXTURES AND EQUIPMENT TO BE DONE IN FLEXIBLE METALLIC CONDUIT. TYPE, SIZE, AND MAXIMUM LENGTH IN ACCORDANCE WITH LATEST NEC AND FOR OTHER EQUIPMENT AS REQUIRED BY CODES
- 5 DIFFERENCES BETWEEN PLANS AND SPECIFICATIONS AND BETWEEN PLANS AND ACTUAL FIELD CONDITIONS SHALL BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER OR OWNER'S REPRESENTATIVE AND NO CHANGE SHALL BE MADE UNLESS BY APPROVAL OF THE ENGINEER OR THE OWNER'S REPRESENTATIVE SAVE AT CONTRACTOR'S RISK AND EXPENSE.
- 6 ALL EQUIPMENT AND MATERIAL SHALL BE NEW THROUGHOUT AND IN ACCORDANCE WITH NEMA, U.S. STANDARDS AND APPROPRIATELY LABELED, ALSO FOR EXISTING EQUIPMENT.
- 7 CONTRACTOR IS REQUIRED TO SUBMIT FOR APPROVAL ALL EQUIPMENT, LIGHTING FIXTURES, PANELS, CONDUITS, AND FITTINGS, RECEPTACLES AND ANY OTHER ELECTRICAL MATERIALS REQUIRED FOR THE CONSTRUCTION WORK TO BE PERFORMED.
- 8 THE ELECTRICAL INSTALLATION, MATERIALS AND METHODS OF WORK SHALL BE WITH IN ACCORDANCE WITH LATEST PREPA, NEC OF P.R., PRLD, OSHA, OGPe, AND OTHER AGENCIES APPLICABLE CODES AND REGULATIONS FOR SAID TYPE OF WORK AND SHALL BE SUBMITTED TO THE OWNER FOR APPROVAL. COORDINATION WITH OWNER'S REPRESENTATIVE IS MANDATORY.
- 9 ALL CONDUITS TO BE SECURELY FASTENED TO ALL BOXES OR CABINETS WITH ONE BUSHING AND TWO LOCK NUTS, ONE INSIDE AND ONE OUTSIDE OF THE BOX, CABINET OR FIXTURE. INSULATED BUSHINGS SHALL BE INSTALLED ON CONDUITS 11/4" DIAMETER AND LARGER.
- 14- CONTRACTOR TO COLOR CODE ALL WIRING:
  - A) MAIN FEEDERS AND CONDUIT RUNS AT 120/240 VOLTS TO PANEL TO BE – BLACK, RED
  - B) SWITCH RETURNS PINK, PURPLE, VIOLET
  - C) NEUTRAL WHITE
  - D) GROUND GREEN



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#### UPR PONCE: BATHROOM REMODEL: PROJECT SPECIFICATIONS

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#### **SECTION 01100 - SUMMARY**

#### I.GENERAL

#### 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. GENERAL PROJECT INFORMATION AND SCOPE

A. Project Identification, Location and Architect's Project Identification Number:

**UPR PONCE BATHROOM REMODEL** AVE. SANTIAGO DE LOS CABALLEROS PONCE, PUERTO RICO

ARA PROJECT NO. 2020-45

B. Owner and Owner's Representative:

#### UPR PONCE

AVE. SANTIAGO DE LOS CABALLEROS PONCE, PUERTO RICO 00716 787-844-8181

DRA. TESSIE H. CRUZ RIVERA UPR PONCE - RECTORA

ALBERTO GARCIA TORRES UPR PONCE - DIRECTOR RECURSOS FISICOS 787-319-3662 alberto.garcia3@upr.edu

C. Architect and Architect's Representative:

#### AYALA RUBIO ARQUITECTURA PSC

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- D. The Work consists of the following:
  - 1. BATHROOM REMODEL IN ACADEMIC, MULTIPURPOSE AND GENERAL AUDITORIUM BUILDINGS. WORK INCLUDES REPLACEMENT OF DOORS, FINISHES, BATHROOM ACCESSORIES AND SANITARY FIXTURES. WORK IN SEVERAL BATHROOMS INCLUDES RELOCATION OF EXISTING SANITARY FIXTURES REQUIRING PLUMBING WORK AND PARTIAL DEMOLITION OF GROUND LEVEL CONCRETE SLABS.

#### 3. TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

#### 4. PHASING

A. If the Work is to be conducted in phases, the scope and sequence of each phase is described in the construction drawings through lists, drawings and diagrams.

B. Before starting Work, submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

#### 5. WORK UNDER OTHER CONTRACTS

- A. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. List of Work Under Other Contracts:
  - 1. AS PER OWNER'S SPECIAL INSTRUCTIONS.

#### 6. PRODUCTS ORDERED IN ADVANCE

- A. General: Owner has negotiated Purchase Orders with suppliers of material and equipment to be incorporated into the Work. Owner will assign these Purchase Orders to Contractor. Costs for receiving, handling, storage if required, and installation of material and equipment are included in the Contract Sum.
  - 1. Contractor's responsibilities are same as if Contractor had negotiated Purchase Orders, including responsibility to renegotiate purchase and to execute final Purchase-Order agreements.
- B. List of Products Ordered in Advance:
  - 1. AS PER OWNER'S SPECIAL INSTRUCTIONS.

#### 7. OWNER-FURNISHED PRODUCTS

- A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections.
  - 1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
  - 2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
  - 3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
  - 4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
  - 5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
  - 6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
  - 7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
  - 8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
  - 9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
  - 10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
  - 11. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.
- B. Owner-Furnished Products:
  - 1. AS PER OWNER'S SPECIAL INSTRUCTIONS..

#### 8. USE OF PREMISES

- A. Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.
- B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
    - a) Schedule deliveries to minimize use of driveways and entrances.
    - b) Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

- C. Existing Building:
  - 1. Maintain existing building in a weathertight condition throughout construction period.
  - 2. Protect building and its occupants during construction period.
  - 3. Repair damage caused by construction operations.
  - 4. Clean all existing construction of dust, dirt, and debris caused by work on new construction.
  - 5. Return all affected areas to condition existing before work on new construction began.
  - 6. All vertical circulation within the building shall be through the existing stairs. Use of elevator for transportation of personnel and materials is prohibited.

#### 9. OWNER'S OCCUPANCY REQUIREMENTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, except for areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits, unless otherwise indicated.
  - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
  - 2. Provide not less than twenty-four (24) hours' notice to Owner of activities that will affect Owner's operations.

#### 10. WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions:
  - 1. Notify Owner not less than two days before proposed utility interruptions.
  - 2. Do not proceed with utility interruptions without Owner's written permission.
  - 3. When required by Owner, arrange to provide temporary utility services.

#### 11. SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI's "MasterFormat" numbering system.
  - Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
  - 2. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
    - a) The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
- C. Revisions to the Specification Content:
  - 1. General:
    - a) Revised specification sections are published as complete sections. Partial section revisions will not be published.

- b) A published revision is formatted as such when the revised specification section is republished showing such revisions for the first time. If a specification section is revised subsequently, new revisions are formatted as such, while previous revisions are formatted as regular text.
- c) Published revised specification sections are identified by the word "Revision", followed by the revision number and date. This identification is printed in the bottom outside corner of the specification pages, next to the specification section title.
- d) It is the responsibility of the Contractor to maintain all specification books complete, containing all published specification sections, both original and revised, and in the correct numeric and chronological sequence.
  - (1) Mark or stamp specification sections, which have been revised as voided, in a manner that is conspicuous and evident but that does not obscure text in a way that is unreadable.
- 2. Format: All text and tables added, voided or altered or from the contents of the Specifications are formatted as follows:
  - a) Additions: Text is printed in italics, as in the following example: *Latches and Exit Devices: Not more than 15 lbf (67 N) required to release latch.*
  - b) Voided text is maintained as originally printed, with strikethrough effect as in the following example: At exterior doors, provide compression weather stripping at fixed stops.
    - (1) Voided text is not to be deleted from the specifications contents.
  - c) Altered information is formatted as addition and as voided text as required.

II.PRODUCTS (Not Used)

III.EXECUTION (Not Used)

**END OF SECTION 01100** 

#### **SECTION 01250 - CONTRACT MODIFICATION PROCEDURES**

#### I.GENERAL

#### 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - 1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

#### 3. MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 Architect's Supplemental Instructions.

#### 4. PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  - 2. Within fourteen (14) days after receipt of Proposal Request, unless otherwise specified, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a) Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts. Include costs of labor and supervision directly attributable to the change.
    - b) If specified in Proposal Request, include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
  - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts. Include costs of labor and supervision directly attributable to the change.
  - 4. Include an updated Contractor's Construction Schedule.
  - 5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
  - 6. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

#### 5. ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

- 1. Include installation costs in purchase amount only where indicated as part of the allowance. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
- 2. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unitcost allowances. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within 14 days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than fourteen (14) days after such authorization.
  - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

#### 6. CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

#### 7. CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
  - 2. Maintain detailed records on a time and material basis of work required by the Construction Change Directive. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

#### II.PRODUCTS (Not Used)

#### III.EXECUTION (Not Used)

#### END OF SECTION 01250

#### **SECTION 01290 - PAYMENT PROCEDURES**

#### I.GENERAL

#### 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

#### 3. SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
    - a) Application for Payment forms with Continuation Sheets.
    - b) Submittals Schedule.
    - c) Contractor's Construction Schedule.
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a) Project name and location.
    - b) Name of Architect.
    - c) Contractor's name and address.
    - d) Date of submittal.
  - 2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
    - a) Related Specification Section or Division.
    - b) Change Orders (numbers) that affect value.
    - c) Dollar value.
    - d) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide several line items for principal subcontract amounts, where appropriate.
  - 4. Round amounts to nearest whole dollar: total shall equal the Contract Sum.
  - 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
  - 6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  - 7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
  - 8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
  - 9. Schedule Updating: Include each Change Order as a new line item or a separate sheet.

#### 4. APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
  - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
  - 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit three (3) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien if required.
- F. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. Schedule of Values.
  - 3. Contractor's Construction Schedule (preliminary if not final).
  - 4. Products list.
  - 5. Schedule of unit prices.
  - 6. Submittals Schedule (preliminary if not final).
  - 7. Certificates of insurance and insurance policies.
  - 8. Performance and payment bonds.
  - 9. Data needed to acquire Owner's insurance.
- G. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
  - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
- H. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
  - 1. Evidence of completion of Project closeout requirements.
  - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  - 3. Updated final statement, accounting for final changes to the Contract Sum.
  - 4. AIA Document G706 "Contractor's Affidavit of Payment of Debts and Claims."
  - 5. AIA Document G706A "Contractor's Affidavit of Release of Liens."
  - 6. AIA Document G707 "Consent of Surety to Final Payment."
  - 7. Evidence that claims have been settled.
  - 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  - 9. Final, liquidated damages settlement statement.

#### II.PRODUCTS (Not Used)

#### **III.EXECUTION (Not Used)**

#### END OF SECTION 01290

#### SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

#### I.PART 1 - GENERAL

#### 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Administrative and supervisory personnel.
  - 2. Project meetings.

#### 3. SUBMITTALS

- A. Key Personnel Names: Within fourteen (14) days of starting construction operations, submit to Owner and Architect a list of key personnel assignments, including superintendent and other key personnel in attendance at Project site.
  - 1. Maintain current copies of list in Project meeting room and temporary field office.

#### 4. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  - 3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three (3) days of the meeting.
- B. Pre-construction Conference: Schedule a pre-construction conference before starting construction, at a time convenient to Owner, and Architect, but no later than fourteen (14) days after execution of the Agreement. Hold the conference at Project site or another convenient location.
  - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference.
  - 2. Agenda: Discuss items of significance that could affect progress, including: Tentative construction schedule; phasing; Critical work sequencing and long-lead items; Designation of key personnel and their duties; Procedures for processing field decisions and Change Orders; Procedures for requests for interpretations (RFIs); Procedures for testing and inspecting; Procedures for processing Applications for Payment; Distribution of the Contract Documents; Submittal procedures; Preparation of Record Documents; Use of the premises and existing building; Work restrictions; Owner's occupancy requirements; Responsibility for temporary facilities and controls; Progress cleaning; Construction waste management and recycling; Parking availability; Office, work, and storage areas; Equipment deliveries and priorities; Security; First aid; Working hours.
- C. Pre-installation Conferences: Conduct a pre-installation conference at Project site before each construction activity that requires coordination with other construction.
  - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following: Contract Documents; Options; Coordination with other work; Coordination with other work; Required performance results; Protection of adjacent work; Protection of construction and personnel; Related requests for interpretations (RFIs); Related Change Orders; Purchases and deliveries; Submittals; Review of mockups; Possible conflicts and compatibility problems; Time schedules; Weather limitations; Manufacturer's written recommendations; Warranty requirements; Compatibility of materials and acceptability of substrates; Temporary facilities and controls; Space and access limitations; Regulations of authorities having jurisdiction; Testing and inspecting requirements; Installation procedures.

- 3. Distribute minutes of the meeting to parties present and to parties who should have been present.
- 4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at biweekly intervals. Coordinate dates of meetings with preparation of payment requests.
  - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a) Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Review schedule for next period.
    - b) Review present and future needs of each entity present, including the following: Interface requirements; Sequence of operations; Status of submittals; Deliveries; Off-site fabrication; Access and site utilization; Temporary facilities and controls; Work hours; Hazards and risks; Progress cleaning; Quality and work standards; Status of correction of deficient items; Field observations; Requests for interpretations (RFIs); Status of proposal requests; Pending changes; Status of Change Orders; Pending claims and disputes; Documentation of information for payment requests.
  - 3. Record and distribute minutes to each party present and to parties who should have been present.
  - 4. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

II.PART 2 - PRODUCTS (Not Used)

III.PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

#### SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

#### I.GENERAL

#### 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Preliminary Construction Schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Submittals Schedule.
  - 4. Field condition reports.
  - 5. Special reports.

#### 3. DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Event: The starting or ending point of an activity.
- E. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- G. Major Area: A story of construction, a separate building, or a similar significant construction element.
- H. Milestone: A key or critical point in time for reference or measurement.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- J. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

#### 4. SUBMITTALS

- A. Submittals Schedule: Submit three (3) copies of schedule. Arrange the following information in a tabular format:
  - 1. Scheduled date for first submittal.
  - 2. Specification Section number and title.
  - 3. Submittal category (action or informational).
  - 4. Name of subcontractor.
  - 5. Description of the Work covered.
  - 6. Scheduled date for Architect's final release or approval.

- B. Preliminary Construction Schedule: Submit two (2) opaque copies.
- C. Contractor's Construction Schedule: Submit two (2) opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
  - 1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- D. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.
- E. Special Reports: Submit two (2) copies at time of unusual event.

#### 5. QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
  - 1. Review software limitations and content and format for reports.
  - 2. Verify availability of qualified personnel needed to develop and update schedule.
  - 3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy.
  - 4. Review delivery dates for Owner-furnished products.
  - 5. Review schedule for work of Owner's separate contracts.
  - 6. Review time required for review of submittals and resubmittals.
  - 7. Review requirements for tests and inspections by independent testing and inspecting agencies.
  - Review time required for completion and startup procedures.
  - 9. Review and finalize list of construction activities to be included in schedule.
  - 10. Review submittal requirements and procedures.
  - 11. Review procedures for updating schedule.

#### 6. COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from parties involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

#### **II.PRODUCTS**

#### 1. SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
  - 1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  - 2. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

#### 2. CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

- 1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Architect.
- 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
- 3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
- 4. Startup and Testing Time: Include not less than two (2) days for startup and testing.
- 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Phasing: Arrange list of activities on schedule by phase.
  - 2. Work under More Than One Contract: Include a separate activity for each contract.
  - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  - 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  - 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
  - 6. Work Restrictions: Show the effect of the following items on the schedule:
    - a) Coordination with existing construction.
    - b) Limitations of continued occupancies.
    - c) Uninterruptible services.
    - d) Partial occupancy before Substantial Completion.
    - e) Use of premises restrictions.
    - f) Provisions for future construction.
    - g) Seasonal variations.
    - h) Environmental control.
  - 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a) Subcontract awards.
    - b) Submittals.
    - c) Purchases.
    - d) Mockups.
    - e) Fabrication.
    - f) Sample testing.
    - g) Deliveries.
    - h) Installation.
    - i) Tests and inspections.
    - j) Adjusting.
    - k) Curing.
    - I) Startup and placement into final use and operation.
  - 8. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

#### 3. PRELIMINARY CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work.

#### 4. CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within thirty (30) days of date established for commencement of the Work. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

#### 5. REPORTS

- A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- B. Special Reports: Submit special reports directly to Owner within three (3) days of an occurrence. Distribute copies of report to parties affected by the occurrence.

#### **III.EXECUTION**

#### 1. CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) week before each regularly scheduled progress meeting.
  - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
  - 1. Post copies in Project meeting rooms and temporary field offices.
  - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

#### END OF SECTION 01320

#### **SECTION 01330 - SUBMITTAL PROCEDURES**

#### I.GENERAL

#### 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

#### 3. DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

#### 4. SUBMITTAL PROCEDURES

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a) Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- C. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
  - 1. Initial Review: Allow fourteen (14) days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  - 3. Resubmittal Review: Allow fourteen (14) days for review of each resubmittal.
  - 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty-one (21) days for initial review of each submittal. Structural, mechanical, plumbing, and electrical components are examples of the Work that often require sequential review.
  - 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow fourteen (14) days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Identification: Place a permanent label or title block on each submittal for identification.
  - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
  - 2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  - 3. Include the following information on label for processing and recording action taken:
    - a) Project name.
    - b) Date.
    - c) Name and address of Architect, Contractor, subcontractor, supplier and manufacturer.
    - d) Submittal number or other unique identifier, including revision identifier.

- e) Number and title of appropriate Specification Section.
- f) Drawing number and detail references, as appropriate.
- g) Location(s) where product is to be installed, as appropriate.
- h) Other necessary identification.
- E. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.
- F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
  - 1. Transmittal Form: Use AIA Document G810 or form typically used by Contractor, as approved by Architect. Provide locations on form for the following information:
    - a) Project name.
    - b) Date.
    - c) Destination (To:).
    - d) Source (From:).
    - e) Names of subcontractor, manufacturer, and supplier.
    - f) Category and type of submittal.
    - g) Submittal purpose and description.
    - h) Specification Section number and title.
    - i) Drawing number and detail references, as appropriate.
    - j) Transmittal number.
    - k) Submittal and transmittal distribution record.
    - I) Remarks.
    - m) Signature of transmitter.
  - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked "Approved."
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating "Approved" taken by Architect.

#### 5. CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
  - 1. Architect's CAD files will be made available when Contractor's written request is approved by Architect.
  - 2. Architect's consultant CAD files will be made available when Contractor's written request is approved by Architect's consultant. Request will be made through Architect.
  - 3. Only CAD files that already exist will be made available.
  - 4. CAD files will be available on DWG format.
  - 5. Layering and attributes of DWG files will be those of party issuing the files.
  - 6. Contractor's use of CAD files is limited to uses specified on Contractor's written request and to uses directly related to the Project.
  - 7. CAD files will be provided to Contractor through e-mail, or through CD media when required by quantity or size of files being provided.
  - 8. Allow seven (7) days for delivery of CAD files provided by Architect.

9. Allow fourteen (14) days for delivery of CAD files provided by Architect's consultant.

#### **II.PRODUCTS**

#### 1. ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Submit Product Data before or concurrent with Samples.
  - 4. Number of Copies: Submit three (3) copies of Product Data, unless otherwise indicated. Architect will return two (2) copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a) Dimensions.
    - b) Identification of products.
    - c) Fabrication and installation drawings.
    - d) Roughing-in and setting diagrams.
    - e) Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f) Shopwork manufacturing instructions.
    - g) Templates and patterns.
    - h) Schedules.
    - i) Design calculations.
    - j) Compliance with specified standards.
    - k) Notation of coordination requirements.
    - I) Notation of dimensions established by field measurement.
    - m) Relationship to adjoining construction clearly indicated.
    - n) Seal and signature of professional engineer if specified.
    - o) Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.
  - 3. Number of Copies: Submit two (2) opaque (bond) copies of each submittal. Architect will return one copy.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
  - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a) Generic description of Sample.
    - b) Product name and name of manufacturer.
    - c) Sample source.
    - d) Number and title of appropriate Specification Section.
  - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a) Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b) Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a) Number of Samples: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, will return submittal with options selected.
- 5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
  - a) Number of Samples: Submit two (2) sets of Samples. Architect will retain one (1) Sample set; remainder will be returned.
    - (1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - (2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of variations.
- E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product.
  - 2. Number and name of room or space.
  - 3. Location within room or space.
  - 4. Number of Copies: Submit three (3) copies of product schedule or list, unless otherwise indicated. Architect will return two (2) copies.
    - a) Mark up and retain one returned copy as a Project Record Document.
- F. Submittals Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 1 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 1 Section "Payment Procedures."
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
  - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
  - 4. Number of Copies: Submit three (3) copies of subcontractor list, unless otherwise indicated. Architect will return two (2) copies.
    - a) Mark up and retain one returned copy as a Project Record Document.

#### 2. INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  - 1. Number of Copies: Submit two (2) copies of each submittal, unless otherwise indicated. Architect will not return copies.
  - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  - 3. Test and Inspection Reports: Comply with requirements specified in Division 1 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements specified in Division 1 Section "Construction Progress Documentation."

- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- F. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- J. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Schedule of Tests and Inspections: Comply with requirements specified in Division 1 Section "Quality Requirements."
- K. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- L. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- M. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- N. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 1 Section "Operation and Maintenance Data."
- O. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment.
- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
  - 1. Name, address, and telephone number of factory-authorized service representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.
  - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 6. Statement whether conditions, products, and installation will affect warranty.
  - 7. Other required items indicated in individual Specification Sections.

- R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- S. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect. Architect will not review submittals that include MSDSs and will return them for resubmittal.

#### **III.EXECUTION**

#### 1. CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### 2. ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
  - 1. Final Unrestricted Release: Where the submittal is marked "**Approved**", the Work covered by the submittal may proceed provided it complies with the Contract Documents. Final acceptance will depend on that compliance.
  - 2. Final-but-Restricted Release: Where the submittal is marked "**Approved as Noted**," the Work covered by the submittal may proceed provided it complies both with Architect's notations and corrections on the submittal and the Contract Documents. Final acceptance will depend on that compliance.
  - 3. Returned for Resubmittal: Where the submittal is marked "Not Approved, Revise and Resubmit," do not proceed with the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to Architect's notations and corrections.
  - 4. Rejected: Where the submittal is marked "**Not Approved, Resubmit**" or "**Rejected**", do not proceed with the Work covered by the submittal. Prepare a new submittal for a product that complied with the Contract Documents.
  - 5. Incomplete: Where the submittal is marked "**Submit Additional Information**," do not proceed with the Work covered by the submittal. Prepare additional information requested, or required by the Contract Documents, that indicates compliance with requirements.
  - 6. Other Action: If the submittal is primarily for information purposes, record purposes, special processing, or other contractor activity, the submittal will be returned marked "**Action Not Required**".
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party. Architect will stamp each informational submittal indicating that the submittal has been received and processed but not approved or disapproved.
- D. Partial submittals are not acceptable, will be considered non-responsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

#### END OF SECTION 01330
# **SECTION 01400 - QUALITY REQUIREMENTS**

# I.GENERAL

# 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

# 2. SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

# 3. DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also

does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 4. CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

# 5. SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards, test and inspection methods.
  - 4. Number of tests and inspections required.
  - 5. Time schedule or time span for tests and inspections.
  - 6. Entity responsible for performing tests and inspections.
  - 7. Requirements for obtaining samples.
  - 8. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.
  - 6. Description of the Work and test and inspection method.
  - 7. Identification of product and Specification Section.
  - 8. Complete test or inspection data.
  - 9. Test and inspection results and an interpretation of test results.
  - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  - 12. Name and signature of laboratory inspector.
  - 13. Recommendations on retesting and reinspecting.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

#### 6. QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
- G. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
  - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.a) Allow seven (7) days for initial review and each re-review of each mockup.
  - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 6. Demolish and remove mockups when directed, unless otherwise indicated.

## 7. QUALITY CONTROL

- A. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  - 1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  - 2. Notify testing agencies at least forty-eight (48) hours in advance of time when Work that requires testing or inspecting will be performed.
  - 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
- B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

- 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
- 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
- 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
- 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
- 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
- 6. Do not perform any duties of Contractor.
- E. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
  - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- F. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within thirty (30) days of date established for commencement of the Work.
  - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

#### 8. SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
  - 1. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
  - 2. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
  - 3. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
  - 4. Retesting and reinspecting corrected work.

#### II.PRODUCTS (Not Used)

#### **III.EXECUTION**

- 1. TEST AND INSPECTION LOG
  - A. Prepare a record of tests and inspections. Include the following:
    - 1. Date test or inspection was conducted.
    - 2. Description of the Work tested or inspected.
    - 3. Date test or inspection results were transmitted to Architect.
    - 4. Identification of testing agency or special inspector conducting test or inspection.
  - B. Maintain log at Project site. Post changes and modifications as they occur.

#### 2. REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  - 1. Protect construction exposed by or for quality-control service activities.
  - 2. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

# **SECTION 01420 - REFERENCES**

# I.GENERAL

## 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

# 2. DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

## 3. INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
- D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations indicated. When in doubt of the meaning of any abbreviation or acronym used in Contract Documents, consult with Architect.

## II.PRODUCTS (Not Used)

III.EXECUTION (Not Used)

# **SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS**

# I.GENERAL

## 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

# 2. SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

# 3. USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water Service: Pay water service use charges for water used by all entities for construction operations.
- C. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

## 4. QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

## 5. PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## **II.PRODUCTS**

## 1. MATERIALS

- A. Wood Enclosure Fence: Plywood, 8 feet high, framed with four 2-by-4-inch rails, with preservative-treated wood posts spaced not more than 8 feet apart.
- B. Gypsum Board: Minimum 1/2 inch thick, regular-type panels with tapered edges. Comply with ASTM C 36/ C 36M.
- C. Provide wood and gypsum board enclosures as indicated in drawings.

## 2. TEMPORARY FACILITIES

- A. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations. Store combustible materials apart from building.

## 3. EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

## **III.EXECUTION**

## 1. INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

#### 2. TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
  - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully and as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service overhead, unless otherwise indicated.
- F. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- G. Telephone Service: Provide temporary telephone service in common-use facilities for use by superintendent, or provide superintendent with cellular telephone.

#### 3. SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
  - 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
  - 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Provide temporary parking facilities for construction personnel.
  - 1. If temporary parking facilities are to be located within Owner's property, obtain Owner's approval of chosen location and amount of vehicles to be parked, prior to making use of such facilities.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
  - 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
- E. Project Identification and Temporary Signs: Contractor's Project identification signs and location shall be approved by Owner prior to installation. Unauthorized signs are not permitted.
- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
- G. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.
- H. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- I. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering so finishes will be undamaged at time of acceptance.

#### 4. SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Pest Control: If necessary, engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with two (2) sets of keys.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  - 1. Prohibit smoking in hazardous fire-exposure areas.
  - 2. Supervise welding operations and similar sources of fire ignition according to requirements of authorities having jurisdiction.

#### 5. OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
- C. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - Remove temporary paving not intended for or acceptable for integration into permanent paving. Where
    area is intended for landscape development, remove soil and aggregate fill that do not comply with
    requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other
    petrochemical compounds, and other substances that might impair growth of plant materials or lawns.
    Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities
    having jurisdiction.
  - 2. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 1 Section "Closeout Procedures."

# **SECTION 01524 - CONSTRUCTION WASTE MANAGEMENT**

# I.GENERAL

# 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

# 2. SUMMARY

A. This Section includes administrative and procedural requirements for the following:
 1. Disposing of nonhazardous demolition and construction waste.

# 3. DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations, including packaging.
- B. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

## 4. QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

## II.PRODUCTS (Not Used)

## **III.EXECUTION**

## 1. SITE ACCESS AND TEMPORARY CONTROLS

- A. Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

## 2. DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate onsite.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.

# **SECTION 01600 - PRODUCT REQUIREMENTS**

# I.GENERAL

## 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

# 2. SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

# 3. DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

## 4. SUBMITTALS

- A. Product List: Submit a list, in tabular from, showing specified products.
  - 1. For each product, include generic names of products, proprietary product names and manufacturer's name. Include Specification Section number and title
  - 2. Identify items that require early submittal approval for scheduled delivery date.
  - 3. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
  - 4. Submittal: Within sixty (60) days after date of commencement of the Work, submit three (3) copies of complete product list. Include a written explanation for omissions of data and for variations from Contract requirements.
  - 5. Architect's Action: Architect will respond in writing to Contractor within fifteen (15) days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- B. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use CSI Form 13.1A.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a) Statement indicating why specified material or product cannot be provided.

- b) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
- c) Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
- d) Product Data, including drawings and descriptions of products and fabrication and installation procedures.
- e) Samples, where applicable or requested.
- f) List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
- g) Cost information, including a proposal of change, if any, in the Contract Sum.
- h) Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
- i) Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
  - a) Form of Acceptance: Change Order.
  - b) Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
- C. Comparable Product Requests: Submit three (3) copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
- D. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

## 5. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  - 2. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system.
  - 3. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
- C. Storage:
  - 1. Store products to allow for inspection and measurement of quantity or counting of units.
  - 2. Store materials in a manner that will not endanger Project structure.
  - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  - 4. Store cementitious products and materials on elevated platforms.
  - 5. Store foam plastic protected from exposure to sunlight, except to extent necessary for period of installation and concealment.
  - 6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  - 7. Protect stored products from damage and liquids from freezing.

## 6. PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.

#### **II.PRODUCTS**

#### 1. PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Where products are accompanied by the term "as selected," Architect will make selection.
  - 4. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
  - 5. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
  - 6. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
  - 1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
  - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
  - 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
  - 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
  - 5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
  - 6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
  - 7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
  - 8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
  - 9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

- a) If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
- 10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
  - a) Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

#### 2. PRODUCT SUBSTITUTIONS

- A. Timing: Architect will consider requests for substitution if received within sixty (60) days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
- B. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
  - 2. Requested substitution does not require extensive revisions to the Contract Documents.
  - 3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
  - 4. Substitution request is fully documented and properly submitted.
  - 5. Requested substitution will not adversely affect Contractor's Construction Schedule.
  - 6. Requested substitution has received necessary approvals of authorities having jurisdiction.
  - 7. Requested substitution is compatible with other portions of the Work.
  - 8. Requested substitution has been coordinated with other portions of the Work.
  - 9. Requested substitution provides specified warranty.
  - 10. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

#### 3. COMPARABLE PRODUCTS

- A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
  - 1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
  - 2. Evidence that proposed product provides specified warranty.
  - 3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

## III.EXECUTION (NOT USED)

# **SECTION 01700 - EXECUTION REQUIREMENTS**

## I.GENERAL

## 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. General installation of products.
  - 4. Coordination of Owner-installed products.
  - 5. Progress cleaning.
  - 6. Starting and adjusting.
  - 7. Protection of installed construction.
  - 8. Correction of the Work.

#### 3. SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

#### 4. QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

#### II.PRODUCTS (Not Used)

#### **III.EXECUTION**

#### 1. EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work. Verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
    - a) Description of the Work.
    - b) List of detrimental conditions, including substrates.
    - c) List of unacceptable installation tolerances.
    - d) Recommended corrections.

#### **EXECUTION REQUIREMENTS**

- 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
- 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
- 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

## 2. PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation."

#### 3. CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 3. Inform installers of lines and levels to which they must comply.
  - 4. Check the location, level and plumb, of every major element as the Work progresses.
  - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

## 4. FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

#### 5. INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
  - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. 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.
- F. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- G. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

#### 6. OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction forces.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.
  - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

## 7. PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

#### 8. STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest. Adjust operating components for proper operation without binding. Adjust equipment for proper operation. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect fieldassembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

#### 9. PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion. Comply with manufacturer's written instructions for temperature and relative humidity.

#### **10. CORRECTION OF THE WORK**

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching." Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair. Remove and replace chipped, scratched, and broken glass or reflective surfaces.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

# **SECTION 01731 - CUTTING AND PATCHING**

# I.GENERAL

# 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

A. This Section includes procedural requirements for cutting and patching.

## 3. DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

## 4. QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their loadcarrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

## 5. WARRANTY

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

## **II.PRODUCTS**

## 1. MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
  - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

## **III.EXECUTION**

## 1. EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

## 2. PREPARATION

- A. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- B. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize or prevent interruption to occupied areas.

# 3. PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a) Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b) Restore damaged pipe covering to its original condition.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a) Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

# **SECTION 01732 - SELECTIVE DEMOLITION**

# I.GENERAL

# 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected site elements.
  - 2. Salvage of existing items to be stored.

#### 3. DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged, or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

## 4. PROJECT CONDITIONS

- A. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- B. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
  - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.
- C. Storage or sale of removed items or materials on-site is not permitted.
- D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. Maintain fire-protection facilities in service during selective demolition operations.

## II.PRODUCTS (Not Used)

## **III.EXECUTION**

## 1. EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

## 2. UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Arrange to shut off indicated utilities with utility companies.
  - 2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

#### 3. PREPARATION

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

#### 4. SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - 1. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces.
  - 2. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
  - 3. Maintain adequate ventilation when using cutting torches.
  - 4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - 5. Dispose of demolished items and materials promptly.

#### B. Removed and Salvaged Items:

- 1. Clean salvaged items.
- 2. Transport items to Owner's storage area on-site designated by Owner.
- 3. Items to be removed and salvaged for this project include those indicated.
- C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.

#### 5. DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them legally.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Comply with requirements specified in Division 1 Section "Construction Waste Management."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
- D. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

# **SECTION 01770 - CLOSEOUT PROCEDURES**

# I.GENERAL

# 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

#### 2. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 3. SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.

## 4. SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  - 6. If necessary, make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 7. Complete startup testing of systems.
  - 8. Submit test/adjust/balance records.
  - 9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  - 10. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  - 11. Complete final cleaning requirements, including touchup painting.
  - 12. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
  - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  - 2. Results of completed inspection will form the basis of requirements for Final Completion.

## 5. FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
  - 1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

- 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
- 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- 4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - 1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 6. LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
  - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
  - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  - 3. Include the following information at the top of each page:
    - a) Project name.
    - b) Date.
    - c) Name of Architect
    - d) Name of Contractor.
    - e) Page number.

## 7. WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

#### II.PRODUCTS

#### 1. MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## **III.EXECUTION**

#### 1. FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  - 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
    - a) Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b) Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c) Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d) Remove tools, construction equipment, machinery, and surplus material from Project site.

- e) Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- f) Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- g) Sweep concrete floors broom clean in unoccupied spaces.
- h) Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
- Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- j) Remove labels that are not permanent.
- k) Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
  - (1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
- I) Wipe surfaces of mechanical, electrical and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m) Replace parts subject to unusual operating conditions.
- n) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- o) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- p) Clean ducts, blowers, and coils if units were operated without filters during construction.
- q) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- r) Leave Project clean and ready for occupancy.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

# **SECTION 01781 - PROJECT RECORD DOCUMENTS**

# I.GENERAL

# 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

## 2. SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.

## 3. SUBMITTALS

- A. When two (2) sets or copies of record documents are required, one shall be addressed to the Architect and the other to the Owner.
- B. Record Drawings: Submit two (2) sets of marked-up Record Prints.
- C. Record Specifications: Submit two (2) copies of marked-up Project's Specifications, including addenda and contract modifications.
- D. Record Product Data: Submit two (2) copies of marked up Product Data.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit markedup Product Data as an insert in manual instead of submittal as Record Product Data.

#### **II.PRODUCTS**

## 1. RECORD DRAWINGS

- A. Record Prints: Maintain one (1) set of prints of the Contract Drawings and Shop Drawings.
  - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
    - a) Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b) Accurately record information in an understandable drawing technique.
    - c) Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a) Dimensional changes to Drawings.
    - b) Revisions to details shown on Drawings.
    - c) Depths of foundations below first floor.
    - d) Locations and depths of underground utilities.
    - e) Revisions to routing of piping and conduits.
    - f) Revisions to electrical circuitry.
    - g) Actual equipment locations.
    - h) Duct size and routing.
    - i) Locations of concealed internal utilities.
    - j) Changes made by Change Order or Construction Change Directive.
    - k) Changes made following Architect's written orders.
    - I) Details not on the original Contract Drawings.
    - m) Field records for variable and concealed conditions.
    - n) Record information on the Work that is shown only schematically.

- 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
- 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
- 5. Mark important additional information that was either shown schematically or omitted from original Drawings.
- 6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

#### 2. RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  - 4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

#### 3. RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

#### 4. MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

#### **III.EXECUTION**

#### 1. RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

# **SECTION 01782 - OPERATION AND MAINTENANCE DATA**

# I.GENERAL

# 1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

# 2. SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation manuals for systems, subsystems, and equipment.
  - 2. Maintenance manuals for the care and maintenance of products, materials, and finishes.

## 3. SUBMITTALS

- A. Submit one (1) copy of each manual in final form at least seven (7) days before final inspection. Include a complete table of contents. Architect will return copy with comments within seven (7) days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit one (1) copy of each corrected manual within fourteen (14) days of receipt of Architect's comments.

## **II.PRODUCTS**

## 1. MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system.
- B. Manual Contents: Organize into sets of manageable size. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

## 2. PRODUCT, OPERATION AND MAINTENANCE MANUAL

- A. Content: For each system, subsystem, product and piece of equipment not part of a system, include source information and manufacturers' documentation, as described below.
- B. Product Information: Include the following, as applicable:
  - 1. Manufacturer's name, product name and model number.
  - 2. Color, pattern, and texture.
  - 3. Material and chemical composition.
  - 4. Reordering information for specially manufactured products.
  - 5. Name, address, and telephone number of Installer or supplier and maintenance service agent.
- C. System Descriptions: Include the following:
  - 1. Manufacturer's name, product name and model number.
  - 2. Equipment identification with serial number of each component.
  - 3. Equipment function and operating characteristics.
  - 4. Limiting conditions and performance curves.
  - 5. Engineering data and tests.
  - 6. Complete nomenclature and number of replacement parts.
  - 7. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- D. Operating Procedures: Include the following, as applicable:
  - 1. Startup procedures.
  - 2. Equipment or system break-in procedures.
  - 3. Routine and normal operating instructions.
  - 4. Regulation and control procedures.
  - 5. Instructions on stopping.
  - 6. Normal shutdown instructions.
  - 7. Seasonal and weekend operating instructions.

- 8. Required sequences for electric or electronic systems.
- 9. Special operating instructions and procedures.
- 10. Precautions against improper use.
- 11. License requirements including inspection and renewal dates.
- E. Product Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
  - 6. Include lists of repair materials and local sources of materials and related services.
- F. Systems Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
  - 5. Test and inspection instructions.
  - 6. Troubleshooting guide.
  - 7. Precautions against improper maintenance.
  - 8. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 9. Aligning, adjusting, and checking instructions.
  - 10. Demonstration and training videotape, if available.
  - 11. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
    - a) Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
    - b) Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
  - 12. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
  - 13. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

#### **III.EXECUTION**

#### 1. MANUAL PREPARATION

- A. Product, Operation and Maintenance Manuals: Assemble a complete set of product, operation and maintenance data indicating operation and maintenance of each system, subsystem, product and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

# **SECTION 01820 - DEMONSTRATION AND TRAINING**

# I.GENERAL

# 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.

## 2. SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
- B. Related Sections include the following:
  - 1. Divisions 2 through 16 Sections for specific requirements for demonstration and training for products in those Sections.

#### 3. QUALITY ASSURANCE

A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 1 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

#### **II.PRODUCTS**

#### 1. INSTRUCTION PROGRAM

- A. Program Structure: Develop a program of Training Sessions that include each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Motorized doors, including overhead coiling doors, grilles and automatic entrance doors.
  - 2. Equipment, including projection screens.
  - 3. Fire-protection systems, including fire alarm and fire-extinguishing systems.
  - 4. Conveying systems, including elevators.
  - 5. Refrigeration and HVAC systems, instrumentation and controls.
  - 6. Electrical service and distribution.
  - 7. Packaged engine generators, including transfer switches.
  - 8. Lighting equipment and controls.
  - 9. Communication and intrusion detection systems.
- B. Training Sessions: For each session, include instruction for the following:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
  - 2. System, subsystem, and equipment descriptions.
  - 3. Performance and design criteria if Contractor is delegated design responsibility.
  - 4. Operating standards.
  - 5. Regulatory requirements.
  - 6. Equipment function and operating characteristics.
  - 7. Limiting conditions and performance curves.
  - 8. Documentation: Review the following items in detail:
  - 9. Emergency manuals.
  - 10. Operations and maintenance manuals.
  - 11. Warranties and bonds.
  - 12. Maintenance service agreements and similar continuing commitments.
  - 13. Emergencies: Include the following, as applicable:
  - 14. Instructions on meaning of warnings, trouble indications, and error messages.
  - 15. Instructions on stopping and shutdown for each type of emergency.
  - 16. Special operating instructions and procedures.
  - 17. Operations: Include the following, as applicable:
  - 18. Startup procedures.

- 19. Equipment or system break-in procedures.
- 20. Routine and normal operating instructions.
- 21. Regulation and control procedures.
- 22. Safety procedures.
- 23. Normal shutdown instructions.
- 24. Operating procedures for system, subsystem, or equipment failure.
- 25. Seasonal and weekend operating instructions.
- 26. Troubleshooting and maintenance: Include the following:
- 27. Diagnostic, test and inspection procedures.
- 28. Types of cleaning agents to be used and methods of routine cleaning.
- 29. List of cleaning agents and methods of cleaning detrimental to product.
- 30. Procedures for preventive and routine maintenance.
- 31. Alignments.
- 32. Noise, vibration, economy and efficiency adjustments.

#### **III.EXECUTION**

#### 1. PREPARATION AND INSTRUCTION

- A. Assemble educational materials necessary for instruction
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Provide instruction at mutually agreed on times.

# SECTION 03331 - CAST-IN-PLACE ARCHITECTURAL CONCRETE

# 1.GENERAL

# 1. SUMMARY

A. This Section specifies cast-in-place architectural concrete including form facings, reinforcement accessories, concrete materials, concrete mixture design, placement procedures, and finishes.

# 2. DEFINITIONS

- A. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.
- B. 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.
- C. Design Reference Sample: Sample designated by Designer in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.
- D. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.

## 3. 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. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.
- D. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints including construction joints.
- E. Samples: For each of the following materials:
  - 1. Form-facing panel.
  - 2. Form ties.
  - 3. Form liners.
  - 4. Coarse- and fine-aggregate gradations.
  - 5. Chamfers and rustications.
- F. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 by 2 inches, of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.
- G. Qualification Data: For manufacturer and testing agency.
- H. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
  - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
- I. Material Certificates: For each of the following, signed by manufacturer:
  - 1. Cementitious materials.
  - 2. Admixtures.
  - 3. Form materials and form-release agents.
  - 4. Repair materials.

J. Minutes of preinstallation conference.

#### 4. QUALITY ASSURANCE

- A. 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 NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency 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 an 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.
- C. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from one manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5 and Section 6, "Architectural Concrete."
  - 2. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."
- E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- F. Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under sample submittals. Produce a minimum of 3 sets of full-scale panels, cast vertically, approximately 48 by 48 by 6 inches minimum, to demonstrate the expected range of finish, color, and texture variations.
  - 1. Locate panels as indicated or, if not indicated, as directed by Designer.
  - 2. Demonstrate methods of curing, aggregate exposure, sealers, and coatings, as applicable.
  - 3. In presence of Designer, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
  - 4. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
  - 5. Demolish and remove field sample panels when directed.
- G. Mockups: Before casting architectural concrete, build mockups to verify selections made under sample submittals and to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Designer.
  - 2. Build mockups of typical exterior wall of cast-in-place architectural concrete as shown on Drawings.
  - 3. Demonstrate curing, cleaning, and protecting of cast-in-place architectural concrete, finishes, and contraction joints, as applicable.
  - 4. In presence of Designer, damage part of the exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
  - 5. Obtain Designer's approval of mockups before casting architectural concrete.
  - 6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 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 architectural 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. Cast-in-place architectural concrete subcontractor.
- 2. Review concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction joints, forms and form-removal limitations, reinforcement accessory installation, concrete repair procedures, and protection of cast-in-place architectural concrete.

#### 2.PRODUCTS

#### 1. FORM-FACING MATERIALS

- A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for formwork and other form-facing material requirements.
- B. Form-Facing Panels for As-Cast and Exposed-Aggregate Finishes: Steel, glass-fiber-reinforced plastic, or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- C. Form-Facing Panels for As-Cast and Exposed-Aggregate Finishes: Exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth architectural concrete surfaces, high-density overlay, Class 1, or better medium-density overlay, Class 1, or better, mill-applied release agent and edge sealed, complying with DOC PS 1, or Finnish phenolic overlaid birch plywood.
- D. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will provide surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- E. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- F. Form Liners: Units of face design, texture, arrangement, and configuration indicated and to match design reference sample. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.
- G. Rustication Strips: Metal, rigid plastic, or dressed wood with sides beveled and back kerfed; nonstaining; in longest practicable lengths.
- H. Chamfer Strips: Metal, rigid plastic, elastomeric rubber, or dressed wood, 3/4 by 3/4 inch, minimum; nonstaining; in longest practicable lengths.
- I. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 inch thick.
- J. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or S, Grade NS, that adheres to form joint substrates.
- K. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.
- L. Form-Release Agent: Commercially formulated colorless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.
  - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- M. Surface Retarder: Chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified.
- N. Form Ties: Factory-fabricated, glass-fiber-reinforced plastic, internally disconnecting or removable ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

- 1. Furnish ties with tapered tie cone spreaders that, when removed, will leave holes 3/4 inch to 1-1/2 inches in diameter on concrete surface.
- 2. Furnish internally disconnecting ties that will leave no metal closer than 1-1/2 inches, after exposing aggregate, from the architectural concrete surface.
- 3. Furnish glass-fiber-reinforced plastic ties, not less than 1/2 inch in diameter, of color to match Designer's sample.
- 4. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

#### 2. STEEL REINFORCEMENT AND ACCESSORIES

A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.

#### 3. 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. Supplement with the following:
    - a. Fly Ash: ASTM C 618, Class C F.
    - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
    - c. Silica Fume: ASTM C 1240, amorphous silica.
  - 2. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace slag IP, portlandpozzolan I (PM), pozzolan-modified portland I (SM), slag-modified portland cement.
- B. Normal-Weight Aggregates: ASTM C 33, Class 5S 5M 1N coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
- C. Normal-Weight Fine Aggregate: ASTM C 33 or ASTM C 144, manufactured or natural sand, from same source for entire Project.
- D. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.
- 4. 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.
  - C. 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.
    - 1. Color: As selected by Designer from manufacturer's full range.

# 5. CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
  - 1. For integrally colored concrete, curing compound shall be pigmented type approved by color pigment manufacturer.

2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

## 6. REPAIR MATERIALS

- A. Bonding Agent: ASTM C 1059, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.
  - 1. Types I and II, non-load bearing and IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

#### 7. CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on 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 design mixtures based on laboratory trial mixtures.
- B. Proportion concrete mixtures as shown on structural drawings.
- C. Cementitious Materials: For cast-in-place architectural concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.
- D. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
- F. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

## 8. CONCRETE MIXING

- A. Ready-Mixed or Site-Mixed Architectural Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
  - 1. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
  - 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.

## 3.EXECUTION

## 1. FORMWORK

- A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.
- B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.
- C. In addition to ACI 303.1 limits on form-facing panel deflection, limit cast-in-place architectural concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
  - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
  - 2. Class C, 1/2 inch for rough-formed finished surfaces.
- D. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.
  - 1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
  - 2. Do not use rust-stained steel form-facing material.

- F. 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.
- G. Chamfer exterior corners and edges of cast-in-place architectural concrete.
- H. Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.
- 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.
- M. Coat contact surfaces of forms with surface retarder, according to manufacturer's written instructions, before placing reinforcement.
- N. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent form liners from sagging and stretching in hot weather. Seal joints of form liners and form liner accessories to prevent mortar leaks. Coat form liner with form-release agent.

#### 2. REINFORCEMENT AND INSERTS

- A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.
- B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

#### 3. REMOVING AND REUSING FORMS

- A. 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 (10 deg C) 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. Schedule form removal to maintain surface appearance that matches approved field sample panels and mockups.
  - 2. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.
- B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved 28-day design compressive strength or at least 70 percent of 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- C. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form-release agent.
- D. 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 cast-in-place architectural concrete surfaces.

#### 4. JOINTS

- A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of castin-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Designer.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
- 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete. Align construction joint within rustications attached to form-facing material.
- 3. 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.
- 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
- 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
- 6. Use bonding agent and epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Designer.

### 5. CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, form-release agent, 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 Designer.
- 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 between construction joints. 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 303.1.
  - 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. Do not permit vibrators to contact forms.
- E. 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.
  - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

# 6. FINISHES, GENERAL

- A. Architectural Concrete Finish: Match Designer's design reference sample, identified and described as indicated, to satisfaction of Designer.
- B. 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.
  - 1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.
- C. Maintain uniformity of special finishes over construction joints, unless otherwise indicated.

# 7. AS-CAST FORMED FINISHES

- 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 exceeding 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. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects.
  - 1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-form-finished as-cast concrete where indicated:
  - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
  - 2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
  - 3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.
- D. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

# 8. EXPOSED-AGGREGATE FINISHES

- A. Scrubbed Finish: After concrete has achieved a compressive strength of from 1000 to 1500 psi, apply scrubbed finish. Wet concrete surfaces thoroughly and scrub with stiff fiber or wire brushes, using water freely, until top mortar surface is removed and aggregate is uniformly exposed. Rinse scrubbed surfaces with clean water. Maintain continuity of finish on each surface or area of Work. Remove only enough concrete mortar from surfaces to match design reference sample or mockup.
- B. High-Pressure Water-Jet Finish: Perform high-pressure water jetting on concrete that has achieved a minimum compressive strength of 4500 psi. Coordinate with formwork removal to ensure that surfaces to be high-pressure water-jet finished are treated at same age for uniform results.
  - 1. Surface Continuity: Perform high-pressure water-jet finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in reveal projection to match design reference sample or mockup.
- C. Abrasive-Blast Finish: Perform abrasive blasting after compressive strength of concrete exceeds 2000 psi. Coordinate with formwork removal to ensure that surfaces to be abrasive blasted are treated at same age for uniform results.
  - 1. Surface Continuity: Perform abrasive-blast finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances in depths of blast to match design reference sample or mockup.
  - 2. Abrasive Blasting: Abrasive blast corners and edges of patterns carefully, using backup boards, to maintain uniform corner or edge line. Determine type of nozzle, nozzle pressure, and blasting techniques required to match design reference sample or mockup.
  - 3. Depth of Cut: Use an abrasive grit of proper type and gradation to expose aggregate and surrounding matrix surfaces to match design reference sample or mockup, as follows:
    - a. Brush: Remove cement matrix to dull surface sheen and expose face of fine aggregate; with no significant reveal.
    - b. Light: Expose fine aggregate with occasional exposure of coarse aggregate and uniform color; with maximum reveal of 1/16 inch.
    - c. Medium: Generally expose coarse aggregate; with slight reveal, a maximum of 1/4 inch.
    - d. Heavy: Expose and reveal coarse aggregate to a maximum projection of one-third its diameter; with reveal range of 1/4 to 1/2 inch.

- D. Bushhammer Finish: Allow concrete to cure at least 14 days before starting bushhammer surface finish operations.
  - 1. Surface Continuity: Perform bushhammer finishing in as continuous an operation as possible, maintaining continuity of finish on each surface or area of Work. Maintain required patterns or variances of cut as shown on Drawings or to match design reference sample or mockup.
  - 2. Surface Cut: Maintain required depth of cut and general aggregate exposure. Use power tool with hammer attachments for large, flat surfaces, and use hand hammers for small areas, at corners and edges, and for restricted locations where power tools cannot reach.
  - 3. Remove impressions of formwork and form facings with exception of tie holes.

# 9. 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 with ACI 301 for hot-weather protection during curing.
- B. Begin curing cast-in-place architectural concrete immediately after removing forms from or applying ascast formed finishes to concrete. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:
  - 1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete 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; use cover material and waterproof tape.
  - 3. Curing Compound: Mist concrete surfaces with water. Apply curing compound 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.

#### 10. FIELD QUALITY CONTROL

A. General: Comply with Division 3 Section "Cast-in-Place Concrete" for field quality-control requirements.

# 11. REPAIRS, PROTECTION, AND CLEANING

- A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Designer. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.
  - 1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Designer's approval.
- B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.
- C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.
- D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.
- E. Wash and rinse surfaces according to concrete finish applicator's written recommendations. Protect other Work from staining or damage due to cleaning operations.
  - 1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

# SECTION 04810 - UNIT MASONRY ASSEMBLIES

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes unit masonry assemblies consisting of the following:
  - 1. Concrete masonry units (CMUs).
  - 2. Mortar and grout.
  - 3. Reinforcing steel.
  - 4. Ties and anchors.

# 3. SUBMITTALS

- A. Samples for Verification: For each type and color of the following:
  - 1. Exposed concrete masonry units.

# 4. 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 masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

# **II.PRODUCTS**

# 1. MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

# 2. CONCRETE MASONRY UNITS (CMUs)

- A. Concrete Masonry Units: ASTM C 90 .
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa), 2800 psi (19.3 MPa), 3050 psi (21.0 MPa).
  - 2. Weight Classification: Normal weight, unless otherwise indicated.
  - 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 Designer'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.
- B. Pre-faced Concrete Masonry Units: Lightweight hollow concrete units complying with ASTM C 90, with manufacturer's standard smooth resinous facing complying with ASTM C 744.
  - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa), 2800 psi (19.3 MPa), 3050 psi (21.0 MPa).
  - 2. Size: Manufactured to dimensions specified in "Concrete Masonry Units" Paragraph above, but with pre-faced surfaces having 1/16-inch- (1.5-mm-) wide returns of facing to create 1/4-inch- (6.5-mm-) wide mortar joints with modular coursing.
  - 3. Colors and Patterns: As selected by Designer from manufacturer's full range.

# 3. MORTAR 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. Hydrated Lime: ASTM C 207, Type S.

- C. 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, Type S.
- D. Water: Potable.

### 4. REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).
- B. Masonry Joint Reinforcement, General: ASTM A 951.
  - 1. Interior Walls: Mill- Hot-dip galvanized, carbon steel.
  - 2. Exterior Walls: Hot-dip galvanized, carbon Stainless steel.
  - 3. Wire Size for Side Rods: W1.7 or 0.148-inch (3.8-mm), W2.8 or 0.188-inch (4.8-mm) diameter.
  - 4. Wire Size for Cross Rods: W1.7 or 0.148-inch (3.8-mm), W2.8 or 0.188-inch (4.8-mm) diameter.
  - 5. Wire Size for Veneer Ties: W1.7 or 0.148-inch (3.8-mm), W2.8 or 0.188-inch (4.8-mm) diameter.
  - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
  - 7. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

# 5. TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
  - 1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 641/A 641M, Class 1 coating.
  - 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; 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 (Z180) zinc coating.
  - 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
  - 6. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Corrugated Metal Ties: Metal strips not less than 7/8 inch (22 mm) wide with corrugations having a wavelength of 0.3 to 0.5 inch (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from steel sheet, galvanized after fabrication stainless-steel sheet not less than 0.043 inch (1.1 mm) 0.053 inch (1.3 mm) 0.067 inch (1.7 mm) 0.097 inch (2.5 mm) thick. Ties made from galvanized steel sheet may be used in interior walls, unless otherwise indicated.
- C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.
- D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
  - 1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long may be used for masonry constructed from solid units or hollow units laid with cells horizontal.
  - 2. Where wythes do not align are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches (32 mm).
  - 3. Wire: Fabricate from 1/4-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls, unless otherwise indicated.
- E. Partition Top anchors: 0.097-inch- (2.5-mm-) thick metal plate with 3/8-inch- (10-mm-) diameter metal rod 6 inches (150 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication stainless steel.
- F. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by 24 inches (600 mm) long, with ends turned up 2 inches (50 mm) or with cross pins, unless otherwise indicated bent to configuration indicated.
  - 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M Epoxy coating 0.020 inch (0.51 mm) thick Rust-inhibitive paint.

# 6. MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, waterrepellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
  - 2. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
  - 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- 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 BIA Technical Notes 8A, 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 S.
  - 2. For reinforced masonry, use Type S N.
  - 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior loadbearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
  - 4. For interior non-load-bearing partitions, Type O may be used instead of Type N.

### **III.EXECUTION**

### 1. EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
  - 1. Verify that reinforcing dowels are properly placed.
- 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.

### 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 the 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.
- E. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:
  - 1. 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
  - 3. 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 (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
  - 4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
  - 5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
  - 6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

#### 3. 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 stack bond one-third running bond Flemish bond English bond bond pattern indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) 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 2 inches (50 mm) 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking 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. 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.
- G. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- H. 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.
  - 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 (13-mm) clearance between end of anchor rod and end of tube. Space anchors 48 inches (1200 mm) o.c., unless otherwise indicated.
  - 3. Wedge non-load-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.
  - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

#### 4. MORTAR BEDDING AND JOINTING

- A. Lay concrete masonry units as follows:
  - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
  - 2. With webs fully bedded in mortar in grouted masonry.

# 5. 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 1/2 inch (13 mm) 1 inch (25 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
  - 2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
  - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

# **SECTION 07920 - JOINT SEALANTS**

# I.GENERAL

### 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.

### 2. PERFORMANCE REQUIREMENTS

A. Provide joint sealants that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

### 3. SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- 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. Warranties: Special warranties specified in this Section.

### 4. QUALITY ASSURANCE

A. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

### 5. PROJECT 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.
  - 2. When joint substrates are wet.
  - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - 4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
- B. Allow sealant in joints at fountains, pools and similar installations to cure for at least fourteen (14) days prior to water immersion.

#### 6. WARRANTY

- A. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
  - 1. Silicones:
    - a) Warranty Period: Fifteen (15) years from date of Substantial Completion.
  - 2. Polyurethanes:
    - a) Warranty Period: Five (5) years from date of Substantial Completion.
- B. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
  - 1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
  - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
  - 3. Mechanical damage caused by individuals, tools, or other outside agents.
  - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

#### II.PRODUCTS

#### 1. MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

# 2. MATERIALS, GENERAL

# JOINT SEALANTS

- 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 sealant manufacturer, based on testing and field experience.
- B. Color:
  - 1. Fully concealed joints: Provide manufacturer's standard color which has best overall performance characteristics for required application.
  - 2. Exposed joints: Colors to be selected by Architect from manufacturer's standard range.
- C. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
- D. Stain-Test-Response Characteristics: Where elastomeric sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- E. Suitability for Immersion in Liquids. Where elastomeric sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247 and qualify for the length of exposure indicated by reference to ASTM C 920 for Class 1 or 2. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- F. Suitability for Contact with Food: Where elastomeric sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

# 3. SEALANTS

- A. Sealant (Exterior Joints)
  - 1. Single-component neutral-curing silicone sealant; capable of 50% movement as measured in compliance with ASTM C719; ASTM C920.
  - 2. Type and Grade: S (single component) and NS (nonsag).
  - 3. Class: 50.
  - 4. Use Related to Exposure: NT (nontraffic).
  - 5. Nonstaining to porous substrates per ASTM C 1248.
  - 6. Available Products:
    - a) Pecora Corporation; 890.
    - b) Dow Corning Corporation; 791.
  - 7. Locations:
    - a) Exterior vertical and horizontal nontraffic construction joints in cast-in-place concrete.
    - b) Exterior vertical control and expansion joints in unit masonry.
    - c) Exterior joints in dimension stone cladding.
    - d) Exterior perimeter joints between concrete, concrete block, cement plaster finishes and frames of doors, windows and louvers.
    - e) Exterior control and expansion joints in ceilings and other overhead surfaces.
- B. Sealant (Wet Joints)
  - Multicomponent, nonsag urethane-based elastomeric sealant; capable of 25% movement as measured in compliance with ASTM C719; ASTM C920. Specifically recommended by manufacturer for continual water immersion service. Class: 50.
  - 2. Type and Grade: M (multicomponent) and NS (nonsag).
  - 3. Use Related to Exposure: NT (nontraffic).
  - 4. Available Products:
    - a) Pecora Corporation; Dynatrol II.
    - b) Tremco; Vulkem 922.
  - 5. Locations: Vertical and horizontal joints at fountains, pools and similar installations.
- C. Sealant (Floor Joints)
  - Multicomponent pourable urethane-based elastomeric sealant, self-leveling and with compatible nonsag sealant for use on slopes, capable of 25% movement as measured in compliance with ASTM C719; ASTM C920. Class: 25.
  - 2. Type and Grade: M (multicomponent) and P (pourable).
  - 3. Use Related to Exposure: T (traffic).

- 4. Uses Related to Substrates: M, A, and O as applicable to joint substrates indicated.
- 5. Available Products:
  - a) Pecora Corporation; Urexpan NR-200.
  - b) Tremco; THC-900/901.
- 6. Locations:
  - a) Exterior horizontal nontraffic and traffic isolation and contraction joints in cast-in-place concrete slabs.
  - b) Interior ceramic and dimension stone tile expansion, control, contraction, and isolation joints in horizontal traffic surfaces.
- D. Sealant (Interior Openings)
  - 1. Latex acrylic emulsion compound sealant, permanently flexible, non-staining and non-bleeding, paintable, conforming with ASTM C 834.
  - 2. Type and Grade: P (Pourable), Grade NF.
  - 3. Available Products:
    - a) Pecora Corporation; AC-20+.
    - b) Tremco; Tremflex 834.
  - 4. Locations:
    - a) Interior perimeter joints of exterior openings.
    - b) Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
- E. Sealant (Plumbing Fixtures)
  - 1. Single-component nonsag silicone sealant containing fungicide for mildew resistance; ASTM C920. Class: 25.
  - 2. Type and Grade: S (single component) and NS (nonsag).
  - 3. Use Related to Exposure: NT (nontraffic).
  - 4. Available Products:
    - a) Dow Corning Corporation; 786 Mildew Resistant.
    - b) Pecora Corporation; 898.
  - 5. Locations: Plumbing fixture and ceramic tile joints.

# 4. JOINT FILLERS

- A. Backer Rod
  - 1. Preformed, compressible, resilient, nonstaining, nonwaxing, nonextgruding flexible closed cell polyethylene foam rod; compatible with joint substrates, sealants and primers; of size, shape and density to control sealant depth. Comply with ASTM C1330.
  - 2. Acceptable products and manufacturers:
    - a) Closed Cell Backer-Rod by Sonneborn.
    - b) Joint Packing by Tremco, Inc.
  - 3. Locations: Provide for bond breaker and support for elastomeric sealants and elsewhere as indicated and required by sealant manufacturer for proper application of sealant.
- B. Cork Joint Filler
  - 1. Resilient and non-extruding: ASTM D1752, Type III, self-expanding.
  - 2. Locations:
    - a) Exterior horizontal joints where sealant is not indicated.
    - b) Horizontal joints as filler below sealant and backer rod where indicated.

#### 5. 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.

D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

# **III.EXECUTION**

### 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 joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 2. PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with jointsealant 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, blast cleaning, 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. Remove laitance and form-release agents from concrete.
  - 3. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Verify the following substrate conditions before application of primer and sealant:
  - 1. That concrete and mortar are fully cured (minimum 28 days) and dry.
  - 2. Remove detrimental curing or form-release compounds from joint surfaces.
- C. Do not apply paint or other coatings or substances to surfaces adjoining joint surfaces until sealants have been installed and are nominally cured, sol that adhesion will not be impaired by migration of such substances onto joint surfaces.
- D. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- E. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

#### 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 type 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 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.
  - 4. Provide flush joint configuration where indicated per Figure 5B in ASTM C 1193.
  - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 5C in ASTM C 1193.
  - 6. Use masking tape to protect surfaces adjacent to recessed tooled joints.

# 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.

### 5. CURING AND PROTECTION

- A. Cure sealants in accordance with manufacturer's instructions to obtain maximum bond to surfaces, cohesive strength and durability at earliest possible date.
- B. 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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

# SECTION 08110 - STEEL DOORS AND FRAMES

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following:
  - 1. Hollow-metal steel doors.
  - 2. Hollow-metal steel frames.

# 3. DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

# 4. SUBMITTALS

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance rating, and finishes, for each type of steel door and frame specified.
- B. Certification: Submit certification stating that fire-rated door and frame assemblies have been fabricated and installed to comply with specified positive-pressure requirements.

# 5. QUALITY ASSURANCE

- A. Source Limitations: Obtain steel doors and frames through one source from a single manufacturer.
- B. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by UL or other testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.

# 6. DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.
- B. Store doors and frames under cover at Project site. Place units in a vertical position with heads up, raised and spaced by blocking. Avoid using shelters that could create a humidity chamber.

# 7. PROJECT CONDITIONS

- A. Field Measurements: Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.
  - 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating steel frames without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

# II.PRODUCTS

# 1. MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Trujillo Alto Metal Corporation.
  - 2. Ceco Door Products; an ASSA ABLOY Group Company.
  - 3. Steelcraft; an Ingersoll-Rand Company.

# 2. MATERIALS

- A. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.
- B. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153/A 153M, Class B.

- C. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153/A 153M.
- D. Grout: Comply with ASTM C 476, with a slump of 4 inches for steel door frames built into concrete or masonry, as measured according to ASTM C 143/C 143M.
- E. Glazing: Comply with requirements in Division 8 Section 08800 "Glazing."
- F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

### 3. STEEL DOORS

- A. Provide as indicated in drawings.
- B. General: Provide doors of design indicated, 1-3/4" thick; fabricated with smooth surfaces, without visible joints or seams on exposed faces, unless otherwise indicated. Comply with ANSI A250.8.
  - 1. Design: Flush panel, unless otherwise indicated.
  - 2. Surface Construction: #16 gauge hollow steel
  - 3. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, mineral-board, or vertical steel-stiffener core that produces doors complying with ANSI A250.8.
    - a) Provide al exterior doors with polystyrene core.
    - b) Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
  - 4. Vertical Edges for Single-Acting Doors: Square edge unless beveled edge is indicated.
    a) Beveled Edge: 1/8 inch in 2 inches
  - Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch radius.
  - 6. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick end closures or channels of same material as face sheets.
  - 7. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- C. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI A250.8 for level and model and ANSI A250.4 for physical-endurance level:
  - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 Full Flush.
- D. Hardware Reinforcement: Fabricate reinforcement plates from same material as door face sheets to comply with the following minimum sizes:
  - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
  - 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

# 4. STEEL FRAMES

- A. Provide as indicated in drawings.
- B. General: Comply with ANSI A250.8 and with details indicated for type and profile.
- C. Exterior Frames: Fabricated from metallic-coated steel sheet.
  - 1. Fabricate frames with mitered or coped and welded face corners using 0.067 inch thick steel sheet.
- D. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:
  - 1. Hinges: Minimum 0.123 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 2. Pivots: Minimum 0.167 inch thick by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
  - 3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick.
  - 4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.
- E. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

- F. 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. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
  - 3. Compression Type for Slip-on Frames: Adjustable compression anchors.
  - 4. 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.
- G. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:
  - 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
  - 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.
- H. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

# 5. STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with steel frames, minimum 5/8 inch high, unless otherwise indicated.

### 6. FABRICATION

- A. General: Fabricate steel doors and frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. 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. Steel Doors:
  - 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Steel 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. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
  - 2. Provide countersunk, flat-head exposed screws and bolts for exposed fasteners, unless otherwise indicated.
  - 3. Where installed in masonry, leave vertical mullions in frames open at top for grouting.
  - 4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
  - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a) Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - (1) Three anchors per jamb up to 90 inches in height.
      - (2) Four anchors per jamb from 90 to 120 inches in height.
    - b) Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      - (1) Four anchors per jamb up to 90 inches in height.
      - (2) Five anchors per jamb from 90 to 96 inches in height.
      - (3) Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
    - c) 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.
  - 6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
    - a) Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    - b) Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Hardware Preparation: Factory prepare steel doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."

- 1. Reinforce doors and frames to receive non-templated mortised and surface-mounted door hardware.
- Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

#### 7. STEEL FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
  - 1. Finish steel door and frames after assembly.
- B. Metallic-Coated Steel Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
  - 1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.
- C. Steel Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel; comply with SSPC-SP 3, "Power Tool Cleaning," or SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied finish paint system indicated; and providing a sound foundation for field-applied topcoats despite prolonged exposure.
- E. Field-Applied Paint Finish: Paint doors and frames with low VOC semi gloss oil-based paint finish with no formaldehyde.
  - 1. Color: As selected by Architect from manufacturer's full range.

#### **III.EXECUTION**

#### 1. EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of steel doors and frames.

# 2. PREPARATION

- A. Prior to installation and with installation spreaders in place, adjust and securely brace steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
  - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- B. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

# 3. INSTALLATION

- A. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Steel Frames: Install steel frames for doors and other openings, of size and profile indicated. Comply with SDI 105.

- 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-protection-rated openings, install frames according to NFPA 80.
  - b) Install door silencers in frames before grouting.
  - c) Remove temporary braces necessary for installation only after frames have been properly set and secured.
  - d) Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
  - e) Apply bituminous coating to backs of frames that are filled with mortar and grout.
- 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
- 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Division 4 Section "Unit Masonry Assemblies."
- 4. Concrete Walls: Solidly fill space between frames and concrete with grout. Install grout in lifts and take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.
- 5. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
- 6. Installation Tolerances: Adjust steel 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 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. Steel Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
  - 1. Non-Fire-Rated Steel Doors:
    - a) Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    - b) Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    - c) Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    - d) Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Install hardware in accordance with hardware manufacturer's instructions and as specified in Section 08711 "Door Hardware".

# 4. ADJUSTING AND CLEANING

- A. Adjust installation to provide uniform clearance at head and jambs and to contact stops uniformly.
- B. 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 steel doors or frames that are warped, bowed, or otherwise unacceptable.
- C. Clean grout and other bonding material off steel doors and frames immediately after installation.

#### 5. PROTECTION

A. Protect units during construction so that they will be without any evidence of damage or use at time of acceptance.

# **SECTION 08710 - DOOR HARDWARE**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following:
  - 1. Commercial door hardware for the swinging doors, sliding doors, folding doors, as listed below, except special types of hardware specified in the same sections as the doors and door frames on which they are installed.
    - a) Heavy Duty Hinges.
    - b) Pivots and Pivot Hinges.
    - c) Cylinders and Keys.
    - d) Key Control System.
    - e) Lock and Latch Sets.
    - f) Electrified Locks and Latch Sets.
    - g) Door Bolts.
    - h) Exit Devices.
    - i) Closers and Door Control Devices.
    - j) Overhead Door Holders, Floor Stops and Wall Bumpers.
    - k) Silencers.
    - I) Door Control Devices.
    - m) Operating Trim.
    - n) Thresholds.
    - o) Door Gasketing.

# 3. SUBMITTALS

- A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples: For exposed door hardware of each type below, in specified finish, full size. Tag with full description for coordination with the Door Hardware Schedule. Submit samples before, or concurrent with, submission of the final Door Hardware Schedule.
  - 1. 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.
- C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
  - a) Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.2. Content: Include the following information:
    - a) Type, style, function, size, label, hand, and finish of each door hardware item.
    - b) Manufacturer of each item.
    - c) Fastenings and other pertinent information.
    - d) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e) Explanation of abbreviations, symbols, and codes contained in schedule.
    - f) Mounting locations for door hardware.
    - g) Door and frame sizes and materials.
    - h) Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.

- 3. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- D. Keying Schedule: Prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.
- E. Warranties: Special warranties specified in this Section.

# 4. QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- D. Regulatory Requirements: Comply with provisions of the following:
  - 1. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," as follows:
    - a) Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
    - b) Door Closers: Comply with the following maximum opening-force requirements indicated:
      - (1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
      - (2) Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
      - (3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
    - c) Thresholds: Not more than 1/2 inch high. Bevel raised thresholds with a slope of not more than 1:2.
  - 2. NFPA 101: Comply with the following for means of egress doors:
    - a) Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    - b) Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf for not more than 3 seconds.
    - c) Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
    - d) Thresholds: Not more than 1/2 inch high.
- E. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
  - 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
  - 2. Preliminary key system schematic diagram.
  - 3. Requirements for key control system.
  - 4. Address for delivery of keys.
- G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

# 5. 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 related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

### 6. COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

#### 7. WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of operators and door hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- C. Warranty periods from date of Substantial Completion.
  - 1. Exit Devices: Three (3) years.
  - 2. Door Closers: Ten (10) years.

### **II.PRODUCTS**

### 1. SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets indicated in door and frame schedule, and the Door Hardware Schedule at the end of Part 3.
  - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
  - 2. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

# 2. MANUFACTURED UNITS

- A. Hinges:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: a) Hager Companies (HAG).
  - 2. Standards: Comply with the following:
    - a) Butts and Hinges: BHMA A156.1.
    - b) Template Hinge Dimensions (for hollow metal doors): BHMA A156.7.
    - c) Self-Closing Hinges: BHMA A156.17.
  - 3. Characteristics:
    - a) Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
32 by 84 by 1-3/8	3-1/2	0.123	-

Maximum Door Size (inches)	Hinge Height (inches)	Metal Thickness (inches)	
		Standard Weight	Heavy Weight
36 by 84 by 1-3/8	4	0.130	-
36 by 84 by 1-3/4	4-1/2	0.134	0.180
42 by 90 by 1-3/4	4-1/2	0.134	0.180
48 by120 by 1-3/4	5	0.146	0.190

- b) Template Requirements: Provide only template-produced units.
- c) Hinge Weight: Unless otherwise indicated, provide the following:
  - (1) Entrance Doors: Heavy-weight hinges.
  - (2) Doors with Closers: Antifriction-bearing hinges.
  - (3) Solid Core Interior Doors: Heavy-weight hinges.
  - (4) Hollow Core Interior Doors: Standard-weight hinges.
- d) 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: Stainless steel, with stainless-steel pin.
- e) Hinge Pins: Provide as follows except as otherwise indicated:
  - (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 the following applications:
    - (a) Outswinging exterior doors.
    - (b) Outswinging corridor doors with locks.
  - (2) Non-rising pins for interior doors.
  - (3) Tips: Flat button and matching plug. Finished to match leafs.
- f) Fasteners: Comply with the following:
  - (1) Metal doors and frames: Machine screws installed into drilled and tapped holes.
  - (2) Wood doors and frames: Threaded-to-the-Head wood screws.
  - (3) Fire-rated wood doors: Threaded-to-the-Head #12 x 1-1/4 inch wood screws.
  - (4) Screws: Phillips flat-head screws. Finish screw heads to match surface of hinges.
- 4. Quantity: Provide the following, unless otherwise indicated:
  - a) Two Hinges: For doors with heights up to 60 inches.
  - b) Three Hinges: For doors with heights 61 to 90 inches.
  - c) Four Hinges: For doors with heights 91 to 120 inches.
  - d) For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- B. Pivots and Pivot Hinges:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Ives: H. B. Ives (IVS).
    - b) Rixson-Firemark, Inc.; Div. of Yale Security Inc. (RIX).
    - c) Sargent Manufacturing Company; Div. of ESSEX Industries, Inc. (SGT).
  - 2. Standards and Grade:
    - a) Self-Closing Pivots: BHMA A156.17.
    - b) Pivots: BHMA A156.4, Grade 1.
  - 3. Characteristics:
    - a) Pivots to be high strength forged bronze with top pivot housing with spring activated bronze retracting pin. Pivots to have tilt-on bearing and bearing pin.
    - b) Center hung pivots to support doors up to 300 pounds. Jamb portion of top center pivot to fit into a 1-3/4" header.
    - c) Offset and intermediate pivots to be handed at the factory. Pivot set to support doors to 200 pounds. With intermediate pivot to support 300 pounds. Center line of pivots to be 3/4" from face of door, 3/4" from edge of door.
    - d) Provide as indicated in schedule.
- C. Cylinders and Keys:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Best Lock Corporation (BEST).

- b) Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
- c) Schlage Lock Company; an Ingersoll-Rand Company (SCH).
- 2. Standards and Grade:
  - a) BHMA A156.5. BHMA Grade 1.
- 3. Characteristics:
  - a) Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
  - b) Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
    - (1) Interchangeable Cores: Core insert, removable by use of a special key, and usable with other manufacturers' cylinders.
- 4. Keying System:
  - a) Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
  - b) Key Material: Provide nickel-silver keys only.
  - c) Key Quantity: In addition to one extra blank key for each lock, provide the following:
    - (1) Cylinder Change Keys: Three.
    - (2) Master Keys: Five.
    - (3) Grand Master Keys: Five.
    - (4) Provide one extra blank for each lock.
  - d) Deliver keys to Owner.
- D. Key Control System:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Telkee, Inc.
    - b) Lund.
    - c) P O Moore.
  - 2. Standards and Grade:
    - a) BHMA Grade 1 system.
  - 3. Characteristics:
    - a) Products includes key-holding hooks, labels, two sets of key tags with self-locking key holders, keygathering envelopes, and temporary and permanent markers. Contain system in metal cabinet with baked-enamel finish.
    - b) Wall-Mounted cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.
    - c) Capacity: Able to hold keys for 150 percent of the number of locks.
- E. Locks and Latch Sets:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Mechanical Locks and Latches:
      - (1) Best Lock Corporation (BEST).
      - (2) Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
      - (3) Schlage Lock Company; an Ingersoll-Rand Company (SCH).
  - 2. Standards and Grade:
    - a) Bored Locks and Latches: BHMA A156.2., Grade 1; Series 4000.
    - b) Mortise Locks and Latches: BHMA A156.13., Grade 1; Series 1000.
    - c) Interconnected Locks and Latches: BHMA A156.12., Grade 1; Series 5000.
    - d) Auxiliary Locks: BHMA A156.5., BHMA Grade 1.
    - e) Push-Button Combination Locks: BHMA A156.2., Grade 1 for cylindrical locks.
    - f) Electromagnetic Locks: BHMA A156.23.
    - g) Delayed-Egress Locks: BHMA A156.24.
    - h) Exit Locks: BHMA A156.5.
  - 3. Certified Products: Provide door hardware listed in the following BHMA directories:
    - a) Mechanical Locks and Latches: BHMA's "Directory of Certified Locks & Latches."
    - b) Electromagnetic and Delayed-Egress Locks: BHMA's "Directory of Certified Electromagnetic & Delayed Egress Locks."
  - 4. Characteristics:

- a) Mortise Locks: Stamped steel case with steel or brass parts.
- b) Lock Trim: Comply with the following:
  - (1) Lever: Cast.
  - (2) Knob: Wrought.
  - (3) Escutcheon (Rose): Wrought #12A, through-bolted through the lock case.
  - (4) Dummy Trim: Match lever lock trim and escutcheons.
- c) Lock Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
  - (1) Bored Locks: Minimum 1/2-inch latch bolt throw.
  - (2) Mortise Locks: Minimum 3/4-inch latch bolt throw.
  - (3) Deadbolts: Minimum 1-inch bolt throw.
- d) Rabbeted Doors: Provide special rabbeted front and strike on locksets for rabbeted meeting stiles.
- e) Backset: 2-3/4 inches, unless otherwise indicated.
- f) Lockset Designs: Provide lockset design indicated
- 5. Lock Functions: Function numbers and descriptions indicated in the Door Hardware Schedule comply with the following:
  - a) Bored Locks: BHMA A156.2.
  - b) Mortise Locks: BHMA A156.13.
  - c) Interconnected Locks: BHMA A156.12.
- 6. Provide as indicated in schedule.
- F. Electrified Locks and Latch Sets:
  - 1. Electromagnetic Locks: Electrically powered locks of strength and configuration indicated; with electromagnet attached to frame and strike plate attached to door. Comply with the following:
    - a) Strength Ranking: 1000 lbf as tested according to BHMA A156.23.
    - b) Inductive Kickback: Not more than 53-V peak voltage, as tested according to BHMA A156.23.
    - c) Residual Magnetism: Not more than 4 lbf to separate door from magnet, as tested according to BHMA A156.23.
  - Self-Contained Electronic Locks and Latches: Internal, battery-powered, self-contained electronic locks; consisting of complete lockset, motor-driven lock mechanism, and actuating device; enclosed in zincdichromate-plated wrought steel case. Provide key override, low-battery detection and warning, LED status indicators, and ability to program at the lock; type and function indicated.
  - 3. Delayed-Egress Locks: Electrically powered locks of strength and configuration indicated; with electromagnet attached to frame and strike plate attached to door. Comply with the following:
    - a) Strength Ranking: 1000 lbf as tested according to BHMA A156.23.
    - b) Inductive Kickback: Not more than 53-V peak voltage, as tested according to BHMA A156.23.
    - c) Residual Magnetism: Not more than 4 lbf to separate door from magnet, as tested according to BHMA A156.23.
  - 4. Exit Locks: Surface-mounted deadbolts or latchbolts; with battery-powered alarm that sounds when unauthorized use of door occurs; housed in metal case. Provide red-and-white pressure-sensitive lettering reading "PUSH TO OPEN--ALARM WILL SOUND."
  - 5. Provide as indicated in schedule.
- G. Door Bolts:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Glynn-Johnson; an Ingersoll-Rand Company (GJ).
    - b) Hager Companies (HAG).
    - c) Ives: H. B. Ives (IVS).
  - 2. Standards and Grade:
    - a) Surface Bolts: BHMA A156.16., BHMA Grade 1.
    - b) Automatic and Self-Latching Flush Bolts: BHMA A156.3., BHMA Grade 1,
    - c) Manual Flush Bolts: BHMA A156.16.
  - 3. Characteristics:
    - a) Flush Bolts:
      - (1) Designed for mortising into door edge.
      - (2) Heads: Minimum of 1/2-inch- diameter rods of stainless steel with minimum 12-inch- long rod for doors up to 84 inches in height. Provide longer rods as necessary for doors exceeding 84 inches.

- (3) Plunger to be supplied with milled surface one side which fits into a matching guide.
- b) Automatic flush bolts to be UL listed as top and bottom bolts on a pair of classified fire doors. Bolt construction to be of rugged steel and brass components.
- c) Bolt Throw: Comply with testing requirements for length of bolts to comply with labeled fire door requirements, and as follows:
  - (1) Half-Round Surface Bolts: Minimum 7/8-inch throw.
  - (2) Interlocking Surface Bolts: Minimum 15/16-inch throw.
  - (3) Fire-Rated Surface Bolts: Minimum 1-inch throw; listed and labeled for fire-rated doors.
  - (4) Dutch-Door Bolts: Minimum 3/4-inch throw.
  - (5) Mortise Flush Bolts: Minimum 3/4-inch throw.
- d) Provide as indicated in schedule.
- H. Exit Devices:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
    - b) Precision Hardware, Inc. (PH).
    - c) Von Duprin; an Ingersoll-Rand Company (VD).
  - 2. Standard: BHMA A156.3.
    - a) BHMA Grade: Grade 1.
  - 3. Certified Products: Provide exit devices listed in BHMA's "Directory of Certified Exit Devices."
  - 4. Characteristics:
    - a) 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.
    - b) Fire Exit 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.
    - c) All exit devices mounted on labeled wood doors shall be thru-bolted mounted on the door per the door manufacturer's requirements.
    - d) All trim shall be thru-bolted to the lock stile case.
    - e) All exit devices shall be made of stainless steel or aluminum material, placed to the standard architectural finishes to match the balance of the door hardware. Painted or aluminum anodized finishes are not accepted.
    - f) Provide glass bead conversion kits to shim exit devices on doors with raised glass heads.
    - g) All exit devices shall be by one manufacturer. No deviation will be considered.
    - All series exits shall incorporate a fluid damper, which decelerates the touchpad on its return stroke and eliminates noise associated with exit device operation. All exit devices shall be non-handed. Touchpad shall extend a minimum of half of the door width and shall be a minimum of 2-3/16 inches in height. Plastic touchpads are not acceptable.
    - i) All latchbolts to be the deadlocking type. Latchbolts shall have a self-lubricating coating to reduce wear. Plated or plastic coated latchbolts are not acceptable.
    - j) Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
  - 5. Provide as indicated in schedule.
- I. Closers and Door Control Devices:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Corbin Russwin Architectural Hardware; Div. of Yale Security Inc. (CR).
    - b) LCN Closers; an Ingersoll-Rand Company (LCN).
  - 2. Standards and Grade:
    - a) Closers: BHMA A156.4., Grade 1.
    - b) Closer Holder Release Devices: BHMA A156.15.
  - 3. Certified Products: Provide door closers listed in BHMA's "Directory of Certified Door Closers."
  - 4. Characteristics:
    - a) Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder.
    - b) Hydraulic fluid shall be of a type requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to –30 degrees F.
    - c) Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force for the physically handicapped. Hydraulic regulation shall be by tamper-

proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed and back check.

- d) All closers shall have solid forged steel main arms (and forearms for parallel arm closers) and where specified shall have a cast-in solid stop on the closer shoe ("cush"). Where door travel on out-swing doors must be limited, use "cush" type closers. Auxiliary stops are not required when "cush" type closers are used.
- e) Overhead concealed closers shall have spring power adjustable for 50% increase in closing power and fully mortised door tracks.
- f) Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ADA and ANSI A-117.1, provisions for door opening force.
- g) Closers to be installed to allow door swings as shown on Drawings. Doors swinging into exit corridors shall provide for corridor clear width as required by code.
- h) Where possible, mount closers inside rooms.
- Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- j) Finish: Powder coating finish to be certified to exceed 100 hours salt spray testing by ETL, an independent testing laboratory used by BHMA for ANSI certification.
- 5. Combination Door Closer and Holder: Provide units designed to hold door in open position under normal usage and to release and automatically close door under fire conditions. Incorporate an integral electromagnetic holder mechanism designed for use with UL listed fire detectors, provided with normally closed switching contacts. Where Combination Door Closer, Holder and Detector are scheduled, provide integral UL listed photoelectric 24V detector module.
- 6. Warranty: All closers (overhead, surface and concealed) shall be of one manufacturer and carry manufacturer's ten (10) year warranty. Electric closers to have two (2) year warranty.
- 7. Provide as indicated in schedule.
- J. Protective Trim Units
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Metal Protective Trim Units:
      - (1) Hager Companies (HAG).
      - (2) Ives: H. B. Ives (IVS).
    - b) Plastic Protective Trim Units:
      - (1) Hager Companies (HAG).
      - (2) IPC Door and Wall Protection Systems, Inc. (IPC).
      - (3) Ives: H. B. Ives (IVS).
      - (4) NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
  - 2. Standard: Comply with BHMA A156.6.
  - 3. Materials: Fabricate protection plates from the following:
    - (1) Aluminum: 0.050 inch thick; beveled top and 2 sides.
    - (2) Brass: 0.050 inch thick; beveled top and 2 sides.
    - (3) Bronze: 0.050 inch thick; beveled top and 2 sides.
    - (4) Stainless Steel: 0.050 inch thick; beveled top and 2 sides.
    - (5) Acrylic: 1/8 inch thick; beveled 4 sides.
  - 4. Color and Texture: As indicated by manufacturer's designations.
  - 5. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine or self-tapping screws.
  - 6. Furnish protection plates sized 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in Door Hardware Schedule.
  - 7. Provide as indicated in schedule.
- K. Overhead Door Holders, Floor Stops and Wall Bumpers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Glynn-Johnson; an Ingersoll-Rand Company (GJ).
    - b) Hager Companies (HAG).
    - c) Ives: H. B. Ives (IVS).

- 2. Standards and Grade:
  - a) Stops and Bumpers: BHMA A156.16., Grade 1.
  - b) Mechanical Door Holders: BHMA A156.16., Grade 1.
  - c) Electromagnetic Door Holders: BHMA A156.15.
  - d) Combination Floor and Wall Stops and Holders: BHMA, Grade 1.
  - e) Concealed Concealed Overhead Holders: BHMA A156.8, Grade 1.
  - f) Combination Overhead Holders and Stops: BHMA A156.8., Grade 1.
- 3. Characteristics:
  - a) Provide heavy duty, medium duty or light duty door holders (concealed and/or surface mounted) of stainless steel, as indicated.
  - b) Holder to be installed with the jamb bracket mounted on the stop.
  - c) Electromagnetic Door Holders for Labeled Fire Door Assemblies: Coordinate with fire detectors and interface with fire alarm system.
  - d) Floor Stops: For doors, unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic.
    - (1) Where floor or wall stops are not appropriate, provide overhead holders.
- 4. Provide as indicated in schedule.
- L. Silencers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: a) Glynn-Johnson; an Ingersoll-Rand Company (GJ).
    - b) Ives: H. B. Ives (IVS).
  - 2. Standards and Grade:
    - (1) Door Silencers: BHMA A156.16., Grade 1.
  - 3. Characteristics:
    - a) Neoprene or rubber, fabricated for drilled-in application to frame.
      - (1) Wood Door Frames: minimum 5/8 by 3/4 inch.
      - (2) Metal Door Frames: minimum diameter 1/2 inch.
  - 4. Quantity: Three for each single door; four for pairs of doors.
- M. Door Control Devices:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Electric Strikes:
      - (1) Von Duprin, Inc.; an Ingersoll-Rand Company (VD).
  - 2. Standards and Grades:
    - a) Strikes for Bored Locks and Latches: BHMA A156.2.
    - b) Strikes for Mortise Locks and Latches: BHMA A156.13.
    - c) Strikes for Interconnected Locks and Latches: BHMA A156.12.
    - d) Strikes for Auxiliary Deadlocks: BHMA A156.5.
    - e) Dustproof Strikes: BHMA A156.16., Grade 1.
    - f) Electric Strikes: BHMA A156.5., Grade 1.
  - 3. Characteristics:
    - a) Manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
    - b) Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
    - c) Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
    - d) Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  - 4. Provide as indicated in schedule.
- N. Operating Trim:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Hager Companies (HAG).
    - b) Ives: H. B. Ives (IVS).
    - c) NT Quality Hardware; an Ingersoll-Rand Company (NTQ).
  - 2. Standard: BHMA A156.6.
  - 3. Characteristics:
    - a) Material: Stainless steel, unless otherwise indicated.
    - b) Attachment:

- (1) Provide mounting system as recommended by manufacturer.
- (2) Push Plates: Manufacturer's standard mounting.
- (3) Pull Plates: Manufacturer's standard mounting.
- (4) Push-Pull Units: Concealed thru-bolted trim on back to back mounted pulls.
- c) Provide plates sized as shown in Drawings or as indicated in schedule.
- O. Thresholds:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) National Guard Products, Inc. (NGP).
    - b) Reese Enterprises, Inc. (RE).
    - c) Zero International, Inc. (ZRO).
  - 2. Standard: Comply with BHMA A156.21.
  - 3. Characteristics:
    - a) Provide thresholds with characteristics as indicated in drawings or schedule.
- P. Door Gasketing:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a) Door Gasketing:
      - (1) National Guard Products, Inc. (NGP).
      - (2) Reese Enterprises, Inc. (RE).
      - (3) Zero International, Inc. (ZRO).
    - b) Door Bottom:
      - (1) Pemko Manufacturing Co., Inc. (PEM).
  - 2. Standard: BHMA A156.22.
  - 3. Characteristics:
    - a) General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
      - (1) Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
        - (a) Steel Door: PEM (Pemko) 1" Siliconseal No. S88-Perimeter of door.
      - (2) Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
      - (3) Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
        - (a) Steel Door: PEM (Pemko) Model 434APKL-Door width.
    - b) 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.
    - c) Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
      - (1) Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.
    - d) Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252.
    - e) Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.
    - f) Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
    - g) Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.
- Q. Door Signage
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: a) Hager Companies (HAG).
  - 2. Standard: ANSI A156.16 for L03201.
  - 3. Characteristics:
    - a) ADA Tactile Sign, plastic, 1/8" thick with 1/32" raised engraving.
    - b) Grade 2 Braille translation conforming to section 4.30 requirements.
    - c) Color: Blue with white symbol lettering.
  - 4. Provide the following types of door signs as indicated:
    - a) "Exit"; to be located at interior side of every door leading to an exit or exit corridor, but not leading to a stair.

- b) "Stair"; to be located at interior side of every door leading to a stairway.
- c) "Women"; to be located at hallway side of every door leading to a bathroom for women.
- d) "Men"; to be located at hallway side of every door leading to a bathroom for men.
- e) "Unisex"; to be located at hallway side of every door leading to a bathroom for unisex use.
- R. Miscellaneous Accessories
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following: a) Hager Companies (HAG).
  - 2. Double Coat Hook
    - a) Characteristics:
      - (1) HAG 940P, 4 1/2 inches by 3 1/2" inches
      - b) Provide one for each door leading to a single user bathroom or changing room, installed at interior side.
  - 3. Door Viewer
    - a) Characteristics:
      - (1) HAG 1755, 160 Degree door viewer.
    - b) Provide as indicated in schedule.

# 3. FABRICATION

- A. Manufacturer's Nameplate: Do not provide manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise approved by Architect.
  - 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal, 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 for finishes. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.
- C. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 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. Steel Machine or Wood Screws: For the following fire-rated applications:
    - a) Mortise hinges to doors.
    - b) Strike plates to frames.
    - c) Closers to doors and frames.
  - 3. Steel Through Bolts: For the following fire-rated applications, unless door blocking is provided:
    - a) Surface hinges to doors.
    - b) Closers to doors and frames.
    - c) Surface-mounted exit devices.
  - 4. Spacers or Sex Bolts: For through bolting of hollow metal doors.
  - 5. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

# 4. FINISHES

- A. Standard: Comply with BHMA A156.18.
- 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.

- D. Provide materials in the following finishes:
  - a) Hinges: 630 (US32D) Satin Stainless Steel.
  - b) Pivots: 630 (US32D) Satin Stainless Steel.
  - c) Cylinders: 630 (US32D) Satin Stainless Steel.
  - d) Lock and Latch Sets: 630 (US32D) Satin Stainless Steel.
  - e) Door Bolts: 630 (US32D) Satin Stainless Steel.
  - f) Exit Devices: 630 (US32D) Satin Stainless Steel.
  - g) Closers and Door Control Devices: 689 (AL) Powder Coat.
  - h) Protective Trim Units: 630 (US32D) Satin Stainless Steel.
  - i) Overhead Door Holders, Floor Stops and Wall Bumpers: 630 (US32D) Satin Stainless Steel.
  - j) Operating Trim: 630 (US32D) Satin Stainless Steel.
  - k) Thresholds: 627 (US27) Mill Aluminum.
  - I) Miscellaneous Accessories: 630 (US32D) Satin Stainless Steel.

### **III.EXECUTION**

#### 1. EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- 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.

#### 2. PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 series.
  - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.
- B. Wood Doors: Comply with DHI A115-W series.

#### 3. INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
  - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  - 2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames."
  - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- 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 specified in Division 9 Sections. 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. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section 07920 "Joint Sealants."

E. Security Hardware: Coordinate with security and electrical system.

# 4. FIELD QUALITY CONTROL

- A. Door Hardware Supplier's Field Service
  - 1. Inspect door hardware items for correct installation and adjustment after complete installation of door hardware.
  - 2. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.
  - 3. File written report of inspection to Architect.
- B. Prior to project completion, a representative of the overhead closer manufacturer shall inspect and adjust all closers and certify that all closers are installed in accordance with the manufacturer's instructions, and are regulated properly and functioning correctly. A written report shall be provided to the Architect as to the inspection and shall include appropriate certificates.

# 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. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
  - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - 3. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
  - 1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
  - 2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
  - 3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

# 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 door hardware is without damage or deterioration at time of Substantial Completion.

# 7. DOOR HARDWARE SCHEDULE

A. Door hardware requirements has been included in the drawings as part of the Door Schedule.

# SECTION 09220 - PORTLAND CEMENT PLASTER

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following:
  - 1. Interior and exterior (stucco) portland cement plasterwork.

# 3. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of factory-prepared, colored or textured finish coat indicated; 12 by 12 inches, and prepared on rigid backing.

# 4. QUALITY ASSURANCE

- A. Source Limitations: Obtain plaster materials through one source from a single manufacturer.
- B. Sample Installation:
  - 1. Prior to commencing Work and preceeding Preinstallation Conference, provide sample installations of portland cement plaster walls.
  - 2. Size and location: Approximately 4 feet by 4 feet, in location acceptable to Architect.
  - 3. Materials: Complete installation with materials, color, texture and workmanship of finished Work. Incorporate framing specified in other Sections.
  - 4. Architect's Review:
    - a) Architect will review sample installations for visual acceptance of materials and workmanship. Obtain Architect's approval before proceeding with subsequent Work.
  - 5. Maintain approved sample installations during construction as standard for Work.
  - 6. Properly finished and maintained sample installations may be incorporated into completed Work.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

# 5. DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.

# 6. PROJECT CONDITIONS

- A. Comply with ASTM C 926 requirements.
- B. Interior Plasterwork: Maintain room temperatures at greater than 40 deg F for at least 48 hours before plaster application, and continuously during and after application.
  - 1. Avoid conditions that result in plaster drying out during curing period. Distribute heat evenly; prevent concentrated or uneven heat on plaster.
  - Ventilate building spaces as required to remove water in excess of that required for hydrating plaster in a manner that prevents drafts of air from contacting surfaces during plaster application and until plaster is dry.
- C. Exterior Plasterwork:
  - 1. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
  - 2. Apply plaster when ambient temperature is greater than 40 deg F.
  - 3. Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.

D. Factory-Prepared Finishes: Comply with manufacturer's written recommendations for environmental conditions for applying finishes.

# **II.PRODUCTS**

# 1. ACCESSORIES

- A. General: Comply with ASTM C 1063 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
- B. Trim Materials:
  - 1. General:
    - a) Material: Impact-resistant and UV-resistant, polyvinyl chloride, complying with ASTM D1784-92.
    - b) Shapes used as grounds: Sized and dimensioned to produce required plaster thickness.
    - c) Flanges: Designed to permit complete embedment of accessory in plaster, alignment and attachment to underlying surface.
  - 2. Available Manufacturers:
    - a) Vinyl Corp. (A Unimast Company)
  - 3. Corner Bead
    - a) Type: Expanded mesh flange.
    - b) Size: Flanges at least 2-3/4 inches wide. Use short flange for narrow returns.
    - c) Arched and curved designs: Use Archmaker type beads.
    - d) Use: All horizontal and vertical plaster corners.
    - e) Where beads meet at wall corners, install in a precise manner so as to not make beads noticeable after applying plaster.
  - 4. Casing Bead
    - a) Type: Expanded mesh flange, square edge.
    - b) Size: Flanges at least 1-3/4 inches wide.
    - c) Use: To terminate stucco and plaster against dissimilar materials.
    - d) Maintain constant width of reveal as indicated.
  - 5. Control Joints
    - a) One-piece-type, folded pair of unperforated screeds in M-shaped configuration with perforated flanges.
    - b) Removable protective tape on plaster face of control joint.
    - c) Use control joint intersections as recommended by manufacturer.
  - 6. Expansion Joints
    - a) Two-piece type, formed to produce slip-joint and square-edged 1/2-inch wide reveal; with perforated concealed flanges.
  - 7. Channel Reveals
    - a) Type: Expanded mesh flange.
    - b) Size: Ground as required by installation and reveal width as indicated.
    - c) Use channel reveal intersections as required by installation:
      - (1) Inside corner.
      - (2) Outside corner.
      - (3) End closure.
      - (4) "T" intersection.
      - (5) Cross intersection.
      - (6) Angle intersection.
    - d) Maintain constant width of reveal as indicated.

#### 2. MISCELLANEOUS MATERIALS

- A. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
- B. Bonding Additive:
  - Acrylic-based emulsion additive, recommended by manufacturer as additive to Portland cement plaster mix for purpose of improving bond of plaster to substrate; suitable for both exterior and interior applications.
  - Acceptable products and manufacturers include but are not limited to the following:
     a) Quick-Cure Ad-Liquid, Finestone. Corp.

- b) Acrylic Admixc-021, Larsen Products Corp.
- C. Bonding Agent: Manufacturer's standard Portland cement plaster bonding agent for application to concrete masonry, concrete, and similar substrates; complying with ASTM C932.

#### 3. PLASTER MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
  - 1. Color for Finish Coats: Grey unless otherwise indicated.
- B. Colorants for Job-Mixed Finish-Coats: Colorfast mineral pigments that produce finish plaster color to match Architect's sample.
- C. Lime: ASTM C 206, Type S.
- D. Sand Aggregate: ASTM C 897.
  - 1. Color for Job-Mixed Finish Coats: White.

### 4. PLASTER MIXES

- A. General:
  - 1. Comply with ASTM C 926 for proportioning of materials and manner of mixing plaster for each required application (options therein are Installer's option unless otherwise indicated).
  - 2. Variations to meet local conditions, manufacturer's requirements, application requirements or to achieve the desired finish are permitted within limits specified in ASTM C 926. Comply with plaster manufacturer's instructions which are more stringent than ASTM C 926.
- B. Bonding Additive: Where the use of bonding additive is indicated, proportion and mix in accordance with additive manufacturer's instructions.
- C. Proportion and mixes to achieve uniform color and texture as indicated. Provide either neat or ready-mixed materials, at Contractor's option, for finish coats.

#### **III.EXECUTION**

#### 1. EXAMINATION

- A. Examine areas and substrates, with Installer present, for compliance with requirements and other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. PREPARATION

- A. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
- B. Prepare solid-plaster bases that are smooth or that do not have the suction capability required to bond with plaster according to ASTM C 926.
- C. Apply bonding agent on concrete and concrete masonry surfaces indicated for direct Portland cement plaster application; comply with manufacturer's instructions for installation.
- D. Install temporary grounds and screeds as necessary to ensure accurate rodding of plaster to true surfaces.
- E. Surface conditioning:
  - 1. Immediately before plastering, dampen surfaces of concrete and masonry which are indicated for direct application of plaster, except where a bonding agent has been applied.
  - 2. Experiment with moisture application to determine degree of saturation which will result in optimum suction for plastering.

### 3. INSTALLING ACCESSORIES

- A. Install according to ASTM C 1063 and at locations indicated on Drawings. Anchor to concrete by nailing.
- B. Miter corners and spline joints of exposed accessories, to form tight joints without offsets. Shim and level units true to line, with a tolerance of 1/8 inch in 10'-0".
- C. Reinforcement for External Corners:

- 1. Install corner bead at interior and exterior locations.
- D. Control Joints: Install control joints at locations indicated on Drawings, and in specific locations approved by Architect for visual effect as follows:
  - 1. As required to delineate plasterwork into areas (panels) of the following maximum sizes:
    - a) Vertical Surfaces: 144 sq. ft..
    - b) Horizontal and other non-vertical Surfaces: 100 sq. ft..
  - 2. At distances between control joints of not greater than 18 feet o.c..
  - 3. As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2:1.
  - 4. Where control joints occur in surface of construction directly behind plaster.
  - 5. Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.

# 4. INSTALLATION OF PORTLAND CEMENT PLASTER

- A. General: Comply with ASTM C 926. Comply with plaster manufacturer's instructions when more stringent than ASTM C 926 and comply with the recommendations of the "Plasterer's Manual" by PCA.
  - 1. Do not deviate more than plus or minus 1/4 inch in 10 feet from a true plane in finished plaster surfaces, as measured by a 10-foot straightedge placed on surface.
  - 2. Finish plaster flush with built-in accessories that act as a plaster ground, unless otherwise indicated. Where casing bead does not terminate plaster at metal frame, cut base coat free from metal frame before plaster sets and groove finish coat at junctures with metal.
  - 3. Provide plaster surfaces that are ready to receive field-applied finishes indicated.
- B. Do not use materials which are caked or lumpy or which are dirty or contaminated by foreign materials. Use only clean water, free from impurities which might impair the plaster work, do not use water which has been used to clean tools.
- C. Do not use excessive water in the mixing and application of plaster materials.
- D. Grout frames and bases solidly and continuously.
- E. Sequence plastering applications with other Work in accordance with recognized industry practices.
  - 1. In general, complete interior plastering prior to installation of adjoining tile work, stone, acoustical materials and similar finishes.
  - 2. Delay application of interior plastering until terrazzo bases and similar adjoining work has been completed.
  - 3. Delay application of exterior plastering until adjoining Work has been completed, wherever possible.
- F. Use mechanical mixing equipment.

# 5. PLASTER APPLICATIONS

- A. Provide two-coat Portland cement plaster applications.
- B. Plaster Thicknesses:
  - 1. Apply total plaster thicknesses as indicated, or if not indicated, 1 inch complying with recognized industry standards.
  - 2. Limit horizontal applications to a maximum of 3/8 inch, where applied directly to concrete without lath or metal reinforcement.
  - 3. Limit vertical applications to a maximum of 5/8 inch where applied directly to masonry or concrete without lath or metal reinforcement. Apply basecoats of minimum 3/8 inch on masonry and minimum 1/4 inch on concrete.
- C. Concealed Interior Plasterwork:
  - 1. Where plaster application will be concealed behind built-in cabinets, similar furnishings, and equipment, apply finish coat.
  - 2. Where plaster application will be concealed above suspended ceilings and in similar locations, finish coat may be omitted.
  - 3. Where plaster application will be used as a base for adhesive application of tile and similar finishes, finish coat may be omitted.

- D. Textures and Patterns:
  - 1. Finish surface to uniform sand float texture, unless otherwise specified.
- E. Curing Portland Cement Plaster:
  - 1. Install each coat of Portland cement plaster within 20 or 30 hours after installation of preceding coat and protect each base-coat from excessive dry-out during the work.
  - 2. Protect finish-coat from dry-out for a period of 20 to 24 hours after placement (or until curing operation will not damage surface), and moisture-cure until not less than 48 hours after time of placement.
  - 3. Moisture-cure by maintaining in a moist condition, by frequent fog-spraying with water and by protecting from fast dry out with covering of polyethylene film or similar enclosure.

### 6. CUTTING AND PATCHING

- A. Cut, patch, replace, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections.
- B. Repair or replace work to eliminate blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, excessive pinholes and similar defects and where bond to substrate has failed. Replace work which sounds "hollow" because of no bonding.
- C. Point-up finish plaster surfaces around items which are built into or penetrate plaster surfaces.
- D. Repair or replace Work as necessary to comply with specified tolerances and required visual effects.

### 7. CLEANING AND PROTECTION

- A. Remove temporary protection and enclosure of other work.
- B. Promptly remove plaster from doorframes, windows, and other surfaces not indicated to be plastered.
- C. Repair floors, walls, and other surfaces stained, marred, or otherwise damaged during plastering.
- D. When plastering Work is completed, remove unused materials, containers, equipment and plaster debris.
- E. Protect Portland cement plaster from deterioration and damage during remainder of construction period.

# **SECTION 09260 - GYPSUM BOARD ASSEMBLIES**

# I.GENERAL

# 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.

# 2. DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

# 3. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For the following products:
  - 1. Submit 12 inch long samples of each type of trim required.
  - 2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

# 4. QUALITY ASSURANCE

- A. Performance Requirements: Provide metal framing as indicated but not less gage than that required to comply with ASTM C754 under the following conditions:
  - 1. Gypsum board partitions:
    - a) Standard systems: Maximum deflection of 1/240 of partition height.
    - b) Systems to receive water resistant gypsum board or backer board: maximum deflection of 1/360 of partition height.
  - 2. Interior suspended ceilings and soffits: Maximum defection of 1/360 of distance between supports.
  - 3. Seismic loads: Fabricate and install systems to resist earthquake loads of Seismic Zone 3, I'1.00, in accordance with requirements of Puerto Rico Building Code 2011 and IBC 2009.
- B. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by UK or other independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products."
- C. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
  - 1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."
- D. Gypsum Board Finish Mockups: Before finishing gypsum board assemblies, install mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Install mockups for surfaces with texture finishes and surfaces indicated to receive textured paint finishes.
  - 2. Simulate finished lighting conditions for review of mockups.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Source Limitations:
  - 1. Obtain steel framing members for gypsum board assemblies through one source from a single manufacturer.
  - 2. Obtain gypsum board panel products through one source from a single manufacturer. Provide accessories including adhesive, clips, attachment devices and others that are standard for panel manufacturer.
- F. Installer Qualifications: Not less than 5 years of documented, successful experience with work comparable to Work of this Project.
- G. Referenced Standards:
  - 1. Except where required by local code or these specifications, comply with applicable requirements of ASTM C754 for installation of steel framing.
  - Except where required by local code, these specifications or more stringent requirements of manufacturer, install gypsum board in accordance with applicable requirements and recommendations of ASTM C840.
  - 3. Apply acoustical sealant in accordance with applicable requirements of ASTM C919.

### 5. DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

# 6. PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

### 7. SEQUENCING AND SCHEDULING

- A. Prior to installation of gypsum board ceiling grid, tag items that will require access panels for access. Review locations with Architect.
- B. Coordinate installation of gypsum board ceilings with balancing of HVAC devices above such ceilings, to allow devices to be balanced before completion of gypsum board installation.

### II.PRODUCTS

### 1. MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Steel Framing and Furring:
    - a) Clark Steel Framing Systems.
    - b) Dietrich Industries, Inc.
    - c) National Gypsum Company.
  - 2. Gypsum Board and Related Products:
    - a) G-P Gypsum Corp.
    - b) National Gypsum Company.
    - c) United States Gypsum Co.

### 2. STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Components, General: Comply with ASTM C 754 for conditions indicated.
- B. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
- C. Hanger Attachments to Concrete: As follows:
  - Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching hanger wires and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by a qualified independent testing agency.
     Type: Postiatalled expansion angles
    - a) Type: Postinstalled, expansion anchor.
  - Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by a qualified independent testing agency.
- D. Hangers: As follows:
  - 1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.
  - 2. Rod Hangers: ASTM A 510, mild carbon steel.

- a) Protective Coating: ASTM A 153/A 153M, hot-dip galvanized.
- 3. Flat Hangers: Commercial-steel sheet, ASTM A 653/A 653M, G40, hot-dip galvanized.
- E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.
   1. Depth: 2 inches minimum.
- F. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G40, hot-dip galvanized zinc coating.
  - 1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
    - a) Minimum Base Metal Thickness: 0.0179 inch.
- G. Optional Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Armstrong World Industries, Inc.; Furring Systems/Drywall.
    - b) Chicago Metallic Corp.; 660 Furring System.
    - c) USG Interiors, Inc.; Drywall Suspension System.

# 3. STEEL PARTITION AND SOFFIT FRAMING

- 1. Components, General: As follows:
- 2. Comply with ASTM C 754 for conditions indicated.
- 3. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653/ A 653M, G40, hot-dip galvanized zinc coating.
- B. Steel Studs and Runners:
  - 1. Conform to ASTM C 645.
  - 2. Provide base metal thickness as indicated in Partition Schedule on Drawings.
  - 3. Provide minimum base metal thickness of 0.0312 inches at walls to receive backer board or water resistant gypsum board with ceramic tile facing, and at walls to receive stone cladding.
  - 4. Provide runner base metal thickness as recommended by stud manufacturer.
  - 5. Provide sections of depth as indicated in Partition Schedule on Drawings.
- C. Flat Strap and Backing Plate: Steel sheet, galvanized, for blocking and bracing, 6 inch wide by 0.0538 inch thick minimum, in lengths to suit size of items to be attached; fastened to studs for attachment of surface mounted fittings and accessories.
  - 1. Elimination of backer plates or direct attachment of accessories or equipment to studs will not be allowed.
- D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum bare metal thickness of 0.0179 inch, and depth required to fit insulation thickness indicated.
- E. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

# 4. INTERIOR GYPSUM WALLBOARD

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Gypsum Wallboard
  - 1. ASTM C 36, regular type.
  - 2. Thickness: as indicated in Partition Schedule on Drawings.
  - 3. Long Edges: Tapered.
- C. Flexible Gypsum Wallboard
  - 1. ASTM C 36, manufactured to bend to fit tight radii and to be more flexible than standard regular-type panels of the same thickness.
  - 2. Thickness: 1/4 inch.
  - 3. Long Edges: Tapered.
  - 4. Location: Apply in double layer at curved assemblies.

- D. Proprietary, Special Fire-Resistive Gypsum Wallboard
  - 1. ASTM C 36, having improved fire resistance over standard Type X.
  - 2. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Gypsum Co.; FireBloc Type C.
    - b) G-P Gypsum Corp.; Firestop Type C.
    - c) National Gypsum Company; Gold Bond Fire-Shield G.
    - d) United States Gypsum Co.; SHEETROCK Brand Gypsum Panels, FIRECODE C Core.
  - 3. Thickness: As indicated in Partition Schedule on Drawings.
  - 4. Long Edges: Tapered.
  - 5. Location: Where required for specific fire-resistance-rated assembly indicated.
- E. Moisture-Resistant Gypsum Board
  - 1. ASTM C 36, regular type except where Type X fire-resistant type is indicated or required.
  - 2. Thickness: as indicated in Partition Schedule on Drawings.
  - 3. Long Edges: Tapered.
  - 4. Locations:
    - a) Partitions in toilet rooms, janitor closets, kitchens and similar wet areas which are not to receive ceramic tile finish.
    - b) Do not use for ceilings.
  - 5. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a) United States Gypsum Co.; SHEETROCK Brand W/R, W/R Firecode "C" or W/R Firecode Type X Gypsum Panels.

# 5. EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

- A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- B. Exterior Gypsum Soffit Board: ASTM C 931/C 931M, with manufacturer's standard edges.
  - 1. Core: 1/2 inch, regular type.

# 6. TILE BACKING PANELS

- 1. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.
- 2. Partitions to receive ceramic tile finishing or interior stone facing; use tile backer board or cementitious backer units, at Contractor's choice.
- 3. Tile Backer Board:
  - a) Silicone treated gypsum core surfaced with inorganic glass fiber mats and moisture resistant surface coating, conforming to ASTM C1178.
  - b) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - (1) G-P Gypsum Products; DensShield Tile Guard.
  - c) Thickness: 1/2 inch.
- 4. Cementitious Backer Unit:
  - a) Aggregated Portland cement board with woven glass fiber mesh facing complying with ANSI A118.9.
  - b) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - (1) United States Gypsum Co.; DUROCK Cement Board.
  - c) Thickness: 1/2 inch minimum.

# 7. TRIM ACCESSORIES

- A. Interior Trim For Gypsum Wallboard: ASTM C 1047.
  - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  - 2. Shapes:
    - a) Cornerbead: Use at outside corners, unless otherwise indicated.
    - b) Bullnose Bead: Use at outside corners where indicated.

- c) LC-Bead: J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
- d) L-Bead: L-shaped; exposed long leg receives joint compound; use where indicated.
- e) Expansion (Control) Joint: Use where indicated.
- f) Curved-Edge Cornerbead: With notched or flexible flanges; use at curved openings where indicated.
- B. Special Trim Materials:
  - 1. General:
    - a) Material: Impact-resistant and UV-resistant, polyvinyl chloride, complying with ASTM D1784-92.
    - b) Shapes used as grounds: Sized and dimensioned to produce required plaster thickness.
    - c) Flanges: Designed to permit complete embedment of accessory in plaster, alignment and attachment to underlying surface.
  - 2. Off-Angle Wall and Ceiling Expansion Joint
    - a) Use on inside corners where necessary to maintain straight joint and prevent cracks.
    - b) Available products and manufacturers:
      - (1) Trim-Tex Inc.; "Magic Corner".
  - 3. Reveal Bead
    - a) Size: 1/4 inch by 1/4 inch for straight and curved reveals.
    - b) Use for fine line reveals in walls and ceilings where indicated.
    - c) Available products and manufacturers:
      - (1) Trim-Tex Inc.; Reveal Bead.

# 8. ADHESIVES AND JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475 and panel manufacturer's recommendations.
- B. Joint Tape:
  - 1. Interior Gypsum Wallboard: Paper.
  - 2. Exterior Gypsum Soffit Board: Paper.
  - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: 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 drying-type, all-purpose compound].
  - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Exterior Applications:
  - 1. Exterior Gypsum Soffit Board: Use setting-type taping and setting-type, sandable topping compounds.
- E. Joint Compound for Tile Backing Panels:
  - 1. Cementitious Backer Units: As recommended by manufacturer.
- F. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- G. Reinforcing joint tape: 2 inch nominal width. For backer board, provide fiberglass tape as recommended by backer board manufacturer and acceptable to manufacturer of ceramic tile setting materials.

# 9. ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Acoustical Sealant for Exposed and Concealed Joints:
    - a) United States Gypsum Co.; SHEETROCK Acoustical Sealant.
- B. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints

and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

# 10. SOUND ATTENUATION BLANKET

- A. Sound attenuation blankets for use in fire-rated construction:
  - 1. Mineral fiber, conforming to ASTM C665, Type I.
  - 2. Surface burning characteristics: per ASTM E84:
    - a) Flame spread: 15 or less.
    - b) Smoke developed: 0.
  - 3. Thickness: As indicated.
  - 4. Acceptable products and manufacturers include but are not limited to the following:
    - a) Thermafiber Sound Attenuation Fire Blankets SAFB by USG.
  - 5. At Contractor's choice, provide sound attenuation blankets for use in fire-rated construction in non-firerated construction. in lieu of the following.
- B. Sound attenuation blankets for use in non-fire-rated construction:
  - 1. Glass fiber, unfaced, conforming to ASTM C665, Type I.
  - 2. Surface burning characteristics: per ASTM E84:
    - a) Flame spread: 25 or less.
    - b) Smoke developed: 50 or less.
  - 3. Thickness: As indicated.
    - a) Sound-SHIELD Sound Control Batts by Johns Mansville.
    - b) Unfaced Thermal Batt Insulation/Sound Attenuation Batts by Owens/Corning Fiberglass Corp.

### 11. AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations, as required for complete installations.
- B. Steel Drill Screws: Self-drilling, self-tapping steel screws.
  - 1. For steel framing less than 0.03 inch thick: comply with ASTM C 1002.
  - 2. For steel framing from 0.033 inch thick to 0.112 inch thick: comply with ASTM C954.
  - 3. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Isolation Strip at Exterior Walls:
  - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
  - 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

#### 12. TEXTURE FINISH

- A. Aggregate Finish
  - 1. Water-based, job-mixed, aggregated, drying-type texture finish for spray application.
  - Texture: Light-spatter or Spatter knock-down, as indicated.
     Available products and manufacturers:
  - - a) United States Gypsum Co.; SHEETROCK Wall and Ceiling Spray Texture.
  - 4. Primer: As recommended by textured finish manufacturer.

#### **III.EXECUTION**

#### **EXAMINATION** 1

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. PREPARATION

- A. Coordination with Sprayed Fire-Resistive Materials:
  - 1. Before spraved fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed-on fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation
of gypsum board assemblies and without reducing the fire-resistive material thickness below that which
is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from
damage.

### 3. INSTALLING STEEL FRAMING, GENERAL

- A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.
  - 1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
  - 2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.
    - a) Use deep-leg deflection track where indicated.
    - b) Use proprietary deflection track where indicated.
    - c) Use proprietary firestop track where indicated.
- D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

# 4. INSTALLING STEEL SUSPENDED CEILING AND SOFFIT FRAMING

- A. Suspend ceiling hangers from building structure as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  - 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
  - 4. Secure rod, flat and angle hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
  - 5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 6. Do not attach hangers to steel deck tabs.
  - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  - 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Installation Tolerances: Install steel framing components for suspended ceilings so members for panel attachment are level to within 1/8 inch in 12 feet measured lengthwise on each member and transversely between parallel members.
- C. Sway-brace suspended steel framing with hangers used for support.
- D. Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.
- E. Install suspended steel framing components in sizes and spacings indicated, but not less than that required by the referenced steel framing and installation standards.
  - 1. Hangers: 48 inches o.c.

- 2. Carrying Channels (Main Runners): 48 inches. o.c.
- 3. Furring Channels (Furring Members): 16 inches o.c.
- F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

### 5. INSTALLING STEEL PARTITION AND SOFFIT FRAMING

- A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.
  - 1. Where studs are installed directly against exterior walls, install asphalt-felt or foam-gasket isolation strip between studs and wall.
- B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
  - For fire-resistance-rated and STC-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid-structure surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.
     a) Terminate partition framing at suspended ceilings where indicated.
- D. Install steel studs and furring at the following spacings:
  - 1. Single-Layer Construction: 24 inches o.c., unless otherwise indicated.
  - 2. Multilayer Construction: 24 inches o.c., unless otherwise indicated.
  - 3. Cementitious Backer Units: 16 inches o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.
- F. Curved Partitions:
  - 1. Cut top and bottom track (runners) through leg and web at 2-inch intervals for arc length. In cutting lengths of track, allow for uncut straight lengths of not less than 12 inches at ends of arcs.
  - 2. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
  - 3. Support outside (cut) leg of track by clinching steel sheet strip, 1-inch- high-by-thickness of track metal, to inside of cut legs using metal lock fasteners.
  - 4. Begin and end each arc with a stud, and space intermediate studs equally along arcs at stud spacing recommended in writing by gypsum board manufacturer for radii indicated. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.
- G. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
  - 1. Install two studs at each jamb, unless otherwise indicated.
  - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint.
  - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- H. Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- I. Z-Furring Members:
  - 1. Erect insulation vertically and hold in place with Z-furring members spaced 24 inches o.c.
  - 2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

### 6. APPLYING AND FINISHING PANELS, GENERAL

- A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.
- B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum 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.
- E. 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.
- F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.
- H. Form control and expansion joints with space between edges of adjoining gypsum panels.
- I. Cover both faces of steel stud partition 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 open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- J. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.
- K. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

# 7. PANEL APPLICATION METHODS

- A. Single-Layer Application:
  - 1. On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
  - 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
    - a) Stagger abutting end joints not less than one framing member in alternate courses of board.
    - b) At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.
  - 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
- B. Multilayer Application on Ceilings: Apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
- C. Multilayer Application on Partitions/Walls: Apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer

joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

- 1. Z-Furring Members: Apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
- D. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.
- E. Multilayer Fastening Methods: Fasten base layers and face layers separately to supports with screws.
- F. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.
- G. Curved Partitions:
  - 1. Install panels horizontally and unbroken, to the extent possible, across curved surface plus 12-inchlong straight sections at ends of curves and tangent to them.
  - 2. Wet gypsum panels on surfaces that will become compressed where curve radius prevents using dry panels. Comply with gypsum board manufacturer's written recommendations for curve radii, wetting methods, stacking panels after wetting, and other preparations that precede installing wetted gypsum panels.
  - 3. On convex sides of partitions, begin installation at one end of curved surface and fasten gypsum panels to studs as they are wrapped around curve. On concave side, start fastening panels to stud at center of curve and work outward to panel ends. Fasten panels to framing with screws spaced 12 inches o.c.
  - 4. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.
  - 5. Allow wetted gypsum panels to dry before applying joint treatment.
- H. Exterior Soffits and Ceilings: Apply exterior gypsum soffit board panels perpendicular to supports, with end joints staggered and located over supports.
  - 1. Delete first subparagraph below or revise if perimeter relief will be provided by trim. If retaining, detail sealant in gap on Drawings to keep insects from entering above ceiling areas.
  - 2. Install with 1/4-inch open space where panels abut other construction or structural penetrations and cover gap with sealant.
  - 3. Fasten with corrosion-resistant screws.
- I. Tile Backing Panels:
  - 1. Install Tile Backer Board: ASTM C1178 or Cementitious Backer Units: ANSI A108.11, at showers, tubs, and where indicated.
  - 2. Areas Not Subject to Wetting: Install moisture-resistant gypsum board panels: ASTM C 36, to produce a flat surface except at showers, tubs, and other locations indicated to receive tile-backing panels.
  - 3. Where tile backing panels abut other types of panels in the same plane, shim surfaces to produce a uniform plane across panel surfaces.

#### 8. sound rated construction

- A. Insulation:
  - 1. Install sound attenuation blankets in sound-rated partitions and ceilings where indicated.
  - 2. Completely fill space between studs and framing to full height of partition wall or full area of ceiling.
  - 3. Fit carefully behind electrical outlets and other Work penetrating sound-rated construction.
  - 4. Install sound attenuation blankets in gaps between steel deck flutes and tops of sound rated partitions which are not fire-rated.
  - 5. Attach blankets in accordance with manufacturer's instructions.
- B. Gypsum Board:
  - 1. Install gypsum board same as for interior partitions and ceilings.
  - 2. Coordinate with installation of perimeter sealants.
- C. Acoustical Sealant:
  - 1. At partition walls, provide continuous beads of acoustic sealant at juncture of both faces of runners or plates with floor and ceiling construction, and wherever gypsum board abuts dissimilar materials, prior to installation of gypsum board.

- 2. At ceilings, provide continuous beads of sealant wherever gypsum board abuts dissimilar materials.
- Provide continuous bead of sealant behind faces of control joints prior to installation of surface-applied control joint accessories. Locate sealant at proper depth in joint to allow for insertion of expansion portion of control joint accessory.
- 4. After installation of gypsum board base layers, cut face layer sheets 2 inch less than floor-to-ceiling height and position with 1/4 inch open space between gypsum board and floor, ceiling and dissimilar vertical construction. Fill 1/4 inch open space with continuous sealant beads after installation of face layer.
- 5. At openings and cutouts, fill open spaces between gypsum board and fixtures, cabinets, ducts and other flush or penetrating items, with continuous bead of sealant.
- 6. Seal sides and backs of electrical boxes to completely close off openings and joints.
- D. Sound Flaking Paths;
  - 1. Where sound-rated partition walls intersect non-rated gypsum board partition walls, extend sound-rated construction to completely close sound flanking paths through non-rated construction.
  - 2. Seal joints between face layers at vertical interior angles of intersecting partitions.

### 9. 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 according to ASTM C 840 and in specific locations approved by Architect for visual effect.

### 10. FINISHING GYPSUM BOARD ASSEMBLIES

- 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 those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
  - 1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
  - 2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
  - 3. Level 3: Embed tape and apply separate first and fill coats of joint compound to tape, fasteners, and trim flanges where panels are specified to receive medium or heavy-textured finish before painting or heavy wallcoverings and lighting conditions are not critical, and where indicated.
  - 4. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.
  - 5. Level 5: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat of joint compound over entire surface where indicated.
- E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

#### 11. APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.
- C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture finish manufacturer's written recommendations.

# 12. FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
  - 1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
  - 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
    - a) Installation of 80 percent of lighting fixtures, powered for operation.
    - b) Installation, insulation, and leak and pressure testing of water piping systems.
    - c) Installation of mechanical system, air-duct systems and air devices.
    - d) Installation of ceiling support framing.

### 13. ADJUSTING

A. Correct damage and defects which may telegraph through finish Work. Leave Work smooth and uniform.

# **END OF SECTION 09260**

# **SECTION 09310 - CERAMIC TILE**

# I.GENERAL

# 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.

# 2. DEFINITIONS

- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.
- B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

# 3. PERFORMANCE REQUIREMENTS

- A. Floor Tile Criteria: For all floor areas indicated to receive tile, provide materials which comply with the following ANSI 137.1 standards and as listed below:
  - 1. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
    - a) Level surfaces and step treads: Minimum 0.6.
    - b) Ramp Surfaces: Minimum 0.8.
  - 2. Break Strength: ASTM C648.
  - 3. Bond Strength: ASTM C482.
  - 4. Abrasion Wear Resistance (Unglazed Tile): ASTM C501.
  - 5. Abrasion Wear Resistance (Glazed Tile): ASTM C1027.
  - 6. Scratch Resistance (Moh's Hardness).
  - 7. Water Absorption: ASTM C373.
  - 8. Freeze/Thaw Resistance: ASTM C1026.

# 4. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection.
- C. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.
  - 3. Stone thresholds in 6-inch lengths.
  - 4. Metal edge strips in 6-inch lengths.

# 5. QUALITY ASSURANCE

- A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.
  - 1. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  - 1. Build mockup of each type of floor and wall tile installation.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

# 6. DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

# 7. PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

# 8. EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: [Furnish quantity of full-size units equal to 2 percent of amount installed, for each type, composition, color, pattern, and size indicated.]

# **II.PRODUCTS**

# 1. PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
  - 1. Provide tile complying with Standard grade requirements, unless otherwise indicated.
  - 2. For facial dimensions of tile, comply with requirements relating to tile sizes specified in Part 1 "Definitions" Article.
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.
- C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
  - 1. As indicated by manufacturer's designations.
- D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.
  - 1. Where tile is indicated for installation on exteriors or in swimming pools, fountains, exteriors or in similar type of wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- F. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.
- G. Available Manufacturers:
  - 1. Tile Products:
    - a) American Olean; Div. of Dal-Tile International Corp.
    - b) Daltile; Div. of Dal-Tile International Inc.
    - c) GranitiFiandre.
    - d) Italgraniti.
    - e) Bisazza.

## 2. TILE PRODUCTS

- A. Provide as indicated in drawings.
- B. Unglazed Ceramic Mosaic Floor Tile: Factory-mounted flat tile as follows:
  - 1. Composition: Porcelain.

- 2. Surface: Manufacturer's standard. When indicated, provide slip-resistant, with abrasive admixture.
- 3. Module Size: 2 inch by 2 inch.
- 4. Nominal Thickness: 1/4 inch.
- Face: Plain with cushion edges.
   Basis-of-Design Product: American Olean; Egyptstones, Color Group 2.
- 7. Color Schemes: As indicated in drawings.
- 8. Provide as indicated in drawings.
- C. Unglazed Ceramic Mosaic Wall Tile: Factory-mounted flat tile as follows:
  - 1. Composition: Porcelain.
  - 2. Surface: Manufacturer's standard.
  - 3. Module Size: 2 inches by 2 inches.
  - 4. Nominal Thickness: 1/4 inch.
  - 5. Face: Plain with cushion edges.
  - 6. Basis-of-Design Product: American Olean; Egyptstones, Color Group 2.
  - 7. Color Schemes: A As indicated in drawings.
  - 8. Provide as indicated in drawings.
- D. Glazed Ceramic Mosaic Wall Tile: Factory-mounted flat tile as follows:
  - 1. Composition: Porcelain.
  - 2. Module Size: 2 inches by 2 inches.
  - 3. Thickness: 1/4 inch.
  - 4. Face: Plain with cushion edges.
  - 5. Finish: High gloss.
  - 6. Color Schemes: As indicated in drawings.
  - 7. Provide as indicated in drawings.
- E. Glass Mosaic Tile:
  - 1. Composition: Glass.
  - 2. Module Size: 3/4 inch x 3/4 inch, in 12-11/16 inch by 12-11/16 inch sheets.
  - 3. Thickness: 5/32 inch.
  - 4. Face: Plain.
  - 5. Basis-of-Design Product: Bisazza Glass Mosaic.
  - 6. Color Schemes: As indicated in drawings.
  - 7. Provide as indicated in drawings.
- F. Unglazed Quarry Tile:
  - 1. Wearing Surface: Nonabrasive, textured slip resistant surface.
  - 2. Module Size: 6 inches by 6 inches.
  - 3. Thickness: 1/2 inch.
  - 4. Face: Plain square-edged.
  - 5. Basis-of-Design Product: American Olean; Quarry Tile and Naturals, Color group 1.
  - 6. Color Schemes: As indicated in drawings.
  - 7. Provide as indicated in drawings.
- G. Unglazed Paver Tile: Flat tile as follows:
  - 1. Composition: Porcelain.
  - 2. Module Size: 16 inch by 16 inch, unless otherwise indicated in drawings.

  - Thickness: 9 mm.
     Finish: As indicated in drawings.
  - 5. Basis-of-Design Product: American Olean.
  - 6. Color Schemes: As indicated in drawings.
  - 7. Provide as indicated in drawings.
- H. Glazed Wall Tile: Flat tile as follows:
  - 1. Composition: Porcelain.
  - 2. Module Size: 6 inch by 6 inch, unless otherwise indicated in drawings.
  - 3. Thickness: 5/16 mm.
  - 4. Finish: Polished.
  - 5. Basis-of-Design Product: American Olean.

- 6. Color Schemes: As indicated in drawings.
- 7. Provide as indicated in drawings.
- I. Ceramic Mosaic Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable.
  - 1. Provide shapes as follows, selected from manufacturer's standard shapes, as indicated in drawings:
    - a) External Corners for Portland Cement Mortar Installations: Bead (bullnose).
    - b) External Corners for Thin-Set Mortar Installations: Surface bullnose.
    - c) Base Cove: Cove.
    - d) Base Cap for Portland Cement Mortar Installations: Bead (bullnose).
    - e) Base Cap for Thin-Set Mortar Installations: Surface bullnose.
    - f) Wainscot Cap for Portland Cement Mortar Installations: Bead (bullnose).
    - g) Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
    - h) Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
    - i) Internal Corners: Cove.
- J. Quarry Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable.
  - 1. Provide as indicated in Drawings:
    - a) Base: Coved with surface bullnose top edge, facial dimensions 8 by 3-7/8 inches.
    - b) Wainscot Cap: Surface bullnose, facial dimensions 8 by 3-7/8 inches.
    - c) Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above.
- K. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable:
  - 1. Provide shapes as follows, selected from manufacturer's standard shapes.
    - a) External Corners for Portland Cement Mortar Installations: Bullnose shape with radius of at least 3/4 inch, unless otherwise indicated.
    - b) External Corners for Thin-Set Mortar Installations: Surface bullnose.
    - c) Internal Corners: Field-butted square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.
  - 2. Provide the following shapes as indicated in Drawings.
    - a) Base for Thin-Set Mortar Installations: Straight.
    - b) Base for Portland Cement Mortar Installations: Coved.
    - c) Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
    - d) Wainscot Cap for Flush Conditions: Regular flat tile for conditions where tile wainscot is shown flush with wall surface above. Wainscot Cap for Portland Cement Mortar Installations: Bullnose cap.
- L. Accessories for Glazed Wall Tile: Vitreous china accessories, in color and finish to match adjoining wall tile, and intended for installing by same method as adjoining wall tile.
  - 1. Provide of type and size as indicated in drawings.

# 3. STONE THRESHOLD

- A. Provide as indicated in drawings.
- B. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  - 1. Bevel edges at 1:2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.
- C. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.
  - 1. Description: Uniform, fine- to medium-grained white stone with gray veining, unless otherwise indicated.
  - 2. Provide as indicated in Drawings.

# 4. WATERPROOFING AND CRACK-SUPPRESSION MEMBRANES FOR THIN-SET TILE INSTALLATIONS

A. Provide as indicated in drawings.

- B. General: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.
- C. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.
  - 1. Available Products:
    - a) Laticrete International Inc.; Laticrete 9235 Waterproof Membrane.
- D. Latex-Portland Cement Product: Flexible mortar consisting of cement-based mix and acrylic-latex additive.
   1. Available Products:
  - a) Mapei Corporation; PRP 315.

# 5. SETTING MATERIALS

- A. Thickset Portland Cement Mortar Installation Materials: ANSI A108.1A and as specified below:
  - 1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
  - 2. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 inches by 2 inches by 0.062 inch diameter, comply with ASTM A185 and ASTM A82, except for minimum wire size.
  - 3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Thin-Set Latex-Portland Cement Mortar: ANSI A118.4, consisting of the following:
  - 1. Mixture of prepackaged dry-mortar mix combined with manufacturer's standard liquid-latex additive.
  - 2. Available Products:
    - a) Mapei Corp. Kerabond Dry Set Mortar with Keralastic Polymer Additive.
    - b) Laticrete International Inc., 211 Crete Filler Powder with 4237 Latex Mortar Additive.
  - 3. Thin-Set Latex-Portland Cement Mortar for Porcelain tiles: ANSI A118.4, composition as follows:
    - a) Mortar Mix with Liquid Latex Additive:
      - (1) Mapei Corp. Kerabond Dry Set Mortar with Keralastic Polymer Additive.
      - (2) Latecrete International Inc., 3030 Porcelain-Bond.

# 6. GROUTING MATERIAL

- A. Latex-Portland Cement Grout: ANSI A118.6, composed as follows:
  - 1. Mixture of Factory-Prepared Dry-Grout Mix and Latex Addditive.
    - a) Unsanded Dry-Grout Mix: Dry-set grout for joints 1/8 inch and narrower.
      - (1) Mapei Corp. KER 800 Latex Modified Unsanded Grout.
      - (2) Laticrete International Inc., Dry-Set Unsanded Wall and Floor Grout.
    - b) Sanded Dry-Grout Mix: Commercial Portland cement grout for joints wider than 1/8 inch.
      - (1) Mapei Corp. KER 200 Latex Modified Sanded Grout.
        - (2) Laticrete International Inc., Floor Grout and Joint Filler with #1776 Grout Admix Plus.
    - c) Latex Additive: Manufacturer's standard.
    - d) All grout colors to be selected by Architect from manufacturer's standard colors.

# 7. ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section 07920 "Joint Sealants."

# 8. MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
  - 1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
  - 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

- C. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- D. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints that does not change color or appearance of grout.
  - 1. Products: Aqua-Mix, Stone Guard.

### 9. MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

### **III.EXECUTION**

### 1. EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
  - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. PREPARATION

- A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
- B. Provide concrete substrates for tile floors installed with adhesives or thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
  - 1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tilesetting material manufacturer's written instructions. Use product specifically recommended by tilesetting material manufacturer.
  - 2. Remove protrusions, bumps, and ridges by sanding or grinding.
- C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, blend tiles at Project site before installing.

#### 3. INSTALLATION, GENERAL

- A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
- B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
- C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

- D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
  - 1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- F. Lay out tile wainscots to next full tile beyond dimensions indicated.
- G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
  - 1. Locate joints in tile surfaces directly above joints in concrete substrates.
  - 2. Formation: Extend joint completely through tile system, including setting material, reinforcing, membranes and leveling materials.
  - 3. Width: Where sealant-filled joints occur over substrate joints, form joints in the tile work to be not less in width than the substrate below, unless otherwise indicated. Where sealant filled joints do not occur over substrate joints, form joints to be the same width as grout joints in the tile work, unless otherwise indicated.
  - 4. Keep joints open and free of setting and grouting materials and contaminants.
  - 5. Prepare joints and apply sealants to comply with requirements in Division 7 Section 07920 "Joint Sealants."
- H. Grout tile to comply with requirements of the following tile installation standards:
  - 1. For ceramic tile grouts (sand-portland cement; dry-set, commercial portland cement; and latex-portland cement grouts), comply with ANSI A108.10.

### 4. WATERPROOFING AND CRACK-SUPPRESSION MEMBRANE INSTALLATION

- A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.
- B. Install crack-suppression membrane to comply with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.
- C. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

# 5. FLOOR TILE INSTALLATION

- A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
  - 1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.
    - a) Exterior tile floors.
    - b) Tile floors in wet areas, including pool decks and laundries.
    - c) Tile floors composed of tiles 8 by 8 inches or larger.
    - d) Tile floors composed of rib-backed tiles.
- B. All adjoining floor areas shall be of a common level not varying more than 1/4 inch over a 10-foot horizontal run in accordance with the American Concrete Institute standards.
- C. Verification: The Architect reserves the right to pull up and examine tiles, up to a maximum of five (5) tiles per 100 square feet of installed work, to verify that required coverage is being achieved and the work is in compliance with requirements indicated. If required coverage is not being achieved, the Contractor is responsible for removing non-compliant work and replacing the work to be in compliance with requirements.
- D. Joint Widths: Install tile on floors with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/16 inch.
  - 2. Quarry Tile: 3/8 inch.

- 3. Paver Tile: 1/4 inch.
- E. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
  - 1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.
- F. Metal Edge Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- G. Grout Sealer: Apply grout sealer to grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

#### WALL TILE INSTALLATION 6.

- A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
- B. Joint Widths: Install tile on walls with the following joint widths:
  - 1. Ceramic Mosaic Tile: 1/16 inch.
  - 2. Glazed Wall Tile: 1/16 inch.
  - 3. Quarry Tile: 3/8 inch.

#### 7. **CLEANING AND PROTECTING**

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove epoxy and latex-portland cement grout residue from tile as soon as possible.
  - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
- B. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces. Clean tile surfaces in accordance with manufacturer's recommendations. Polish bright-glazed and polished-surface tiles.
  - 1. Surface Treatment: When recommended by tile manufacturer, apply penetrating surface treatment to finished tile work in accordance with tile manufacturer's recommendations and surface treatments manufacturer's instructions. Apply two coats unless otherwise indicated. Treat glazed tiles with one application of surface treatment. Allow surface treatment to penetrate grout joints for time period recommended by manufacturer. Do not allow surface treatment to dry on surface of tile. Apply additional material if required to keep surface damp. Damp mop sealer off surface of tile after period recommended by manufacturer.

#### 8. **CERAMIC TILE FLOOR INSTALLATION SCHEDULE**

- A. For interior floor installations using the tile type indicated, comply with the following:
  - Tyle Type: Unglazed Ceramic Mosaic Floor Tile
     Tyle Type: Unglazed Paver Tile

  - 3. Installation Method: TCA F122 (thin-set mortar bonded to waterproof membrane/anti fracture membrane over elevated concrete slab).
  - 4. Setting Bed and Grout: ANSI A108.5B with the following mortar and grout:
    - a) Latex-portland cement mortar and liquid anti-fracture/waterproofing membrane.
      - b) Grout: Sanded latex-portland cement grout. ANSI 108.10
- B. For interior floor installations using the tile type indicated, comply with the following:

- 1. Tyle Type: Unglazed Quarry Tile
- 2. Installation Method: TCA F111 (thick-set cement mortar bed with cleavage membrane over elevated concrete subfloor).
- 3. Setting Bed and Grout: ANSI A108.1B with the following mortar and grout:
  - a) Latex-portland cement mortar and liquid waterproofing membrane for thin setting on cured bed per TCA F122 and ANSI 108.J.
  - b) Grout: Sanded latex-portland cement grout, ANSI 108.10

### 9. CERAMIC TILE WALL INSTALLATION SCHEDULE

- A. For interior concrete and concrete masonry wall installations using the tile type indicated, comply with the following:
  - 1. Tyle Type: Unglazed Ceramic Mosaic Wall Tile
  - 2. Tyle Type: Glazed Ceramic Mosaic Wall Tile
  - 3. Tyle Type: Glass Mosaic Tile
  - 4. Installation Method: TCA W202 (thin-set cement mortar bed over parged masonry).
  - 5. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:
    - a) Latex-portland cement mortar.
    - b) Unsanded latex-portland cement grout.
- B. For interior installation over gypsum tile backer board or cementitious backer units on metal studs wall, using the tile type indicated, comply with the following:
  - 1. Tyle Type: Unglazed Ceramic Mosaic Wall Tile
  - 2. Tyle Type: Glazed Ceramic Mosaic Wall Tile
  - 3. Tyle Type: Glass Mosaic Tile
  - 4. Installation Method: TCA W202 (thin-set cement mortar bed over parged masonry).
  - 5. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:
    - a) Latex-portland cement mortar.
    - b) Unsanded latex-portland cement grout.

# END OF SECTION 09310

# **SECTION 09912 - PAINTING**

# 1.GENERAL

# 1. SUMMARY

1.

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
  - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
  - Prefinished items include the following factory-finished components:
    - a. Architectural woodwork.
    - b. Acoustical wall panels.
    - c. Toilet enclosures.
    - d. Metal lockers.
    - e. Kitchen equipment.
    - f. Elevator entrance doors, frames and equipment.
    - g. Finished mechanical and electrical equipment.
    - h. Light fixtures.
  - 2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Foundation spaces.
    - b. Furred areas.
    - c. Ceiling plenums.
    - d. Utility tunnels, pipe spaces and duct shafts.
    - e. Elevator shafts.
  - 3. Finished metal surfaces include the following:
    - a. Anodized aluminum.
    - b. Stainless steel.
    - c. Chromium plate.
    - d. Copper and copper alloys.
    - e. Bronze and brass.
  - 4. Operating parts include moving parts of operating equipment and the following:
    - a. Valve and damper operators.
    - b. Linkages.
    - c. Sensing devices.
    - d. Motor and fan shafts.
  - 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

# 2. DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
  - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85degree meter.
  - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60degree meter.
  - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
  - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60degree meter.

# 3. SUBMITTALS

- A. Product Data: For each paint system indicated. Include block fillers and primers.
  - 1. Material List: An inclusive list of required coating materials. Indicate each material and crossreference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
  - 2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
- B. Samples for Initial Selection: For each type of finish-coat material indicated.
  - 1. After color selection, Architect will furnish color chips for surfaces to be coated.
- C. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
  - 1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
  - 2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
  - 3. Submit Samples on the following substrates for Architect's review of color and texture only:
    - a. Painted Wood: 8-inch-square Samples for each color and material on hardboard.
    - b. Stained or Natural Wood: 4-by-8-inch Samples of natural- or stained-wood finish on representative wood species surfaces to be used.

### 4. QUALITY ASSURANCE

- A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

#### 5. DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type) and VOC content.
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Contents by volume, for pigment and vehicle constituents.
  - 5. Thinning and application instructions.
  - 6. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area. Maintain storage containers in a clean condition, free of foreign materials and residue.
  - 1. Keep storage area neat and orderly. Remove oily rags and waste daily.

# 6. **PROJECT CONDITIONS**

- A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
- B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
- C. Do not apply paint in rain, fog, or mist; or when relative humidity exceeds 85 percent; or to damp or wet surfaces.

# 7. EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with 1 gal. of each material and color applied.

# 2.PRODUCTS

### 1. MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.
- B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. PPG Industries, Inc. (Pittsburgh Paints).
  - 2. Sherwin-Williams Co. (Sherwin-Williams).

### 2. PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Colors: As selected by Architect from manufacturer's full range.

### 3. CONCRETE UNIT MASONRY BLOCK FILLERS

- A. Concrete Unit Masonry Block Filler: High-performance latex.
  - 1. Pittsburgh Paints; 6-7 SpeedHide Interior/Exterior Masonry Latex Block Filler: Applied at a dry film thickness of not less than 6.0 to 12.5 mils.
  - 2. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25: Applied at a dry film thickness of not less than 8.0 mils.

# 4. EXTERIOR PRIMERS

- A. Exterior Concrete and Masonry Primer: Alkali-resistant acrylic-latex primer.
  - 1. Pittsburgh Paints; 6-603 SpeedHide Interior/Exterior Acrylic Latex Alkali Resistant Primer: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. Sherwin-Williams; Loxon Exterior Masonry Acrylic Primer A24W300: Applied at a dry film thickness of not less than 3.0 mils.
- B. Exterior Mineral-Fiber Reinforced Cement Panel Primer: Alkali-resistant acrylic-latex primer.
  - 1. Sherwin-Williams; A-100 Latex Exterior Wood Primer B42W41: Applied at a dry film thickness of not less than 1.4 mils.
- C. Exterior Wood Primer for Acrylic Enamels: Alkyd or latex wood primer.
  - 1. Pittsburgh Paints; 6-609 SpeedHide Exterior House & Trim Wood Primer 100 Percent Acrylic Latex: Applied at a dry film thickness of not less than 1.6 mils.
  - 2. Sherwin-Williams; A-100 Exterior Latex Wood Primer B42W41: Applied at a dry film thickness of not less than 1.4 mils.
- D. Exterior Wood Primer for Alkyd Enamels: Alkyd or latex wood primer.
  - 1. General: Consult manufacturer's recommendations if deep-tone colors are used.
  - 2. Pittsburgh Paints; 6-609 SpeedHide Exterior House & Trim Wood Primer 100 Percent Acrylic Latex: Applied at a dry film thickness of not less than 1.6 mils.
  - 3. Sherwin-Williams; A-100 Exterior Latex Wood Primer B42W42: Applied at a dry film thickness of not less than 1.4 mils.
- E. Exterior Ferrous-Metal Primer: Rust-inhibitive.
  - 1. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
  - 2. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.

- F. Exterior Galvanized Metal Primer:
  - 1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
  - 2. Sherwin-Williams; Galvite HS Paint B50WZ3: Applied at a dry film thickness of not less than 2.0 mils.

# 5. INTERIOR PRIMERS

- A. Interior Concrete and Masonry Primer: Alkali-resistant acrylic-latex interior primer.
  - 1. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Sherwin-Williams; PrepRite Masonry Primer B28W300: Applied at a dry film thickness of not less than 3.0 mils.
- B. Interior Gypsum Board Primer: Latex-based.
  - 1. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- C. Interior Wood Primer for Acrylic-Enamel and Semigloss Alkyd-Enamel Finishes: Alkyd- or acrylic-latexbased.
  - 1. Pittsburgh Paints; 6-855 SpeedHide Latex Enamel Undercoater: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
  - 3. Sherwin-Williams; PrepRite Classic Interior Primer B28W101 Series: Applied at a dry film thickness of not less than 1.6 mils. Use for semigloss acrylic enamel finishes, as recommended by manufacturer.
- D. Interior Wood Primer for Full-Gloss Alkyd-Enamel Finishes: Alkyd- or acrylic-latex-based.
  - 1. Pittsburgh Paints; 6-6 SpeedHide Interior Quick-Drying Enamel Undercoater: Applied at a dry film thickness of not less than 1.4 mils.
  - 2. Sherwin-Williams; PrepRite Wall and Wood Primer B49W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- E. Interior Ferrous-Metal Primer: Quick-drying rust-inhibitive alkyd-based.
  - 1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. Sherwin-Williams; Kem Kromik Universal Metal Primer B50NZ6/B50WZ1: Applied at a dry film thickness of not less than 3.0 mils.
- F. Interior Zinc-Coated Metal Primer: Galvanized metal primer.
  - 1. Pittsburgh Paints; 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
  - 2. Sherwin-Williams; Galvite HS B50WZ30: Applied at a dry film thickness of not less than 3.0 mils.

# 6. EXTERIOR FINISH COATS

- A. Exterior Flat Acrylic Paint.
  - 1. Pittsburgh Paints; 6-600 Series SpeedHide Exterior House Paint Flat Latex: Applied at a dry film thickness of not less than 1.3 mils.
  - 2. Sherwin-Williams; A-100 Exterior Latex Flat House & Trim Paint A6 Series: Applied at a dry film thickness of not less than 1.3 mils.
- B. Exterior Low-Luster Acrylic Paint: Low-sheen, eggshell or satin.
  - 1. Pittsburgh Paints; 6-2000 Series SpeedHide Exterior House & Trim Satin--Acrylic Latex: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Pittsburgh Paints; 90-400 Series Pitt-Tech One Pack High Performance Waterborne Satin DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils. Use for a low-luster acrylic finish over zinc-coated metal as recommended by manufacturer.

- 3. Sherwin-Williams; A-100 Exterior Latex Satin House & Trim Paint A82 Series: Applied at a dry film thickness of not less than 1.5 mils.
- C. Exterior Semigloss Acrylic Enamel: Waterborne acrylic-latex enamel.
  - 1. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. Sherwin-Williams; A-100 Latex Gloss A8 Series: Applied at a dry film thickness of not less than 1.3 mils.
- D. Exterior Full-Gloss Acrylic Enamel for Concrete, Masonry, and Wood: Waterborne acrylic-latex enamel.
  - 1. Pittsburgh Paints; 90 Line Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
  - 2. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.
  - 3. Sherwin-Williams; SuperPaint Exterior High Gloss Latex Enamel A85 Series: Applied at a dry film thickness of not less than 1.2 mils. Use only as finish coat over exterior wood trim.
- E. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals: Waterborne acrylic-latex enamel.
  - 1. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels: Applied at a dry film thickness of not less than 3.0 mils.
  - 2. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series: Applied at a dry film thickness of not less than 2.4 mils.
- F. Exterior Full-Gloss Alkyd Enamel.
  - 1. Pittsburgh Paints; 7-814 Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. Sherwin-Williams; Industrial Enamel B-54 Series: Applied at a dry film thickness of not less than 2.0 mils.

### 7. INTERIOR FINISH COATS

- A. Interior Flat Acrylic Paint.
  - 1. Pittsburgh Paints; 6-70 Line SpeedHide Interior Wall Flat-Latex Paint: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30W200 Series: Applied at a dry film thickness of not less than 1.4 mils.
- B. Interior Flat Latex-Emulsion Size.
  - 1. Pittsburgh Paints; 6-70 Line SpeedHide Interior Wall Flat-Latex Paint: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Sherwin-Williams; ProMar 200 Interior Latex Flat Wall Paint B30W200 Series: Applied at a dry film thickness of not less than 1.4 mils.
- C. Interior Low-Luster Acrylic Enamel: Satin or eggshell.
  - 1. Pittsburgh Paints; 6-400 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils.
  - 2. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- D. Interior Semigloss Acrylic Enamel.
  - 1. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series: Applied at a dry film thickness of not less than 1.3 mils.
- E. Interior Full-Gloss Acrylic Enamel:
  - 1. Pittsburgh Paints; 6-8534 SpeedHide Interior Latex 100 Percent Acrylic Gloss Enamels: Applied at a dry film thickness of not less than 1.0 mil.
  - 2. Pittsburgh Paints; 90-374 Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils. Use for a high-gloss finish over ferrous and zinc-coated metal, as recommended by manufacturer.

- 3. Sherwin-Williams; ProMar 200 Interior Latex Gloss Enamel B21W201: Applied at a dry film thickness of not less than 1.5 mils.
- F. Interior Semigloss Alkyd Enamel:
  - 1. Pittsburgh Paints; 6-1110 Series SpeedHide Interior Enamel Wall & Trim Semi-Gloss Oil: Applied at a dry film thickness of not less than 1.4 mils.
  - 2. Sherwin-Williams; ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200 Series: Applied at a dry film thickness of not less than 1.7 mils.
- G. Interior Full-Gloss Alkyd Enamel for Wood and Metal Surfaces: Factory-formulated full-gloss alkyd interior enamel.
  - 1. Pittsburgh Paints; 7-814 Series Pittsburgh Paints Industrial Gloss-Oil Interior/Exterior Enamel: Applied at a dry film thickness of not less than 1.5 mils.
  - 2. Sherwin-Williams; ProMar 200 Alkyd Gloss Enamel B35W200 Series: Applied at a dry film thickness of not less than 1.6 mils.

### 8. INTERIOR WOOD STAINS AND VARNISHES

- A. Open-Grain Wood Filler: Paste wood filler applied at spreading rate recommended by manufacturer.
   1. Sherwin-Williams: Sher-Wood Fast-Dry Filler.
- B. Interior Wood Stain: Alkyd-based penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.
  - 1. Pittsburgh Paints; 77-560 Rez Interior Semi-Transparent Oil Stain.
  - 2. Sherwin-Williams; Wood Classics Interior Oil Stain A-48 Series.
- C. Clear Sanding Sealer: Fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer.
  - 1. Pittsburgh Paints; 6-10 SpeedHide Quick-Drying Interior Sanding Wood Sealer/Finish.
  - 2. Sherwin-Williams; Wood Classics Fast Dry Sanding Sealer B26V43.
- D. Interior Alkyd- or Polyurethane-Based Clear Satin Varnish.
  - 1. Pittsburgh Paints; 77-7 Rez Varnish, Interior Satin Oil Clear.
  - 2. Sherwin-Williams; Wood Classics Fast Dry Oil Varnish, Satin A66-300 Series.
- E. Interior Waterborne Clear Satin Varnish: Acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
  - 1. Pittsburgh Paints; 77-49 Rez Satin Acrylic Clear Polyurethane.
  - 2. Sherwin-Williams; Wood Classics Waterborne Polyurethane Satin, A68 Series.
- F. Interior Waterborne Clear Gloss Varnish: Acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
  - 1. Pittsburgh Paints; 77-45 Rez Full-Gloss Acrylic Clear Polyurethane.
  - 2. Sherwin-Williams; Wood Classics Waterborne Polyurethane Gloss, A68 Series.

# 3.EXECUTION

#### 1. EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.
  - 1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
  - 2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

# 2. PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
  - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
  - 1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime.
  - 2. Cementitious Materials: Prepare concrete, concrete unit masonry, cement plaster, and mineralfiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
    - a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    - b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
    - c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.
  - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
    - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
    - c. If transparent finish is required, backprime with spar varnish.
    - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
    - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
  - 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
    - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
  - 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
  - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

- Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
- 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

# 3. APPLICATION

- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
  - 1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
  - 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  - 3. Provide finish coats that are compatible with primers used.
  - 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
  - 5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  - 6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
  - 7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  - 8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
  - 9. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
  - 10. Sand lightly between each succeeding enamel or varnish coat.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
  - 1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
  - 2. Omit primer over metal surfaces that have been shop primed and touchup painted.
  - 3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
  - 4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
  - 1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
  - 2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
  - 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
    - a. Do not use spray equipment in occupied buildings and in areas of Project where other finishing materials have been installed or applied.

- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.
- E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- F. Mechanical items to be painted include, but are not limited to, the following:
  - 1. Uninsulated metal and plastic piping, pipe hangers and supports.
  - 2. Tanks that do not have factory-applied final finishes.
  - 3. Duct, equipment, and pipe insulation having paintable jacket material.
  - 4. Mechanical equipment that is indicated to have a factory-primed finish for field painting.
- G. Electrical items to be painted include, but are not limited to, the following:
  - 1. Electrical equipment that is indicated to have a factory-primed finish for field painting.
- H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
  - 1. Provide satin finish for final coats.
- L. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.
- M. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

# 4. CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

# 5. **PROTECTION**

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- A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
  - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

#### 6. EXTERIOR PAINT SCHEDULE

- A. Concrete, Stucco, and Masonry (Other Than Concrete Unit Masonry):
  - Flat Acrylic Finish: At least two finish coats over a primer.
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior flat acrylic paint.
  - 2. Low-Luster Acrylic Finish: At least two finish coats over a primer.
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior low-luster acrylic paint.

B. Concrete Unit Masonry:

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- Flat Acrylic Finish: At least two finish coats over a block filler.
  - a. Block Filler: Concrete unit masonry block filler.
  - b. Finish Coats: Exterior flat acrylic paint.
- 2. Low-Luster Acrylic Finish: At least two finish coats over a block filler.
  - a. Block Filler: Concrete unit masonry block filler.
  - b. Finish Coats: Exterior low-luster acrylic paint.
- C. Mineral-Fiber-Reinforced Cement Panels:
  - Flat Acrylic Finish: At least two finish coats over a primer.
    - a. Primer: Exterior concrete and masonry primer.
    - b. Finish Coats: Exterior flat acrylic paint.
- D. Smooth Wood:
  - Semigloss Acrylic-Enamel Finish: At least two finish coats over a primer.
    - a. Primer: Exterior wood primer for acrylic enamels.
    - b. Finish Coats: Exterior semigloss acrylic enamel.
- E. Wood Trim:

1.

- Full-Gloss Alkyd-Enamel Finish: At least two finish coats over a primer.
  - a. Primer: Exterior wood trim primer for full-gloss alkyd enamels.
  - b. Finish Coats: Exterior full-gloss alkyd enamel.
- F. Plywood:

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- 1. Low-Luster Finish: At least two finish coats over a primer.
  - a. Primer: Exterior wood primer for acrylic enamels.
  - b. Finish Coats: Exterior low-luster acrylic paint.
- G. Ferrous Metal: Primer is not required on shop-primed items.
  - Full-Gloss Alkyd-Enamel Finish: At least two finish coats over a rust-inhibitive primer.
    - a. Primer: Exterior ferrous-metal primer.
    - b. Finish Coats: Exterior full-gloss alkyd enamel.
- H. Zinc-Coated Metal:
  - Full-Gloss Alkyd-Enamel Finish: At least two finish coats over a galvanized metal primer.
    - a. Primer: Exterior galvanized metal primer.
    - b. Finish Coats: Exterior full-gloss alkyd enamel.

# 7. INTERIOR PAINT SCHEDULE

- A. Concrete and Masonry (Other Than Concrete Unit Masonry):
  - Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Interior concrete and masonry primer.
    - b. Finish Coats: Interior flat acrylic paint.
  - 2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior concrete and masonry primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior concrete and masonry primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- B. Concrete Unit Masonry:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a block filler. Include a second coat of block filler over very coarse concrete masonry substrates.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 2. Semigloss Acrylic-Enamel Finish: Two finish coats over a block filler. Include a second coat of block filler over very coarse concrete masonry substrates.
    - a. Block Filler: Concrete unit masonry block filler.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- C. Mineral-Fiber-Reinforced Cement Panels:

- 1. Flat Acrylic Finish: Two finish coats.
  - a. Finish Coats: Interior flat acrylic paint.
- D. Gypsum Board:
  - 1. Flat Acrylic Finish: Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior flat acrylic paint.
  - 2. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior low-luster acrylic enamel.
  - 3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior gypsum board primer.
    - b. Finish Coats: Interior semigloss acrylic enamel.
- E. Wood and Hardboard:
  - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer. Spot prime over knots before applying primer.
    - a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes.
    - b. Finish Coats: Interior low-luster acrylic enamel.
    - Semigloss Acrylic-Enamel Finish: Two finish coats over a wood undercoater.
      - a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes.b. Finish Coats: Interior semigloss acrylic enamel.
  - 3. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a wood primer. Spot prime over knots before applying primer.
    - a. Primer: Interior wood primer for full-gloss alkyd-enamel finishes.
    - b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.
- F. Ferrous Metal:

2.

- 1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a primer.
  - a. Primer: Interior ferrous-metal primer.
  - b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.
- G. Zinc-Coated Metal:
  - 1. Full-Gloss Alkyd-Enamel Finish: Two finish coats over a primer.
    - a. Primer: Interior zinc-coated metal primer.
    - b. Finish Coats: Interior full-gloss alkyd enamel for wood and metal surfaces.

# 8. INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

- A. General: Apply filler coat on open grain woods such as oak and walnut, do not apply on tight-grained woods such as birch or poplar.
- B. Stained Woodwork:
  - 1. Alkyd-Based Stain Satin-Varnish Finish: At least two finish coats of alkyd-based clear satin varnish over a sealer coat and interior wood stain. Wipe wood filler before applying stain.
    - a. Filler Coat: Open-grain wood filler.
    - b. Stain Coat: Interior wood stain.
    - c. Sealer Coat: Clear sanding sealer.
    - d. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.
- C. Natural-Finish Woodwork:
  - 1. Alkyd-Based Satin-Varnish Finish: At least two finish coats of alkyd-based clear satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.
    - a. Filler Coat: Open-grain wood filler.
    - b. Sealer Coat: Clear sanding sealer.
    - c. Finish Coats: Interior alkyd- or polyurethane-based clear satin varnish.

# END OF SECTION 09912

# **SECTION 10431 - SIGNS**

# I.GENERAL

#### 10. SUMMARY

- A. This Section includes the following:
  - 1. Panel signs.
  - 2. Dimensional characters (letters and numbers) and logos for exterior use.
  - 3. Cast-metal plaques.

#### 11. SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.
  - 1. Provide message list for each sign, including large-scale details of wording, lettering, artwork, and braille layout.
  - 2. Wiring Diagrams: For signs with illuminated characters.
- C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.
- D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
  - 1. Panel Signs: Full-size Samples of each type of sign required.
  - 2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
  - 3. Casting: Show representative texture, character style, spacing, finish, and method of attachment.
  - 4. Approved samples will be returned for installation into Project.
- E. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

#### 12. QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by signage manufacturer .
- B. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

# 13. PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

# 14. COORDINATION

- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
  - 1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.
- B. Coordinate location of remote transformers with building construction. Ensure that transformers are accessible after completion of Work.

#### **II.PRODUCTS**

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

#### 2. PANEL SIGNS

- A. Provide as indicated in drawings.
- B. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
  - 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.

#### C. Available Manufacturers:

- 1. Allenite Signs; Allen Marking Products, Inc.
- 2. American Graphics Inc.
- 3. Andco Industries Corp.
- 4. APCO Graphics, Inc.
- 5. ASI Sign Systems. Inc.
- 6. Best Manufacturing Co.
- 7. Grimco. Inc.
- 8. Innerface Sign Systems, Inc.
- 9. Kaltech Industries Group, Inc.
- 10. Mills Manufacturing, Inc.
- 11. Mohawk Sign Systems.
- 12. Seton Identification Products.
- 13. Signature Signs, Inc.
- 14. Supersine Company (The).

#### 3. **DIMENSIONAL CHARACTERS**

- A. Available Manufacturers:
  - 1. American Graphics Inc.
  - 2. A.R.K. Ramos.
  - 3. ASI Sign Systems, Inc.
  - 4. Charleston Industries, Inc.
  - 5. Gemini Incorporated.
  - 6. Grimco, Inc.
  - 7. Innerface Sign Systems, Inc.
  - 8. Kaltech Industries Group, Inc.
  - 9. Metal Arts; Div. of L&H Mfg.
  - 10. Mills Manufacturing. Inc.
  - 11. Mohawk Sign Systems.
  - 12. Signature Sign Signs, Inc.
  - 13. Southwell Co. (The).

#### **CAST-METAL PLAQUES** 4.

- A. General: Provide castings free from pits, scale, sand holes, and other defects. Comply with requirements specified for metal, border style, background texture, and finish and in required thickness, size, shape, and copy.
- B. Available Manufacturers:
  - 1. A.R.K. Ramos.
  - 2. American Graphics Inc.
  - 3. Gemini Incorporated.
  - 4. Matthews International Corporation; Bronze Division.
  - Metal Arts; Div. of L&H Mfg.
     Mills Manufacturing, Inc.

  - 7. Southwell Co. (The).
  - 8. York Bronze/Bryan.

- C. Aluminum Castings: Provide aluminum castings of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- D. Bronze Castings: ASTM B 584, alloy UNS No. C83600 (No. 1 manganese bronze).

### 5. PANEL SIGN TYPES

- A. Room Signs: Provide as indicated on drawings.
- B. Occupancy Signs: Provide as indicated on drawings.
- C. Toilet Room Signs: Provide as indicated on drawings.
- D. Wayfinding Signs: Provide as indicated on drawings.
- E. Accessible Parking Signs: Provide as indicated on drawings.
- F. Symbols of Accessibility: Provide 6-inch- (150-mm-) high symbol fabricated from opaque nonreflective vinyl film, 0.0035-inch (0.089-mm) nominal thickness, with pressure-sensitive adhesive backing suitable for both exterior and interior applications.

### 6. 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 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 range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

### 7. EXECUTION

#### 1. EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Verify that items, including anchor inserts, and electrical power provided under other sections of Work are sized and located to accommodate signs.
- C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. INSTALLATION

- A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
  - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
- B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
  - 1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
  - 2. Hook-and-Loop Tapes: Use hook-and-loop tapes to mount signs to smooth, nonporous surfaces.
  - 3. Magnetic Tape: Use magnetic tape to mount signs to smooth, nonporous surfaces.
  - 4. Silicone-Adhesive Mounting: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.
  - 5. Shim Plate Mounting: Provide 1/8-inch- (3-mm-) thick, concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable.

Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach panel signs to plate using method specified above.

- 6. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
- 7. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.
- C. Bracket-Mounted Units: Provide manufacturer's standard brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions.
- D. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
  - 1. Flush Mounting: Mount characters with backs in contact with wall surface.
  - 2. Projected Mounting: Mount characters at projection distance from wall surface indicated.
- E. Cast-Metal Plaques: Mount plaques using standard fastening methods recommended in writing by manufacturer for type of wall surface indicated.
  - 1. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.
  - 2. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through face of plaque into wall surface.
- F. Illuminated Characters:
  - 1. Run wires into wall construction through conduit. Use insulators as necessary for neon lighting wiring.
  - 2. Exposed-to-view wiring or conduit on wall face is not permitted.
  - 3. Engage a licensed electrician to connect wiring to power source.

#### 3. CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

#### **END OF SECTION 10431**

# SECTION 10801 - TOILET AND BATH ACCESSORIES

# I.GENERAL

# 1. SUMMARY

- A. This Section includes the following:
  - 1. Public-use washroom accessories.
  - 2. Institutional accessories.
  - 3. Custodial accessories.
- B. Related Sections include the following:
  - 1. Division 8 Section 08830 "Mirrors" for frameless mirrors.

### 2. SUBMITTALS

- A. Product Data: For each type of product indicated. Include the following:
  - 1. Construction details and dimensions.
  - 2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
  - 3. Material and finish descriptions.
  - 4. Features that will be included for Project.
  - 5. Manufacturer's warranty.
- B. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.
  1. Approved full-size Samples will be returned and may be used in the Work.
- C. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

### 3. QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

# 4. COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

# 5. WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: Fifteen [15] years from date of Substantial Completion.

#### **II.PRODUCTS**

### 1. MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- C. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.
- H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

### 2. PUBLIC-USE WASHROOM ACCESSORIES

A. Provide as indicated in Bathroom Accessory Schedule contained in drawings.

### 3. CUSTODIAL ACCESSORIES

A. Provide as in Bathroom Accessory Schedule contained in drawings.

### 4. FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

### **III.EXECUTION**

### 1. INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

# 2. ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

# END OF SECTION 10801

# SECTION 15051 - BASIC MECHANICAL MATERIALS AND METHODS (NO PVC)

# **I.GENERAL**

#### 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.

#### 2. SUMMARY

- A. As per Owner's requirements, the use of PVC materials is not permitted in this Project. PCV materials may only be used when absolutely required in order to connect new non-PVC piping to existing PVC piping that, for reason's beyond the Owner's and Contractor's control, will not be replaced.
- B. This Section includes the following:
  - 1. Piping materials and installation instructions common to most piping systems.
  - 2. Transition fittings.
  - 3. Dielectric fittings.
  - 4. Mechanical sleeve seals.

  - Sleeves.
    Escutcheons.
  - 7. Grout.
  - 8. Mechanical demolition.
  - 9. Equipment installation requirements common to equipment sections.
  - 10. Painting and finishing.
  - 11. Concrete bases.
  - 12. Supports and anchorages.

#### 3. DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. 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.
- F. The following are industry abbreviations for plastic materials:
  - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
  - 2. PE: Polyethylene plastic.
- G. The following are industry abbreviations for rubber materials:
  - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 2. NBR: Acrylonitrile-butadiene rubber.

#### 4 **SUBMITTALS**

- A. Product Data: For the following:
  - 1. Transition fittings.
  - 2. Dielectric fittings.
  - 3. Mechanical sleeve seals.
  - 4. Escutcheons.
- B. Welding certificates.

### 5. QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code-Steel."
- B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
  - 1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
  - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. Electrical Characteristics for Mechanical Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

### 6. 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 to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

### 7. COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for mechanical installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for mechanical items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors and Frames."

### II.PRODUCTS

### 1. MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2. PIPE, TUBE, AND FITTINGS

- A. Refer to individual Division 15 piping Sections for pipe, tube, and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

# 3. JOINING MATERIALS

- A. Refer to individual Division 15 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
  - 1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless 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.
  - 2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

- E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.
- G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- H. Solvent Cements for Joining Plastic Piping:1. ABS Piping: ASTM D 2235.
- I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

### 4. DIELECTRIC FITTINGS

- A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
- B. Insulating Material: Suitable for system fluid, pressure, and temperature.
- C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
  - 1. Available Manufacturers:
    - a) Capitol Manufacturing Co.
    - b) Central Plastics Company.
    - c) Eclipse, Inc.
    - d) Epco Sales, Inc.
    - e) Hart Industries, International, Inc.
    - f) Watts Industries, Inc.; Water Products Div.
    - g) Zurn Industries, Inc.; Wilkins Div.
- D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070- kPa) minimum working pressure as required to suit system pressures.
  - 1. Available Manufacturers:
    - a) Capitol Manufacturing Co.
    - b) Central Plastics Company.
    - c) Epco Sales, Inc.
    - d) Watts Industries, Inc.; Water Products Div.
- E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
  - 1. Available Manufacturers:
    - a) Advance Products & Systems, Inc.
    - b) Calpico, Inc.
    - c) Central Plastics Company.
    - d) Pipeline Seal and Insulator, Inc.
  - 2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.
- F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
  - 1. Available Manufacturers:
    - a) Calpico, Inc.
    - b) Lochinvar Corp.
- G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
  - 1. Available Manufacturers:
    - a) Perfection Corp.
    - b) Precision Plumbing Products, Inc.
    - c) Sioux Chief Manufacturing Co., Inc.

d) Victaulic Co. of America.

### 5. MECHANICAL SLEEVE SEALS

- A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
  - 1. Available Manufacturers:
    - a) Advance Products & Systems, Inc.
    - b) Calpico, Inc.
    - c) Metraflex Co.
    - d) Pipeline Seal and Insulator, Inc.
  - 2. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 3. Pressure Plates: Plastic . Include two for each sealing element.
  - 4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

### 6. SLEEVES

- A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
- B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
- C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
  - 1. Underdeck Clamp: Clamping ring with set screws.
- E. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

### 7. ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
  - 1. Finish: Polished chrome-plated and rough brass.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
  1. Finish: Polished chrome-plated and rough brass.

### 8. GROUT

- A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
  - 1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
  - 2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
  - 3. Packaging: Premixed and factory packaged.

### **III.EXECUTION**

### 1. PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.
- B. Drawing 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 unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
  - 1. New Piping:
    - a) Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b) Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    - c) Insulated Piping: One-piece, stamped-steel type with spring clips.
    - d) Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    - e) Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece Split-casting One-piece or splitcasting, cast-brass type with polished chrome-plated finish.
    - f) Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type Split-plate, stamped-steel type with concealed hinge One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    - g) Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated rough-brass finish.
    - h) Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed exposedrivet concealed or exposed-rivet hinge and set screw spring clips set screw or spring clips.
    - i) Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    - j) Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw spring clips set screw or spring clips.
    - k) Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.
- M. Sleeves are not required for core-drilled holes.
- N. Permanent sleeves are not required for holes formed by removable PE sleeves.
- O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
- P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
  - 3. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
    - a) Steel Sheet Sleeves: For pipes NPS 6 (DN 150) and larger, penetrating gypsum-board partitions.
    - b) Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Refer to Division 7 Section "Sheet Metal Flashing and Trim" for flashing.
      - (1) Seal space outside of sleeve fittings with grout.
  - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to Division 7 Section "Joint Sealants" for materials and installation.

- Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
  - 2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
  - 3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - 1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
- T. Verify final equipment locations for roughing-in.
- U. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

### 2. PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 15 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
- F. 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 ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
- H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
  - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
  - 2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
- J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
- K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

- L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
  - 1. Plain-End Pipe and Fittings: Use butt fusion.
  - 2. Plain-End Pipe and Socket Fittings: Use socket fusion.
- M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

### 3. PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
  - 1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
  - 2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
  - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
  - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

### 4. EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

### 5. CONCRETE BASES

- A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
  - 1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
  - 2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
  - 3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
  - 4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 5. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete Cast-in-Place Concrete (Limited Applications)."

### 6. ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

### 7. ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor mechanical materials and equipment.

- B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

# 8. GROUTING

- A. Mix and install grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors.
- B. Clean surfaces that will come into contact with grout.
- C. Provide forms as required for placement of grout.
- D. Avoid air entrapment during placement of grout.
- E. Place grout, completely filling equipment bases.
- F. Place grout on concrete bases and provide smooth bearing surface for equipment.
- G. Place grout around anchors.
- H. Cure placed grout.

### **END OF SECTION 15051**

# **SECTION 15060 - HANGERS AND SUPPORTS**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following hangers and supports for mechanical system piping and equipment:
  - 1. Trapeze pipe hangers.
  - 2. Fastener systems.
  - 3. Pipe stands.
  - 4. Pipe positioning systems.
  - 5. Equipment supports.

# 3. DEFINITIONS

- A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

# 4. PERFORMANCE REQUIREMENTS

- A. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Design seismic-restraint hangers and supports for piping and equipment.

# 5. SUBMITTALS

- A. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
  - 1. Trapeze pipe hangers. Include Product Data for components.
  - 2. Pipe stands. Include Product Data for components.
  - 3. Equipment supports.

# **II.PRODUCTS**

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

# 2. STEEL PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Available Manufacturers:
  - 1. AAA Technology & Specialties Co., Inc.
  - 2. Bergen-Power Pipe Supports.
  - 3. B-Line Systems, Inc.; a division of Cooper Industries.
  - 4. Carpenter & Paterson, Inc.
  - 5. Empire Industries, Inc.
  - 6. ERICO/Michigan Hanger Co.
  - 7. Globe Pipe Hanger Products, Inc.
  - 8. Grinnell Corp.
  - 9. GS Metals Corp.

- 10. National Pipe Hanger Corporation.
- 11. PHD Manufacturing, Inc.
- 12. PHS Industries, Inc.
- 13. Piping Technology & Products, Inc.
- 14. Tolco Inc.
- C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

# 3. TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structuralsteel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

### 4. FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pullout, tension, and shear capacities appropriate for supported loads and building materials where used.
  - 1. Available Manufacturers:
    - a) Hilti, Inc.
    - b) ITW Ramset/Red Head.
    - c) Masterset Fastening Systems, Inc.
    - d) MKT Fastening, LLC.
    - e) Powers Fasteners.
- B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
  - 1. Available Manufacturers:
    - a) B-Line Systems, Inc.; a division of Cooper Industries.
    - b) Empire Industries, Inc.
    - c) Hilti, Inc.
    - d) ITW Ramset/Red Head.
    - e) MKT Fastening, LLC.
    - f) Powers Fasteners.

### **III.EXECUTION**

# 1. HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
  - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.

- 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
- 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24 (DN 15 to DN 600), if little or no insulation is required.
- 5. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
- 6. Adjustable Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8 (DN 20 to DN 200).
- 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
- 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
- 9. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2 (DN 15 to DN 50).
- 10. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8 (DN 10 to DN 200).
- 11. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3 (DN 10 to DN 80).
- 12. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
- 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
- 14. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
- 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
- Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36 (DN 65 to DN 900), if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
- 17. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
- 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 20 (DN 65 to DN 500), from single rod if horizontal movement caused by expansion and contraction might occur.
- 19. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
- 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 24 (DN 50 to DN 600), if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
- 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 30 (DN 50 to DN 750), if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
  - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
  - 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  - 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  - 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

- 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
- 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
- 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
- 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
- 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
- 6. C-Clamps (MSS Type 23): For structural shapes.
- 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
- 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
- 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
- 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
- 11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
- 12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
  - a) Light (MSS Type 31): 750 lb (340 kg).
  - b) Medium (MSS Type 32): 1500 lb (680 kg).
  - c) Heavy (MSS Type 33): 3000 lb (1360 kg).
- 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
  - Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
  - 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
  - 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
  - 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
  - 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
  - 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
  - Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

     a) Horizontal (MSS Type 54): Mounted horizontally.
    - a) Horizontal (MSS Type 54): Mounted nonzontal
      b) Vertical (MSS Type 55): Mounted vertically.
    - b) vertical (MSS Type 55): Mounted vertically.
      c) Trapaza (MSS Type 56): Two vertical type supports and
    - c) Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

- M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
- N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

### 2. HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.
  - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
  - 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.
- C. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.
- D. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
- E. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.
- F. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- G. Fastener System Installation:
  - Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick 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.
  - 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- H. Pipe Stand Installation:
  - 1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
  - 2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Division 7 Section "Roof Accessories" for curbs.
- I. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Division 15 Section "Plumbing Fixtures" for plumbing fixtures.
- J. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- K. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- L. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- M. Install lateral bracing with pipe hangers and supports to prevent swaying.
- N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

- O. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- Q. Insulated Piping: Comply with the following:
  - 1. Attach clamps and spacers to piping.
    - a) Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b) Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c) Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
  - 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    - a) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
  - 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    - a) Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
  - 4. Shield Dimensions for Pipe: Not less than the following:
    - a) NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    - b) NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    - c) NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    - d) NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    - e) NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
  - 5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
  - 6. Insert Material: Length at least as long as protective shield.
  - 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

# 3. ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm)

# 4. PAINTING

- A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting 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 paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

### END OF SECTION 15060

# SECTION 15071 - MECHANICAL VIBRATION AND SEISMIC CONTROLS

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following:
  - 1. Spring hangers.
  - 2. Spring hangers with vertical-limit stops.
  - 3. Thrust limits.
  - 4. Pipe riser resilient supports.
  - 5. Resilient pipe guides.
  - 6. Restrained vibration isolation roof-curb rails.
  - 7. Seismic snubbers.
  - 8. Restraining cables.

# 3. **DEFINITIONS**

- A. A<sub>v</sub>: Effective peak velocity related acceleration coefficient.
- B. OSHPD: Office of Statewide Health Planning & Development for the State of California. OSHPD assigns a unique anchorage preapproval "R" number to each seismic restraint it tests. The number describes a specific device applied as tested.

# 4. SUBMITTALS

- A. Product Data: Include load deflection curves for each vibration isolation device.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Include the following:
  - 1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
  - Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.
  - 3. Vibration Isolation Base Details: Detail fabrication, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.
  - 4. Seismic-Restraint Details: Detail fabrication and attachment of seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
  - 5. Submittals for Interlocking Snubbers: Include load deflection curves up to 1/2-inch (13-mm) deflection in x, y, and z planes.

# 5. QUALITY ASSURANCE

A. Seismic-restraint devices shall have horizontal and vertical load testing and analysis performed according to OSHPD and shall bear anchorage preapproval "R" number, from OSHPD or another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer. Testing and calculations must include both shear and tensile loads and 1 test or analysis at 45 degrees to the weakest mode.

# 6. COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into base. Concrete, reinforcement, and formwork requirements are specified in Division 3.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

# 7. EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Seismic Snubber Units: Furnish replacement neoprene inserts for all snubbers.

### **II.PRODUCTS**

### 1. MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

### 2. VIBRATION ISOLATORS

- A. Available Manufacturers:
  - 1. Ace Mounting Co., Inc.
  - 2. Amber/Booth Company, Inc.
  - 3. B-Line Systems, Inc.
  - 4. California Dynamics Corp.
  - 5. Isolation Technology, Inc.
  - 6. Kinetics Noise Control, Inc.
  - 7. Mason Industries, Inc.
  - 8. Vibration Eliminator Co., Inc.
  - 9. Vibration Isolation Co., Inc.
  - 10. Vibration Mountings & Controls/Korfund.
- B. Elastomeric Mounts: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.
  - 1. Durometer Rating: 50.
- C. Restrained Elastomeric Mounts: All-directional elastomeric mountings with seismic restraint.
  - 1. Neoprene: Shock-absorbing materials compounded according to, the standard for bridge-bearing neoprene as defined by AASHTO.
- D. Spring Isolators: Freestanding, laterally stable, open-spring isolators.
  - 1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 3. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  - 4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - 5. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- E. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
  - 1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
  - 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- F. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.
  - 1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.

- 2. Base: Factory drilled for bolting to structure.
- 3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch (6-mm) travel before contacting a resilient collar.
- G. Elastomeric Hangers: Double-deflection type, with molded, oil-resistant rubber or neoprene isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.
- H. Spring Hangers:Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
  - 1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
  - 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
- I. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.
  - 1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
  - 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  - 7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
- J. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop. Include rod and angle-iron brackets for attaching to equipment.
  - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
  - 2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
  - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
  - 4. Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
  - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
  - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

### 3. RESTRAINED VIBRATION ISOLATION ROOF-CURB RAILS

- A. Available Manufacturers:
  - 1. Amber/Booth Company, Inc.
  - 2. California Dynamics Corp.
  - 3. Isolation Technology, Inc.
  - 4. Kinetics Noise Control, Inc.
  - 5. Mason Industries, Inc.
  - 6. Vibration Eliminator Co., Inc.
  - 7. Vibration Isolation Co., Inc.
  - 8. Vibration Mountings & Controls/Korfund.
- B. Description: Factory-assembled, fully enclosed, insulated, air- and watertight curb rail designed to resiliently support equipment and to withstand 125-mph (56-m/s) wind impinging laterally against side of equipment.
- C. Lower Support Assembly: Sheet-metal "Z" section containing adjustable and removable steel springs that support upper floating frame. Upper frame shall provide continuous support for equipment and shall be captive to resiliently resist wind and seismic forces. Lower support assembly shall have a means for

attaching to building structure and a wood nailer for attaching roof materials, and shall be insulated with a minimum of 2 inches (50 mm) of rigid, glass-fiber insulation on inside of assembly.

- D. Spring Isolators: Adjustable, restrained spring isolators shall be mounted on 1/4-inch- (6-mm-) thick, elastomeric vibration isolation pads and shall have access ports, for level adjustment, with removable waterproof covers at all isolator locations. Isolators shall be located so they are accessible for adjustment at any time during the life of the installation without interfering with the integrity of the roof.
  - 1. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.
    - a) Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and leveling bolt.
    - b) Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
    - c) Minimum Additional Travel: 50 percent of the required deflection at rated load.
    - d) Lateral Stiffness: More than 80 percent of the rated vertical stiffness.
    - e) Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
  - Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment.
    - a) Material: Standard neoprene.
    - b) Durometer Rating: 50.
    - c) Number of Layers: 2 .
- E. Snubber Bushings: All-directional, elastomeric snubber bushings at least 1/4 inch (6 mm) thick.

### 4. SEISMIC-RESTRAINT DEVICES

- A. Available Manufacturers:
  - 1. Amber/Booth Company, Inc.
  - 2. B-Line Systems, Inc.
  - 3. California Dynamics Corp.
  - 4. Kinetics Noise Control, Inc.
  - 5. Loos & Co., Inc.; Cableware Technology Division.
  - 6. Mason Industries, Inc.
  - 7. TOLCO Incorporated.
  - 8. Unistrut Diversified Products Co.; Wayne Manufacturing Division.
  - 9. Vibration Eliminator Co., Inc.
  - 10. Vibration Isolation Co., Inc.
  - 11. Vibration Mountings & Controls/Korfund.
- B. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 50, plus or minus 5, with a flat washer face.
- C. Seismic Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.
  - 1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
  - 2. Resilient Isolation Washers and Bushings: 1-piece, molded, bridge-bearing neoprene complying with AASHTO M 251 and having a durometer of 50, plus or minus 5.
- D. Restraining Cables: Galvanized steel aircraft cables with end connections made of steel assemblies that swivel to final installation angle and utilize two clamping bolts for cable engagement.
- E. Anchor Bolts: Seismic-rated, drill-in, and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488/E 488M.

# 5. VIBRATION ISOLATION EQUIPMENT BASES

- A. Available Manufacturers:
  - 1. Amber/Booth Company, Inc.
  - 2. California Dynamics Corp.

- 3. Isolation Technology, Inc.
- 4. Kinetics Noise Control, Inc.
- 5. Mason Industries, Inc.

- Vibration Eliminator Co., Inc.
  Vibration Isolation Co., Inc.
  Vibration Mountings & Controls/Korfund.
- B. Steel Base: Factory-fabricated, welded, structural-steel bases and rails.
  - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.
  - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
  - 3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
- C. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for field-applied, cast-in-place concrete.
  - 1. Design Requirements: Lowest possible mounting height with not less than 1-inch (25-mm) clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails. Include supports for suction and discharge elbows for pumps.
  - 2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
  - 3. Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
  - 4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

#### FACTORY FINISHES 6.

- A. Manufacturer's standard prime-coat finish ready for field painting.
- B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.
  - 1. Powder coating on springs and housings.
  - 2. All hardware shall be electrogalvanized. Hot-dip galvanize metal components for exterior use.
  - 3. Baked enamel for metal components on isolators for interior use.
  - 4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

# **III.EXECUTION**

#### 1 **EXAMINATION**

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements, installation tolerances, and other conditions affecting performance.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. INSTALLATION

- A. Install roof curbs, equipment supports, and roof penetrations as specified in Division 7 Section "Roof Accessories."
- B. Install thrust limits at centerline of thrust, symmetrical on either side of equipment.
- C. Install seismic snubbers on isolated equipment. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
- D. Install restraining cables at each trapeze and individual pipe hanger. At trapeze anchor locations, shackle piping to trapeze. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

- E. Install steel angles or channel, sized to prevent buckling, clamped with ductile-iron clamps to hanger rods for trapeze and individual pipe hangers. At trapeze anchor locations, shackle piping to trapeze. Requirements apply equally to hanging equipment. Do not weld angles to rods.
- F. Install resilient bolt isolation washers on equipment anchor bolts.

# 3. EQUIPMENT BASES

- A. Fill concrete inertia bases, after installing base frame, with 3000-psi (20.7-MPa) concrete; trowel to a smooth finish.
  - 1. Cast-in-place concrete materials and placement requirements are specified in Division 3.
- B. Concrete Bases: Anchor equipment to concrete base according to supported equipment manufacturer's written instructions for seismic codes at Project site.
  - 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
  - 2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base and anchor into structural concrete floor.
  - 3. Place and secure anchorage devices. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
  - 5. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
  - 6. Cast-in-place concrete materials and placement requirements are specified in Division 3.

# 4. FIELD QUALITY CONTROL

A. Testing: Engage a qualified testing agency to perform the following field quality-control testing:

# 5. ADJUSTING

- A. Adjust isolators after piping systems have been filled and equipment is at operating weight.
- B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
- C. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop.
- D. Adjust air spring leveling mechanism.
- E. Adjust active height of spring isolators.
- F. Adjust snubbers according to manufacturer's written recommendations.
- G. Adjust seismic restraints to permit free movement of equipment within normal mode of operation.
- H. Torque anchor bolts according to manufacturer's written recommendations to resist seismic forces.

# 6. CLEANING

A. After completing equipment installation, inspect vibration isolation and seismic-control devices. Remove paint splatters and other spots, dirt, and debris.

# **END OF SECTION 15071**

# **SECTION 15110 - VALVES**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following general-duty valves:
  - 1. Bronze angle valves.
  - 2. Cast-iron angle valves.
  - 3. Copper-alloy ball valves.
  - 4. Ferrous-alloy ball valves.
  - 5. Ferrous-alloy butterfly valves.
  - 6. Bronze check valves.
  - 7. Spring-loaded, lift-disc check valves.
  - 8. Bronze gate valves.
  - 9. Cast-iron gate valves.
  - 10. Bronze globe valves.
  - 11. Cast-iron globe valves.
  - 12. Cast-iron plug valves.

# 3. DEFINITIONS

- A. The following are standard abbreviations for valves:
  - 1. CWP: Cold working pressure.
  - 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - 3. NBR: Acrylonitrile-butadiene rubber.
  - 4. PTFE: Polytetrafluoroethylene plastic.
  - 5. SWP: Steam working pressure.
  - 6. TFE: Tetrafluoroethylene plastic.

# 4. SUBMITTALS

A. Product Data: For each type of valve used in Project. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

# 5. QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.
  - 1. Exceptions: Domestic hot- and cold-water, sanitary waste, and storm drainage piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

# 6. DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, grooves, and weld ends.
  - 3. Set angle, gate, and globe valves closed to prevent rattling.
  - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
  - 5. Set butterfly valves closed or slightly open.
  - 6. Block check valves in either closed or open position.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.

- 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

### II.PRODUCTS

### 1. MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

### 2. VALVES, GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 (DN 50) and smaller with threaded ends, unless otherwise indicated.
- C. Ferrous Valves: NPS 2-1/2 (DN 65) and larger with flanged ends, unless otherwise indicated.
- D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- F. Valve Actuators:
  - 1. Chainwheel: For attachment to valves, of size and mounting height, as indicated in the "Valve Installation" Article in Part 3.
  - 2. Gear Drive: For quarter-turn valves NPS 8 (DN 200) and larger.
  - 3. Handwheel: For valves other than quarter-turn types.
  - 4. Lever Handle: For quarter-turn valves NPS 6 (DN 150) and smaller, except plug valves.
  - 5. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug head.
- G. Extended Valve Stems: On insulated valves.
- H. Valve Flanges: ASME B16.1 for cast-iron valves, ASME B16.5 for steel valves, and ASME B16.24 for bronze valves.
- I. Valve Grooved Ends: AWWA C606.
  - 1. Solder Joint: With sockets according to ASME B16.18.
    - a) Caution: Use solder with melting point below 840 deg F (454 deg C) for angle, check, gate, and globe valves; below 421 deg F (216 deg C) for ball valves.
  - 2. Threaded: With threads according to ASME B1.20.1.
- J. Valve Bypass and Drain Connections: MSS SP-45.

# 3. BRONZE ANGLE VALVES

- A. Available Manufacturers:
  - 1. Type 1, Bronze Angle Valves with Metal Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Hammond Valve.
    - d) NIBCO INC.
  - 2. Type 2, Bronze Angle Valves with Nonmetallic Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) NIBCO INC.
  - 3. Type 3, Bronze Angle Valves with Metal Disc and Renewable Seat:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.

- c) Grinnell Corporation.
- d) NIBCO INC.
- B. Bronze Angle Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- C. Type 1, Class 125, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.
- D. Type 1, Class 150, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.
- E. Type 1, Class 200, Bronze Angle Valves: Bronze body with bronze disc and union-ring bonnet.
- F. Type 2, Class 125, Bronze Angle Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.
- G. Type 2, Class 150, Bronze Angle Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.
- H. Type 2, Class 200, Bronze Angle Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.
- I. Type 3, Class 125, Bronze Angle Valves: Bronze body with bronze disc and renewable seat. Include unionring bonnet.
- J. Type 3, Class 150, Bronze Angle Valves: Bronze body with bronze disc and renewable seat. Include unionring bonnet.
- K. Type 3, Class 200, Bronze Angle Valves: Bronze body with bronze disc and renewable seat. Include unionring bonnet.

# 4. CAST-IRON ANGLE VALVES

- A. Available Manufacturers:
  - 1. Type II, Cast-Iron Angle Valves with Metal Seats:
    - a) Crane Co.; Crane Valve Group.
    - b) NIBCO INC.
- B. Cast-Iron Angle Valves, General: MSS SP-85, Type II.
- C. Class 125, Cast-Iron Angle Valves: Bronze mounted with gray-iron body and bronze seats.
- D. Class 250, Cast-Iron Angle Valves: Bronze mounted with gray-iron body and bronze seats.

# 5. COPPER-ALLOY BALL VALVES

- A. Available Manufacturers:
  - 1. One-Piece, Copper-Alloy Ball Valves:
    - a) Conbraco Industries, Inc.; Apollo Div.
    - b) Crane Co.; Crane Valve Group.
    - c) DynaQuip Controls.
    - d) Grinnell Corporation.
    - e) NIBCO INC.
  - 2. Two-Piece, Copper-Alloy Ball Valves:
    - a) Conbraco Industries, Inc.; Apollo Div.
    - b) Crane Co.; Crane Valve Group.
    - c) DynaQuip Controls.
    - d) Flow-Tek, Inc.
    - e) Grinnell Corporation.
    - f) Hammond Valve.
    - g) Honeywell Braukmann.
    - h) NIBCO INC.
  - 3. Three-Piece, Copper-Alloy Ball Valves:
    - a) Conbraco Industries, Inc.; Apollo Div.
    - b) DynaQuip Controls.
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) NIBCO INC.

- 4. Safety-Exhaust, Copper-Alloy Ball Valves:
  - a) Conbraco Industries, Inc.; Apollo Div.
  - b) DynaQuip Controls.
  - c) Grinnell Corporation.
  - d) Hammond Valve.
  - e) NIBCO INC.
- B. Copper-Alloy Ball Valves, General: MSS SP-110.
- C. One-Piece, Copper-Alloy Ball Valves: Brass or bronze body with chrome-plated bronze ball, PTFE or TFE seats, and 400-psig (2760-kPa) minimum 600-psig (4140-kPa) CWP rating.
- D. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze Forged-brass Bronze body with full regular-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowoutproof stem.
- E. Three-Piece, Copper-Alloy Ball Valves: Brass or bronze Forged-brass Bronze body with full regular-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa).
- F. Safety-Exhaust, Copper-Alloy Ball Valves: Two-piece bronze body with exhaust vent opening, chrome-plated ball with vent, blowout-proof stem, locking handle, and working pressure rating for compressed air of at least 125 psig (860 kPa) of 400-psig (2760-kPa) CWP of 600-psig (4140-kPa) CWP.

### 6. FERROUS-ALLOY BALL VALVES

- A. Available Manufacturers:
  - 1. Conbraco Industries, Inc.; Apollo Div.
  - 2. Cooper Cameron Corp.; Cooper Cameron Valves Div.
  - 3. Crane Co.; Crane Valve Group; Stockham Div.
  - 4. Flow-Tek, Inc.
  - 5. Foster Valve Co.
  - 6. Hammond Valve.
  - 7. KTM Products, Inc.
  - 8. McCANNA, Incorporated.
  - 9. NIBCO INC.
- B. Ferrous-Alloy Ball Valves, General: MSS SP-72, with flanged ends.
- C. Ferrous-Alloy Ball Valves: Class 150, full or regular port.
- D. Ferrous-Alloy Ball Valves: Class 300, full or regular port.

### 7. FERROUS-ALLOY BUTTERFLY VALVES

- A. Available Manufacturers:
  - 1. Flangeless, Ferrous-Alloy Butterfly Valves:
    - a) Bray International, Inc.
    - b) Cooper Cameron Corp.; Cooper Cameron Valves Div.
    - c) Crane Co.; Crane Valve Group.
    - d) Dover Corp.; Dover Resources Company; Norriseal Div.
    - e) General Signal; DeZurik Unit.
    - f) Grinnell Corporation.
    - g) Hammond Valve.
    - h) Mueller Steam Specialty.
    - i) NIBCO INC.
  - 2. Single-Flange, Ferrous-Alloy Butterfly Valves:
    - a) Bray International, Inc.
    - b) Cooper Cameron Corp.; Cooper Cameron Valves Div.
    - c) Crane Co.; Crane Valve Group.
    - d) Dover Corp.; Dover Resources Company; Norriseal Div.
    - e) Grinnell Corporation.
    - f) Hammond Valve.
    - g) Mueller Steam Specialty.
    - h) NIBCO INC.

- 3. Flanged, Ferrous-Alloy Butterfly Valves:
  - a) Bray International, Inc.
  - b) Cooper Cameron Corp.; Cooper Cameron Valves Div.
  - c) Grinnell Corporation.
  - d) Mueller Steam Specialty.
- 4. Grooved-End, Ductile-Iron Butterfly Valves:
  - a) Central Sprinkler Co.; Central Grooved Piping Products.
  - b) Grinnell Corporation.
  - c) Hammond Valve.
  - d) McWane, Inc.; Kennedy Valve Div.
  - e) Mueller Steam Specialty.
  - f) NIBCO INC.
- B. Ferrous-Alloy Butterfly Valves, General: MSS SP-67, Type I, for tight shutoff, with disc and lining suitable for potable water, unless otherwise indicated.
- C. Flangeless, 150-psig (1035-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer type with one- or twopiece stem.
- D. Flangeless, 175-psig (1207-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer type with one- or twopiece stem.
- E. Flangeless, 200-psig (1380-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer type with one- or twopiece stem.
- F. Flangeless, 250-psig (1725-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer type with one- or twopiece stem.
- G. Flangeless, 300-psig (2070-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer type with one- or twopiece stem.
- H. Single-Flange, 150-psig (1035-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one- or two-piece stem.
- I. Single-Flange, 175-psig (1207-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one- or two -piece stem.
- J. Single-Flange, 200-psig (1380-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one- or two-piece stem.
- K. Single-Flange, 250-psig (1725-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one- or two-piece stem.
- L. Single-Flange, 300-psig (2070-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Wafer-lug type with one- or two-piece stem.
- M. Flanged, 150-psig (1035-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Flanged-end type with one- or two-piece stem.
- N. Flanged, 175-psig (1207-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Flanged-end type with one- or two-piece stem.
- O. Flanged, 200-psig (1380-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Flanged-end type with one- or two-piece stem.
- P. Flanged, 250-psig (1725-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Flanged-end type with one- or two-piece stem.
- Q. Flanged, 300-psig (2070-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Flanged-end type with one- or two-piece stem.
- R. Grooved-End, 175-psig (1207-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Ductile-iron or steel body with grooved or shouldered ends.
- S. Grooved-End, 300-psig (2070-kPa) CWP Rating, Ferrous-Alloy Butterfly Valves: Ductile-iron or steel body with grooved or shouldered ends.

### 8. BRONZE CHECK VALVES

- A. Available Manufacturers:
  - 1. Type 1, Bronze, Horizontal Lift Check Valves with Metal Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Walworth Co.
  - 2. Type 2, Bronze, Horizontal Lift Check Valves with Nonmetallic Disc:
    - a) Cincinnati Valve Co.
      - b) Crane Co.; Crane Valve Group.
      - c) Walworth Co.
  - 3. Type 1, Bronze, Vertical Lift Check Valves with Metal Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
  - 4. Type 2, Bronze, Vertical Lift Check Valves with Nonmetallic Disc:
    - a) Grinnell Corporation.
    - b) Kitz Corporation of America.
    - c) Milwaukee Valve Company.
  - 5. Type 3, Bronze, Swing Check Valves with Metal Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) NIBCO INC.
    - e) Powell, Wm. Co.
    - f) Walworth Co.
  - 6. Type 4, Bronze, Swing Check Valves with Nonmetallic Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) McWane, Inc.; Kennedy Valve Div.
    - f) NIBCO INC.
- B. Bronze Check Valves, General: MSS SP-80.
- C. Type 1 Class 125, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- D. Type 1 Class 125, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- E. Type 1 Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- F. Type 1 Class 150, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- G. Type 1 Class 200, Bronze, Horizontal Lift Check Valves: Bronze body with bronze disc and seat.
- H. Type 1 Class 200, Bronze, Vertical Lift Check Valves: Bronze body with bronze disc and seat.
- I. Type 2 Class 125, Bronze, Horizontal Lift Check Valves:Bronze body with nonmetallic disc and bronze seat.
- J. Type 2, Class 125, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- K. Type 2 Class 150, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- L. Type 2, Class 150, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- M. Type 2 Class 200, Bronze, Horizontal Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- N. Type 2 Class 200, Bronze, Vertical Lift Check Valves: Bronze body with nonmetallic disc and bronze seat.
- O. Type 3 Class 125, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.
- P. Type 3 Class 150, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.
- Q. Type 3 Class 200, Bronze, Swing Check Valves: Bronze body with bronze disc and seat.
- R. Type 4 Class 125, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.
- S. Type 4 Class 150, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

T. Type 4 Class 200, Bronze, Swing Check Valves: Bronze body with nonmetallic disc and bronze seat.

# 9. GRAY-IRON SWING CHECK VALVES

- A. Available Manufacturers:
  - 1. Type I, Gray-Iron Swing Check Valves with Metal Seats:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Flomatic Valves.
    - d) Grinnell Corporation.
    - e) Mueller Co.
    - f) NIBCO INC.
    - g) Powell, Wm. Co.
  - 2. Type II, Gray-Iron Swing Check Valves with Composition to Metal Seats:
    - a) Crane Co.; Crane Valve Group.
    - b) Mueller Co.
    - c) Watts Industries, Inc.; Water Products Div.
  - 3. Grooved-End, Ductile-Iron Swing Check Valves:
    - a) Grinnell Corporation.
    - b) Mueller Co.
    - c) Victaulic Co. of America.
- B. Gray-Iron Swing Check Valves, General: MSS SP-71.
- C. Type I, Class 125, gray-iron, swing check valves with metal seats.
- D. Type I, Class 250, gray-iron, swing check valves with metal seats.
- E. Type II, Class 125, gray-iron, swing check valves with composition to metal seats.
- F. Type II, Class 250, gray-iron, swing check valves with composition to metal seats.
- G. 175-psig (1207-kPa) CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.
- H. 300-psig (2070-kPa) CWP Rating, Grooved-End, Swing Check Valves: Ductile-iron body with grooved or shouldered ends.

# 10. FERROUS-ALLOY WAFER CHECK VALVES

- A. Available Manufacturers:
  - 1. Single-Plate, Ferrous-Alloy, Wafer Check Valves:
    - a) Gestra, Inc.
    - b) McWane, Inc.; Kennedy Valve Div.
    - c) Mueller Co.
    - d) Techno Corp.
  - 2. Dual-Plate, Ferrous-Alloy, Wafer Check Valves:
    - a) Crane Co.; Crane Valve Group.
    - b) Flomatic Valves.
    - c) Gestra, Inc.
    - d) Grinnell Corporation.
    - e) Gulf Valve Co.
    - f) Mueller Steam Specialty.
    - g) NIBCO INC.
    - h) Techno Corp.
    - i) Val-Matic Valve & Mfg. Corp.
  - 3. Dual-Plate, Ferrous-Alloy, Wafer-Lug Check Valves:
    - a) Crane Co.; Crane Valve Group; Crane Valves.
    - b) Gulf Valve Co.
    - c) Valve and Primer Corp.
  - 4. Dual-Plate, Ferrous-Alloy, Double-Flanged-Type Check Valves:
    - a) Crane Co.; Crane Valve Group; Crane Valves.
    - b) Gulf Valve Co.

- c) Techno Corp.
- B. Ferrous-Alloy Wafer Check Valves, General: API 594, spring loaded.
- C. Single-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.
- D. Single-Plate, Class 250 or 300, Ferrous-Alloy, Wafer Check Valves: Flangeless body.
- E. Single-Plate, Class 125 or 150, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.
- F. Single-Plate, Class 250 or 300, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.
- G. Single-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.
- H. Single-Plate, Class 250 or 300, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.
- I. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Wafer Check Valves: Flangeless body.
- J. Dual-Plate, Class 250 or 300, Ferrous-Alloy, Wafer Check Valves: Flangeless body.
- K. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.
- L. Dual-Plate, Class 250 or 300, Ferrous-Alloy, Wafer-Lug Check Valves: Single-flange body.
- M. Dual-Plate, Class 125 or 150, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.
- N. Dual-Plate, Class 250 or 300, Ferrous-Alloy, Double-Flanged Check Valves: Flanged-end body.

### 11. SPRING-LOADED, LIFT-DISC CHECK VALVES

- A. Available Manufacturers:
  - 1. Type I, Wafer Lift-Disc Check Valves:
    - a) Mueller Steam Specialty.
  - 2. Type II, Compact-Wafer, Lift-Disc Check Valves:
    - a) Flomatic Valves.
    - b) GA Industries, Inc.
    - c) Grinnell Corporation.
    - d) Mueller Steam Specialty.
    - e) Multiplex Manufacturing Co.
    - f) NIBCO INC.
  - 3. Type III, Globe Lift-Disc Check Valves:
    - a) Flomatic Valves.
    - b) GA Industries, Inc.
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) Multiplex Manufacturing Co.
    - f) NIBCO INC.
  - 4. Type IV, Threaded Lift-Disc Check Valves:
    - a) Grinnell Corporation.
    - b) Legend Valve & Fitting, Inc.
    - c) Metraflex Co.
    - d) Mueller Steam Specialty.
    - e) NIBCO INC.
- B. Lift-Disc Check Valves, General: FCI 74-1, with spring-loaded bronze or alloy disc and bronze or alloy seat.
- C. Type I, Class 125, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.
- D. Type I, Class 250, Wafer Lift-Disc Check Valves: Wafer style with cast-iron shell with diameter matching companion flanges.
- E. Type II, Class 125, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.
- F. Type II, Class 250, Compact-Wafer, Lift-Disc Check Valves: Compact-wafer style with cast-iron shell with diameter made to fit within bolt circle.

- G. Type III, Class 125, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.
- H. Type III, Class 250, Globe Lift-Disc Check Valves: Globe style with cast-iron shell and flanged ends.
- I. Type IV, Class 125, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.
- J. Type IV, Class 150, Threaded Lift-Disc Check Valves: Threaded style with bronze shell and threaded ends.

### 12. BRONZE GATE VALVES

- A. Available Manufacturers:
  - 1. Type 1, Bronze, Nonrising-Stem Gate Valves:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) NIBCO INC.
    - f) Powell, Wm. Co.
  - 2. Type 2, Bronze, Rising-Stem, Solid-Wedge Gate Valves:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) NIBCO INC.
    - f) Powell, Wm. Co.
  - 3. Type 3, Bronze, Rising-Stem, Split-Wedge Gate Valves:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group; Jenkins Valves.
    - c) Grinnell Corporation.
    - d) NIBCO INC.
- B. Bronze Gate Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- C. Type 1 Class 125 Bronze Gate Valves: Bronze body, nonrising stem, bronze solid wedge, union-ring bonnet.
- D. Type 1 Class 150 Bronze Gate Valves: Bronze body, nonrising stem, bronze solid wedge, union-ring bonnet.
- E. Type 1 Class 200 Bronze Gate Valves: Bronze body, nonrising stem, bronze solid wedge, union-ring bonnet.
- F. Type 2 Class 125 Bronze Gate Valves: Bronze body, rising stem, bronze solid wedge, union-ring bonnet.
- G. Type 2 Class 150 Bronze Gate Valves: Bronze body, rising stem, bronze solid wedge, union-ring bonnet.
- H. Type 2 Class 200 Bronze Gate Valves: Bronze body, rising stem, bronze solid wedge, union-ring bonnet.
- I. Type 3 Class 125 Bronze Gate Valves: Bronze body, rising stem, bronze split wedge, union-ring bonnet.
- J. Type 3 Class 150 Bronze Gate Valves: Bronze body, rising stem, bronze split wedge, union-ring bonnet.
- K. Type 3 Class 200 Bronze Gate Valves: Bronze body, rising stem, bronze split wedge, union-ring bonnet.

# 13. CAST-IRON GATE VALVES

- A. Available Manufacturers:
  - 1. Type I, Cast-Iron, Nonrising-Stem Gate Valves:
    - a) Crane Co.; Crane Valve Group.
    - b) Grinnell Corporation.
    - c) Hammond Valve.
    - d) NIBCO INC.
    - e) Powell, Wm. Co.
    - f) Walworth Co.
  - 2. Type I, Cast-Iron, Rising-Stem Gate Valves:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) Hammond Valve.

- e) NIBCO INC.
- f) Powell, Wm. Co.
- g) Walworth Co.
- B. Cast-Iron Gate Valves, General: MSS SP-70, Type I.
- C. Class 125, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.
- D. Class 125, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.
- E. Class 125, NRS, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, nonrising stem, and solid-wedge disc.
- F. Class 125, OS&Y, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, rising stem, and solidwedge disc.
- G. Class 250, NRS, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, nonrising stem, and solid-wedge disc.
- H. Class 250, OS&Y, Bronze-Mounted, Cast-Iron Gate Valves: Cast-iron body with bronze trim, rising stem, and solid-wedge disc.
- I. Class 250, NRS, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, nonrising stem, and solid-wedge disc.
- J. Class 250, OS&Y, All-Iron, Cast-Iron Gate Valves: Cast-iron body with cast-iron trim, rising stem, and solidwedge disc.

### 14. BRONZE GLOBE VALVES

- A. Available Manufacturers:
  - 1. Type 1, Bronze Globe Valves with Metal Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) NIBCO INC.
    - f) Powell, Wm. Co.
  - 2. Type 2, Bronze Globe Valves with Nonmetallic Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group,
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) McWane, Inc.; Kennedy Valve Div.
    - f) Milwaukee Valve Company.
    - g) NIBCO INC.
    - h) Powell, Wm. Co.
  - 3. Type 3, Bronze Globe Valves with Renewable Seat and Metal Disc:
    - a) Cincinnati Valve Co.
    - b) Crane Co.; Crane Valve Group.
    - c) Grinnell Corporation.
    - d) Hammond Valve.
    - e) NIBCO INC.
- B. Bronze Globe Valves, General: MSS SP-80, with ferrous-alloy handwheel.
- C. Type 1 Class 125 Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.
- D. Type 1 Class 150 Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.
- E. Type 1 Class 200 Bronze Globe Valves: Bronze body with bronze disc and union-ring bonnet.
- F. Type 2 Class 125 Bronze Globe Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.

- G. Type 2 Class 150 Bronze Globe Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.
- H. Type 2 Class 200 Bronze Globe Valves: Bronze body with nonmetallic PTFE or TFE disc and union-ring bonnet.
- I. Type 3 Class 125 Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include unionring bonnet.
- J. Type 3 Class 150 Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include unionring bonnet.
- K. Type 3 Class 200 Bronze Globe Valves: Bronze body with bronze disc and renewable seat. Include unionring bonnet.

### 15. CAST-IRON GLOBE VALVES

- A. Available Manufacturers:
  - 1. Type I, Cast-Iron Globe Valves with Metal Seats:
    - a) Cincinnati Valve Co.
      - b) Crane Co.; Crane Valve Group.
      - c) Grinnell Corporation.
      - d) Hammond Valve.
      - e) Milwaukee Valve Company.
      - f) NIBCO INC.
      - g) Powell, Wm. Co.
- B. Cast-Iron Globe Valves, General: MSS SP-85.
- C. Type I, Class 125, Cast-Iron Globe Valves: Gray-iron body with bronze seats.
- D. Type I, Class 250, Cast-Iron Globe Valves: Gray-iron body with bronze seats.

### **III.EXECUTION**

### 1. EXAMINATION

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

### 2. VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
  - 1. Shutoff Service: Ball, butterfly, or gate, gate, or plug valves.
  - 2. Throttling Service: Angle, ball, butterfly, or globe valves.
  - 3. Pump Discharge: Spring-loaded, lift-disc check valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Domestic Water Piping: Use the following types of valves:
  - 1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125, 150, 200, bronze.

- 2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125, 250, cast iron.
- 3. Ball Valves, NPS 2 (DN 50) and Smaller: One, Two, Three-piece, 400-psig (2760-kPa)or 600-psig (4140-kPa) CWP rating, copper alloy.
- 4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150 or, 300, ferrous alloy.
- Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Flangeless or Single-flange Flanged, 150-psig (1035kPa) or 175-psig (1207-kPa) or 200-psig (1380-kPa) 250-psig (1725-kPa) or 300-psig (2070-kPa) CWP rating, ferrous alloy, with EPDM liner.
- 6. Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) 300-psig (2070-kPa) CWP rating.
- 7. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125 or 150 or 200, horizontal or vertical, bronze.
- 8. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 125 or 150 or 200, bronze.
- 9. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125 or 250, gray iron.
- 10. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) or 300-psig (2070-kPa) CWP rating.
- 11. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Single or Dual-plate, wafer or wafer-lug or doubleflanged, Class 125 or 150 250 or 300, ferrous alloy.
- 12. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 125 minimum or 150 or 200.
- 13. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 (DN 65) and Larger: Type I or II, Class 125 or 250, cast iron.
- 14. Gate Valves, NPS 2 (DN 50) and Smaller: Type 1 or 2, Class 125, 150 or 200, bronze.
- 15. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125 or 250, NRS or OS&Y, bronze-mounted cast iron.
- 16. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125, 150 or 200, bronze.
- 17. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125 or 250, bronze-mounted cast iron.
- 18. Plug Valves, NPS 2 (DN 50) and Larger: Class 125 or 150, 250 or 300, lubricated-type with FDAapproved-material sealant or nonlubricated-type, cast iron.
- 19. Resilient-Seated, Eccentric Plug Valves, NPS 3 (DN 80) and Larger: 175-psig (1207-kPa) CWP rating, cast iron.
- D. Heating Water Piping: Use the following types of valves:
  - 1. Angle Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125 or 150 or 200, bronze.
  - 2. Angle Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125 or 250, cast iron.
  - 3. Ball Valves, NPS 2 (DN 50) and Smaller: One or Two or Three-piece, 400-psig (2760-kPa) or 600-psig (4140-kPa) CWP rating, copper alloy.
  - 4. Ball Valves, NPS 2-1/2 (DN 65) and Larger: Class 150 or 300, ferrous alloy.
  - Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: Flangeless or Single-flange Flanged, 150-psig (1035kPa) or 175-psig (1207-kPa) or 200-psig (1380-kPa) 250-psig (1725-kPa) or 300-psig (2070-kPa) CWP rating, ferrous alloy, with EPDM liner.
  - 6. High-Pressure Butterfly Valves, NPS 3 (DN 80) and Larger: Flangeless or Single-flange, Class 150 or 300.
  - Grooved-End, Ductile-Iron Butterfly Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) or 300psig (2070-kPa) CWP rating.
  - 8. Lift Check Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125 or 150 or 200, horizontal or vertical, bronze.
  - 9. Swing Check Valves, NPS 2 (DN 50) and Smaller: Type 4, Class 125 or 150 or 200, bronze.
  - 10. Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: Type II, Class 125 or 250, gray iron.
  - 11. Grooved-End, Ductile-Iron, Swing Check Valves, NPS 2-1/2 (DN 65) and Larger: 175-psig (1207-kPa) or 300-psig (2070-kPa) CWP rating.
  - 12. Wafer Check Valves, NPS 2-1/2 (DN 65) and Larger: Single or Dual-plate, wafer or wafer-lug or doubleflanged, Class 125 or 150 or 250 or 300, ferrous alloy.
  - 13. Spring-Loaded, Lift-Disc Check Valves, NPS 2 (DN 50) and Smaller: Type IV, Class 125 minimum or 150 or 200.
  - 14. Spring-Loaded, Lift-Disc Check Valves, NPS 2-1/2 (DN 65) and Larger: Type I or II or III, Class 125 or 250, cast iron.
  - 15. Gate Valves, NPS 2 (DN 50) and Smaller: Type 2 or 3, Class 125 or 150 or 200, bronze.
  - 16. Gate Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125 or 250, NRS or OS&Y, bronze-mounted cast iron.

- 17. Globe Valves, NPS 2 (DN 50) and Smaller: Type 2, Class 125 or 150 or 200, bronze.
- 18. Globe Valves, NPS 2-1/2 (DN 65) and Larger: Type I, Class 125 or 250, bronze-mounted cast iron.
- 19. Plug Valves, NPS 2 (DN 50) and Larger: Class 125 or 150, 250 or 300, lubricated or nonlubricated-type, cast iron.
- 20. Resilient-Seated, Eccentric Plug Valves, NPS 3 (DN 80) and Larger: 175-psig (1207-kPa) CWP rating, cast iron.
- E. Select valves, except wafer and flangeless types, with the following end connections:
  - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Solder-joint or threaded ends, except provide valves with threaded ends for condenser water, heating hot water, steam, and steam condensate services.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
  - 3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.
  - 4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded ends.
  - 5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends.
  - 6. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.
  - 7. For Grooved-End, Copper Tubing and Steel Piping: Valve ends may be grooved. Do not use for steam or steam condensate piping.

# 3. VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.
- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install check valves for proper direction of flow and as follows:
  - 1. Swing Check Valves: In horizontal position with hinge pin level.
  - 2. Dual-Plate Check Valves: In horizontal or vertical position, between flanges.
  - 3. Lift Check Valves: With stem upright and plumb.

# 4. JOINT CONSTRUCTION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

### 5. ADJUSTING

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

### END OF SECTION 15110

# SECTION 15141 - DOMESTIC WATER PIPING (NO PVC)

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes domestic water piping inside the building.
- B. As per Owner's requirements, the use of PVC materials is not permitted in this Project. PCV materials may only be used when absolutely required to connect new non-PVC piping to existing PVC piping that, for reason's beyond the Owner's and Contractor's control, will not be replaced.

# 3. DEFINITIONS

A. PEX: Crosslinked polyethylene plastic.

# 4. PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing domestic water piping systems with 125 psig (860 kPa), unless otherwise indicated.

# 5. SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in Part 3 "Cleaning" Article.
- C. Field quality-control test reports.

# 6. QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping System Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- C. Comply with NSF 61, "Drinking Water System Components Health Effects; Sections 1 through 9," for potable domestic water piping and components.

# II.PRODUCTS

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

# 2. PIPING MATERIALS

- A. Refer to Part 3 "Pipe and Fitting Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

# 3. COPPER TUBE AND FITTINGS

- A. Soft Copper Tube: ASTM B 88, Types K and L (ASTM B 88M, Types A and B), water tube, annealed temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solderjoint fittings. Furnish wrought-copper fittings if indicated.

- 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
- 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-tometal seating surfaces, and solder-joint or threaded ends.
- B. Hard Copper Tube: ASTM B 88, Types L and M (ASTM B 88M, Types B and C), water tube, drawn temper.
  - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solderjoint fittings. Furnish wrought-copper fittings if indicated.
  - 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Furnish Class 300 flanges if required to match piping.
  - 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-tometal seating surfaces, and solder-joint or threaded ends.
  - 4. Copper, Grooved-End Fittings: ASTM B 75 (ASTM B 75M) copper tube or ASTM B 584 bronze castings.
  - a) Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

# **III.EXECUTION**

### 1. PIPE AND FITTING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Aboveground Domestic Water Piping: Use any of the following piping materials for each size range:
  - 1. NPS 1 (DN 25) and Smaller: Hard copper tube, Type L (Type B), Type M (Type C); copper pressure fittings; and soldered joints.
  - 2. NPS 1 (DN 25) and Smaller: PEX distribution system, manifold, insert fittings, and crimped joints.
  - 3. NPS 1-1/4 and NPS 1-1/2 (DN 32 and DN 40): Hard copper tube, Type L (Type B) or Type M (Type C); copper pressure fittings; and soldered joints.
  - 4. NPS 2 (DN 50): Hard copper tube, Type L (Type B) or Type M (Type C); copper pressure fittings; and soldered joints.
  - 5. NPS 2 (DN 50): Hard copper tube, Type L (Type B) or Type M (Type C) with grooved ends; copper grooved-end fittings; grooved-end-tube couplings; and grooved joints.

### 2. PIPING INSTALLATION

- A. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Install under-building-slab copper tubing according to CDA's "Copper Tube Handbook."
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Pressure gages are specified in Division 15 Section "Meters and Gages," and drain valves and strainers are specified in Division 15 Section "Plumbing Specialties."
- F. Install domestic water piping level with 0.25 percent slope downward toward drain without pitch and plumb.

### 3. JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.
- C. Grooved Joints: Assemble joints with grooved-end-pipe or grooved-end-tube coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- D. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

#### 4. HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 15 Section "Mechanical Vibration and Seismic Controls."
- B. Pipe hanger and support devices are specified in Division 15 Section "Hangers and Supports." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
    - a) 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b) Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    - c) Longer Than 100 Feet (30 m): MSS Type 49, spring cushion rolls, if indicated.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Division 15 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- F. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
  - 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
  - 3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
  - 4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
  - 5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
  - 6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.
  - 7. NPS 8 (DN 200): 10 feet (3 m) with 3/4-inch (19-mm) rod.
- G. Install supports for vertical copper tubing every 10 feet (3 m).
- H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

# 5. CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve, and extend and connect to the following:
  - 1. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Refer to Division 15 Section "Plumbing Fixtures."
  - Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

# 6. FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

- 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
  - a) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  - b) Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
  - 1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
  - Test for leaks and defects in new piping and parts of existing piping 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 piping tested.
  - 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
  - 6. Prepare reports for tests and required corrective action.

# 7. ADJUSTING

- A. Perform the following adjustments before operation:
  - 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Open shutoff valves to fully open position.
  - 3. Open throttling valves to proper setting.
  - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a) Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    - b) Adjust calibrated balancing valves to flows indicated.
  - 5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
  - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

# 8. CLEANING

- A. Clean and disinfect potable and non-potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
  - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures 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 and isolate system according to either of the following:
      - (1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
      - (2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
    - c) Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.

- d) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

# **SECTION 15145 - DOMESTIC WATER PIPING SPECIALTIES**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following domestic water piping specialties:
  - 1. Vacuum breakers.
  - 2. Backflow preventers.
  - 3. Water pressure-reducing valves.
  - 4. Balancing valves.
  - 5. Temperature-actuated water mixing valves.
  - 6. Strainers.
  - 7. Outlet boxes.
  - 8. Hose stations.
  - 9. Hose bibbs.
  - 10. Drain valves.
  - 11. Water hammer arresters.
  - 12. Trap-seal primer valves.
  - 13. Trap-seal primer systems.
- B. Related Sections include the following:
  - 1. Division 15 Section "Meters and Gages" for thermometers, pressure gages, and flow meters in domestic water piping.
  - 2. Division 15 Section "Domestic Water Piping" for water meters.
  - 3. Division 15 Section "Medical Plumbing Fixtures" for thermostatic mixing valves for sitz baths, thermostatic mixing-valve assemblies for hydrotherapy equipment, and outlet boxes for dialysis equipment.
  - 4. Division 15 Section "Emergency Plumbing Fixtures" for water tempering equipment.
  - 5. Division 15 Section "Drinking Fountains and Water Coolers" for water filters for water coolers.
  - 6. Division 15 Section "Water Filtration Equipment" for water filters in domestic water piping.

# 3. PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 30 psig, unless otherwise indicated.

# 4. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

# 5. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:
  - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
  - 2. Comply with NSF 61, "Drinking Water System Components Health Effects; Sections 1 through 9."

# **II.PRODUCTS**

# 1. VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Ames Co.
    - b) Cash Acme.
    - c) Conbraco Industries, Inc.
    - d) FEBCO; SPX Valves & Controls.
    - e) Toro Company (The); Irrigation Div.
    - f) Watts Industries, Inc.; Water Products Div.
    - g) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1001.
  - 3. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
  - 4. Body: Bronze.
  - 5. Inlet and Outlet Connections: Threaded.
  - 6. Finish: Rough bronze, Chrome plated.
- B. Hose-Connection Vacuum Breakers:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Cash Acme.
    - b) Conbraco Industries, Inc.
    - c) Legend Valve.
    - d) MIFAB, Inc.
    - e) Prier Products, Inc.
    - f) Watts Industries, Inc.; Water Products Div.
    - g) Zurn Plumbing Products Group; Light Commercial Operation.
    - h) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1011.
  - 3. Body: Bronze, nonremovable, with manual drain.
  - 4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
  - 5. Finish: Chrome or nickel plated, Rough bronze.
- C. Pressure Vacuum Breakers:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Ames Co.
    - b) Conbraco Industries, Inc.
    - c) FEBCO; SPX Valves & Controls.
    - d) Flomatic Corporation.
    - e) Toro Company (The); Irrigation Div.
    - f) Watts Industries, Inc.; Water Products Div.
    - g) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1020.
  - 3. Operation: Continuous-pressure applications.

# 2. BACKFLOW PREVENTERS

- A. Intermediate Atmospheric-Vent Backflow Preventers:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Cash Acme.
    - b) Conbraco Industries, Inc.
    - c) FEBCO; SPX Valves & Controls.
    - d) Honeywell Water Controls.
    - e) Legend Valve.
    - f) Watts Industries, Inc.; Water Products Div.
    - g) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1012.
  - 3. Operation: Continuous-pressure applications.

- 4. Size: NPS 1/2 (DN 15), NPS 3/4 (DN 20).
- B. Double-Check Backflow-Prevention Assemblies:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Ames Co.b) Conbraco Industries, Inc.
    - c) FEBCO; SPX Valves & Controls.
    - d) Flomatic Corporation.
    - e) Watts Industries, Inc.; Water Products Div.
    - f) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1015.
  - 3. Operation: Continuous-pressure applications, unless otherwise indicated.
- C. Dual-Check-Valve Backflow Preventers:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Cash Acme.
    - b) Conbraco Industries, Inc.
    - c) FEBCO; SPX Valves & Controls.
    - d) Flomatic Corporation.
    - e) Ford Meter Box Company, Inc..
    - f) Honeywell Water Controls.
    - g) Legend Valve.
    - h) McDonald, A. Y. Mfg. Co.
    - i) Mueller Co.; Water Products Div.
    - j) Watts Industries, Inc.; Water Products Div.
    - k) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1024.
  - 3. Operation: Continuous-pressure applications.
- D. Reduced-Pressure-Detector, Fire-Protection Backflow-Preventer Assemblies:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Ames Co.
    - b) Conbraco Industries, Inc.
    - c) FEBCO; SPX Valves & Controls.
    - d) Watts Industries, Inc.; Water Products Div.
    - e) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1047 and FMG approved or UL listed.
  - 3. Operation: Continuous-pressure applications.

# 3. WATER PRESSURE-REDUCING VALVES

- A. Water Regulators:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Cash Acme.
    - b) Conbraco Industries, Inc.
    - c) Honeywell Water Controls.
    - d) Watts Industries, Inc.; Water Products Div.
    - e) Zurn Plumbing Products Group; Wilkins Div.
  - 2. Standard: ASSE 1003.
  - 3. Pressure Rating: Initial working pressure of 150 psig (1035 kPa).
- B. Water Control Valves:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) CLA-VAL Automatic Control Valves.
    - b) Flomatic Corporation.

- c) OCV Control Valves.
- d) Watts Industries, Inc.; Ames Fluid Control Systems.
- e) Watts Industries, Inc.; Watts ACV.
- f) Zurn Plumbing Products Group; Wilkins Div.
- 2. Description: Pilot-operation, diaphragm-type, single-seated main water control valve.
- 3. Pressure Rating: Initial working pressure of 150 psig (1035 kPa) minimum with AWWA C550 or FDAapproved, interior epoxy coating. Include small pilot-control valve, restrictor device, specialty fittings, and sensor piping.
- 4. Main Valve Body: Cast- or ductile-iron body with AWWA C550 or FDA-approved, interior epoxy coating; or stainless-steel body.
  - a) Size: As indicated in drawings.
  - b) Pattern: Globe-valve design.
  - c) Trim: Stainless steel.
- 5. Design Flow: As indicated in drawings.
- 6. Design Inlet Pressure: As indicated in drawings.
- 7. Design Outlet Pressure Setting: As indicated in drawings.
- 8. End Connections: Threaded for NPS 2 (DN 50) and smaller; for NPS 2-1/2 (DN 65) and larger.

#### 4. STRAINERS FOR DOMESTIC WATER PIPING

- A. Y-Pattern Strainers:
  - 1. Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
  - 2. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 (DN 65) and larger.
  - 3. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
  - 4. Screen: Stainless steel with round perforations, unless otherwise indicated.
  - 5. Drain: Factory-installed, hose-end drain valve.

#### HOSE BIBBS 5.

- A. Hose Bibbs:
  - 1. Standard: ASME A112.18.1 for sediment faucets.
  - 2. Body Material: Bronze.
  - 3. Seat: Bronze, replaceable.
  - 4. Supply Connections: NPS 1/2 or NPS 3/4 (DN 15 or DN 20) threaded or solder-joint inlet.
  - 5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
  - 6. Pressure Rating: 125 psig (860 kPa).
  - 7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
  - 8. Finish for Equipment Rooms: Rough bronze, unless otherwise indicated.
  - 9. Provide operating key type when indicated. Include operating key with each operating-key hose bibb.

#### **DRAIN VALVES** 6.

- A. Ball-Valve-Type, Hose-End Drain Valves:
  - 1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
  - 2. Pressure Rating: 400-psig (2760-kPa) minimum CWP.
  - 3. Size: NPS 3/4 (DN 20).
  - Body: Copper alloy.
  - 5. Ball: Chrome-plated brass.
  - 6. Seats and Seals: Replaceable.
  - 7. Handle: Vinyl-covered steel.
  - 8. Inlet: Threaded or solder joint.
  - 9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.
- B. Gate-Valve-Type, Hose-End Drain Valves:
  - 1. Standard: MSS SP-80 for gate valves.
  - 2. Pressure Rating: Class 125.

  - Size: NPS 3/4 (DN 20).
     Body: ASTM B 62 bronze.

- 5. Inlet: NPS 3/4 (DN 20) threaded or solder joint.
- 6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.
- C. Stop-and-Waste Drain Valves:
  - 1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
  - 2. Pressure Rating: 200-psig (1380-kPa) minimum CWP or Class 125.
  - 3. Size: NPS 3/4 (DN 20).
  - 4. Body: Copper alloy or ASTM B 62 bronze.
  - 5. Drain: NPS 1/8 (DN 6) side outlet with cap.

#### 7. WATER HAMMER ARRESTERS

- A. Water Hammer Arresters:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) AMTROL, Inc.
    - b) Josam Company.
    - c) MIFAB, Inc.
    - d) PPP Inc.
    - e) Sioux Chief Manufacturing Company, Inc.
    - f) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - g) Tyler Pipe; Wade Div.
    - h) Watts Drainage Products Inc.
    - i) Zurn Plumbing Products Group; Specification Drainage Operation.
  - 2. Standard: ASSE 1010 or PDI-WH 201.
  - 3. Type: Metal bellows, Copper tube with piston.
  - 4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

# 8. TRAP-SEAL PRIMER VALVES

- A. Supply-Type, Trap-Seal Primer Valves:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) MIFAB, Inc.
    - b) PPP Inc.
    - c) Sioux Chief Manufacturing Company, Inc.
    - d) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - e) Watts Industries, Inc.; Water Products Div.
  - 2. Standard: ASSE 1018.
  - 3. Pressure Rating: 125 psig (860 kPa) minimum.
  - 4. Body: Bronze.
  - 5. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
  - 6. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
  - 7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- B. Drainage-Type, Trap-Seal Primer Valves:
  - Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

     a) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - 2. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 (DN 10) minimum, trap makeup connection.
  - 3. Size: NPS 1-1/4 (DN 32) minimum.
  - 4. Material: Chrome-plated, cast brass.

# 9. TRAP-SEAL PRIMER SYSTEMS

- A. Trap-Seal Primer Systems:
  - Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

     a) PPP Inc.
  - 2. Standard: ASSE 1044,
  - 3. Piping: NPS 3/4, ASTM B 88, Type L (DN 20, ASTM B 88M, Type B); copper, water tubing.

- 4. Cabinet: Recessed-mounting steel box with stainless-steel cover.
- 5. Number Outlets: Four.
- 6. Size Outlets: NPS 1/2 (DN 15), NPS 5/8 (DN 18).

#### **III.EXECUTION**

#### 1. INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
  - 1. Locate backflow preventers in same room as connected equipment or system.
  - 2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
  - 3. Do not install bypass piping around backflow preventers.
- C. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.
- D. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.
- E. Install freeze-resistant yard hydrants with riser pipe set in concrete or pavement. Do not encase canister in concrete.
- F. Install water hammer arresters in water piping according to PDI-WH 201.
- G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- H. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.
- I. Install trap-seal primer systems with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust system for proper flow.

#### 2. CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 16 Section "Grounding and Bonding."
- C. Connect wiring according to Division 16 Section "Conductors and Cables."

#### 3. FIELD QUALITY CONTROL

A. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

#### 4. ADJUSTING

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

# SECTION 15151 - SANITARY WASTE AND VENT PIPING (NO PVC)

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following for soil, waste, and vent piping inside the building:
  - 1. Pipe, tube, and fittings.
  - 2. Special pipe fittings.
- B. According to Owner's requirements, the use of PVC materials is not permitted in this Project. PCV materials may only be used when absolutely required to connect new non-PVC piping to existing PVC piping that, for reason's beyond the Owner's and Contractor's control, will not be replaced.

# 3. DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. EPDM: Ethylene-propylene-diene terpolymer rubber.
- C. LLDPE: Linear, low-density polyethylene plastic.
- D. NBR: Acrylonitrile-butadiene rubber.
- E. PE: Polyethylene plastic.
- F. TPE: Thermoplastic elastomer.

# 4. PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

# 5. SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Field quality-control inspection and test reports.

# 6. QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

# **II.PRODUCTS**

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

# 2. PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

#### 3. HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).
- B. Gaskets: ASTM C 564, rubber.
- C. Lead and Oakum: ASTM B 29, pure lead and oakum or hemp fiber.

#### 4. SPECIAL PIPE FITTINGS

- A. Sovent Drainage System Fittings: ASME B16.45 or ASSE 1043, cast-iron aerator and deaerator fittings.
- B. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.
  - 1. Sleeve Materials:
    - a) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
- C. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

#### **III.EXECUTION**

#### 1. EXCAVATION

A. Refer to Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

#### 2. PIPING APPLICATIONS

- A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.
- B. Above and belowground, sovent drainage system with soil, waste, and vent piping materials indicated.

#### 3. PIPING INSTALLATION

- A. Sanitary sewer piping outside the building is specified in Division 2 Section "Sanitary Sewerage."
- B. Basic piping installation requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."
- C. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 15 Section "Mechanical Vibration and Seismic Controls."
- D. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.
- E. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.
- F. Install wall-penetration fitting at each service pipe penetration through foundation wall. Make installation watertight.
- G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

- 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
- 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
- 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- J. Install engineered soil and waste drainage and vent piping systems as follows:
  - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
  - 2. Sovent Drainage System: Comply with ASSE 1043 and sovent fitting manufacturer's written installation instructions.
  - 3. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- K. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

#### 4. JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 15 Section "Basic Mechanical Materials and Methods."

#### 5. HANGER AND SUPPORT INSTALLATION

- A. Seismic-restraint devices are specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."
- B. Pipe hangers and supports are specified in Division 15 Section "Hangers and Supports." Install the following:
  - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
  - 2. Install individual, straight, horizontal piping runs according to the following:
    - a) 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
- C. Install supports according to Division 15 Section "Hangers and Supports."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.
- F. Install supports for vertical ABS piping every 48 inches (1200 mm).
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

# 6. CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 (DN 65) and larger.

# 7. FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
  - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

- 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
  - 1. Test for leaks and defects in new piping and parts of existing piping 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 piping tested.
  - 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa). From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

# 8. CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

# **SECTION 15155 - DRAINAGE PIPING SPECIALTIES**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following drainage piping specialties:
  - 1. Cleanouts.
  - 2. Floor drains.
  - 3. Through-penetration firestop assemblies.
  - 4. Roof drains.
  - 5. Miscellaneous drainage piping specialties.

# 3. DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. FRP: Fiberglass-reinforced plastic.
- D. HDPE: High-density polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PUR: Polyurethane plastic.
- H. PVC: Polyvinyl chloride plastic.

# 4. SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
  - 1. FOG disposal systems.
  - 2. Grease interceptors.
  - 3. Grease removal devices.
  - 4. Oil interceptors.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

# 5. QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

# 6. COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate size and location of roof penetrations.

# II.PRODUCTS

# 1. CLEANOUTS

- A. Exposed Metal Cleanouts:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - b) Tyler Pipe; Wade Div.
    - c) Watts Drainage Products Inc.
    - d) Zurn Plumbing Products Group; Specification Drainage Operation.
  - 2. Standard: ASME A112.36.2M for cast iron or ASME A112.3.1 for stainless steel for cleanout test tee.
  - 3. Size: Same as connected drainage piping
  - 4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee or Stainless-steel tee with side cleanout as required to match connected piping.
  - 5. Closure: Countersunk or Countersunk or raised-head or Raised-head, brass cast-iron plastic plug.
  - 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Metal Floor Cleanouts:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Oatey.
    - b) Sioux Chief Manufacturing Company, Inc.
    - c) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - d) Tyler Pipe; Wade Div.
    - e) Watts Drainage Products Inc.
    - f) Zurn Plumbing Products Group; Light Commercial Operation.
    - g) Zurn Plumbing Products Group; Specification Drainage Operation.
    - h) Kusel Equipment Co.
    - i) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - 2. Standard: ASME A112.3.1.
  - 3. Size: Same as connected branch.
- C. Plastic Floor Cleanouts:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Canplas LLC.
    - b) IPS Corporation.
    - c) NDS Inc.
    - d) Plastic Oddities; a division of Diverse Corporate Technologies.
    - e) Sioux Chief Manufacturing Company, Inc.
    - f) Zurn Plumbing Products Group; Light Commercial Operation.
  - 2. Size: Same as connected branch.
  - 3. Body: PVC.
  - 4. Closure Plug: PVC.
  - 5. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

# 2. FLOOR DRAINS

- A. Plastic Floor Drains:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Canplas LLC.
    - b) IPS Corporation.
    - c) Oatey.
    - d) Plastic Oddities; a division of Diverse Corporate Technologies.
    - e) Sioux Chief Manufacturing Company, Inc.
    - f) Zurn Plumbing Products Group; Light Commercial Operation.
  - 2. Standard: ASME A112.6.3.
  - 3. Material: PVC.

- 4. Seepage Flange: Not required.
- 5. Clamping Device: Not required.
- 6. Outlet: Bottomor Side.
- 7. Sediment Bucket: Not required.
- Top or Strainer Material: Bronz or Plastic.
   Top of Body and Strainer Finish: Nickel bronze or polished bronze or Rough bronze.
- 10. Top Shape: Round or Square.
- 11. Dimensions of Top or Strainer: As indicated in drawings.
- 12. Trap Material: Cast iron, plastic drainage piping.
- 13. Trap Pattern: Standard P-trap.

#### 3. **ROOF DRAINS**

- A. Metal Roof Drains:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Olympic Manufacturing Group.
    - b) Portals Plus, Inc.
    - c) Thaler Metal Industries Ltd.
    - d) Marathon Roofing Products.
    - e) MIFAB. Inc.
    - f) Portals Plus. Inc.
    - g) Prier Products, Inc.
    - h) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - Tyler Pipe; Wade Div. i)
    - Watts Drainage Products Inc. i)
    - Zurn Plumbing Products Group: Light Commercial Operation. k)
    - Zurn Plumbing Products Group; Specification Drainage Operation. I)
    - m) LSP Products Group, Inc.
    - n) Marathon Roofing Products.
    - o) Olympic Manufacturing Group.
    - p) Thaler Metal Industries Ltd.
    - Thunderbird Products. a)
  - 2. Standard: ASME A112.21.2M.
  - 3. Pattern: Balcony or Canopy or Cornice or Promenade-deck or Roof or Scupper drain.
  - 4. Body Material: Cast iron.
  - 5. Dimensions of Body: see drawing
  - 6. Combination Flashing Ring and Gravel Stop: Required.
  - 7. Outlet: Bottom or Side.
  - 8. Dome Material: Cast iron.
  - 9. Extension Collars: Required.
  - 10. Underdeck Clamp: Required.
  - 11. Sump Receiver: Required.
- B. Plastic Roof Drains:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Canplas LLC.
    - b) LSP Products Group, Inc.
    - c) Marathon Roofing Products.
    - d) Olympic Manufacturing Group.
    - e) Plastic Oddities; a division of Diverse Corporate Technologies.
    - Portals Plus, Inc. f)
    - g) Sioux Chief Manufacturing Company, Inc.
    - h) Town & Country Plastics, Inc.
    - Zurn Plumbing Products Group; Light Commercial Operation. i)
  - 2. Standard: ASME A112.21.2M.
  - 3. Pattern: Balcony or Canopy or Roof or Scupper drain.
  - 4. Body Material: ABS or PVC or PUR.

- 5. Dimensions of Body: As indicated in drawings.
- 6. Combination Flashing Ring and Gravel Stop: Required.
- 7. Outlet: Bottom or Side.
- 8. Dome Material: ABS or PVC or PUR.
- 9. Underdeck Clamp: Required.

#### 4. MISCELLANEOUS DRAINAGE PIPING SPECIALTIES

- A. Downspout Boots:
  - 1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 (DN 100) outlet; and shop-applied bituminous coating.
  - 2. Size: Inlet size to match downspout.
  - 3. Description: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.
  - 4. Size: Same as or larger than connected downspout.

#### **III.EXECUTION**

#### 1. INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  - 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
  - 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
- G. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 7.
  - 1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
  - 2. Position roof drains for easy access and maintenance.

# 2. CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

# 3. PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

# **SECTION 15156 - DRAINAGE PIPING SPECIALTIES (NO PVC)**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following drainage piping specialties:
  - 1. Cleanouts.
  - 2. Floor drains.
  - 3. Through-penetration firestop assemblies.
- B. According to Owner's requirements, the use of PVC materials is not permitted in this Project. PVC materials may only be used when absolutely required to connect new non-PVC piping to existing PVC piping that, for reason's beyond the Owner's and Contractor's control, will not be replaced.

# 3. DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. FOG: Fats, oils, and greases.
- C. FRP: Fiberglass-reinforced plastic.
- D. HDPE: High-density polyethylene plastic.
- E. PE: Polyethylene plastic.
- F. PP: Polypropylene plastic.
- G. PUR: Polyurethane plastic.

# 4. SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
  - 1. FOG disposal systems.
  - 2. Grease interceptors.
  - 3. Grease removal devices.
  - 4. Oil interceptors.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

# 5. QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary and storm piping specialty components.

# 6. COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 3.
- B. Coordinate size and location of roof penetrations.

# II.PRODUCTS

#### 1. CLEANOUTS

- A. Exposed Metal Cleanouts:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - b) Tyler Pipe; Wade Div.
    - c) Watts Drainage Products Inc.
    - d) Zurn Plumbing Products Group; Specification Drainage Operation.
  - 2. Standard: ASME A112.36.2M for cast iron or ASME A112.3.1 for stainless steel for cleanout test tee.
  - 3. Size: Same as connected drainage piping
  - 4. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee or Stainless-steel tee with side cleanout as required to match connected piping.
  - 5. Closure: Countersunk or Countersunk or raised-head or Raised-head, brass cast-iron plastic plug.
  - 6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
- B. Metal Floor Cleanouts:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) Oatey.
    - b) Sioux Chief Manufacturing Company, Inc.
    - c) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    - d) Tyler Pipe; Wade Div.
    - e) Watts Drainage Products Inc.
    - f) Zurn Plumbing Products Group; Light Commercial Operation.
    - g) Zurn Plumbing Products Group; Specification Drainage Operation.
    - h) Kusel Equipment Co.
    - i) Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - 2. Standard: ASME A112.3.1.
  - 3. Size: Same as connected branch.

#### 2. FLOOR DRAINS

- A. Metal Floor Drains:
  - 1. As indicated in drawings.

#### **III.EXECUTION**

#### 1. INSTALLATION

- A. Refer to Division 15 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  - 1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
  - 2. Locate at each change in direction of piping greater than 45 degrees.
  - 3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
  - 4. Locate at base of each vertical soil and waste stack.
- C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- F. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.

# 2. CONNECTIONS

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

# 3. PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

# **SECTION 15410 - PLUMBING FIXTURES**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following conventional plumbing fixtures and related components:
  - 1. Faucets for lavatories and sinks.
  - 2. Laminar-flow faucet-spout outlets.
  - 3. Flushometers.
  - 4. Toilet seats.
  - 5. Protective shielding guards.
  - 6. Fixture supports.
  - 7. Interceptors.
  - 8. Water closets.
  - 9. Urinals.
  - 10. Lavatories.
  - 11. Kitchen sinks.

# 3. DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.
- D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.
- E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- F. FRP: Fiberglass-reinforced plastic.
- G. PMMA: Polymethyl methacrylate (acrylic) plastic.
- H. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

# 4. SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- C. Warranty: Special warranty specified in this Section.

# 5. QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
  - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

- B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.
- C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
  - 1. Enameled. Cast-Iron Fixtures: ASME A112.19.1M.
  - Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
     Vitreous-China Fixtures: ASME A112.19.2M.

  - 4. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.
  - 5. Water-Closet, Flushometer Tank Trim: ASSE 1037.
- G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
  - 1. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
  - 2. Faucets: ASME A112.18.1.
  - 3. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
  - 4. NSF Potable-Water Materials: NSF 61.
  - 5. Pipe Threads: ASME B1.20.1.
  - 6. Supply Fittings: ASME A112.18.1.
- H. Comply with the following applicable standards and other requirements specified for miscellaneous components:
  - 1. Floor Drains: ASME A112.6.3.
  - 2. Grab Bars: ASTM F 446.
  - 3. Off-Floor Fixture Supports: ASME A112.6.1M.
  - 4. Pipe Threads: ASME B1.20.1.

#### **II.PRODUCTS**

#### 1. LAVATORY FAUCETS

- A. Lavatory Faucets: Provide as indicated in drawings.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Standard Companies, Inc.
    - b) Bradley Corporation.
    - c) Chicago Faucets.
    - d) Delta Faucet Company.
    - e) Eljer.
    - Elkay Manufacturing Co. f)
    - g) Grohe America, Inc.
    - h) Kohler Co.
    - i) Moen, Inc.
      - Zurn Plumbing Products Group; Commercial Brass Operation.

#### SINK FAUCETS 2.

j)

- A. Sink Faucets: Provide as indicated in drawings.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Standard Companies, Inc.
    - b) Bradley Corporation.
    - c) Chicago Faucets.
    - d) Delta Faucet Company.

- e) Eljer.
- f) Elkay Manufacturing Co.
- g) Grohe America, Inc.
- h) Kohler Co.
- i) Moen, Inc.
- j) Zurn Plumbing Products Group; Commercial Brass Operation.

# 3. TOILET SEATS

- A. Toilet Seats: Provide as indicated in drawings.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Standard Companies, Inc.
    - b) Bemis Manufacturing Company.
    - c) Eljer.
    - d) Kohler Co.
    - e) Sanderson Plumbing Products, Inc.; Beneke Div.

# 4. FIXTURE SUPPORTS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Josam Company.
  - 2. Smith, Jay R. Mfg. Co.
  - 3. Tyler Pipe; Wade Div.
  - 4. Watts Drainage Products Inc.; a div. of Watts Industries, Inc.
  - 5. Zurn Plumbing Products Group; Specification Drainage Operation.
- B. Urinal Supports: Provide as indicated in drawings and as required by specified fixtures that require supports for correct installation.
- C. Lavatory Supports: Provide as indicated in drawings and as required by specified fixtures that require supports for correct installation.
- D. Sink Supports: Provide as indicated in drawings and as required by specified fixtures that require supports for correct installation.

# 5. WATER CLOSETS

- A. Water Closets: Provide as indicated in drawings.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Standard Companies, Inc.
    - b) Briggs Plumbing Products, Inc.
    - c) Crane Plumbing, L.L.C./Fiat Products.
    - d) Eljer.
    - e) Kohler Co.

# 6. URINALS

- A. Urinals: Provide as indicated in drawings.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Standard Companies, Inc.
    - b) Briggs Plumbing Products, Inc.
    - c) Crane Plumbing, L.L.C./Fiat Products.
    - d) Duravit USA, Inc.
    - e) Eljer.
    - f) Kohler Co.
    - g) Mansfield Plumbing Products, Inc.
    - h) Peerless Pottery, Inc.
    - i) TOTO USA, Inc.

## 7. LAVATORIES

- A. Lavatories: Provide as indicated in drawings.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Standard Companies, Inc.
    - b) Eljer.
    - c) Kohler Co.

#### 8. KITCHEN SINKS

- A. Kitchen Sink: Provide as indicated in drawings.
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a) American Standard Companies, Inc.
    - b) Eljer.
    - c) Kohler Co.

#### **III.EXECUTION**

#### 1. EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.
  - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
  - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
  - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
- D. Install wall-mounting fixtures with tubular waste piping attached to supports.
- E. Install counter-mounting fixtures in and attached to casework.
- F. Install fixtures level and plumb according to roughing-in drawings.
- G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 15 Section "Valves."
- H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
- L. Install toilet seats on water closets.
- M. Install trap-seal liquid in dry urinals.

- N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- Q. Install shower flow-control fittings with specified maximum flow rates in shower arms.

# 3. CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

# 4. FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
- E. Install fresh batteries in sensor-operated mechanisms.

# 5. ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- C. Replace washers and seals of leaking and dripping faucets and stops.

# 6. CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

# 7. PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

# **SECTION 15455 - ELECTRIC WATER HEATERS**

# I.GENERAL

#### 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.

#### 2. SUBMITTALS

A. Product Data: Include selected fixture and trim, fittings, accessories, and supports and indicate materials and dimensions.

#### 3. QUALITY ASSURANCE

A. Source Limitations: Obtain water heaters and related components through one source from a single manufacturer.

#### 4. COORDINATION

A. Coordinate roughing-in and final equipment locations, and verify that water heaters can be installed to comply with original design and referenced standards.

#### **II.PRODUCTS**

#### 1. ELECTRIC WATER HEATERS

A. Product description: As indicated in drawings.

#### 2. ACCESSORIES

- A. Wall brackets:
  - 1. If not indicated for specific models, manufacturer's standard for wall installation.

#### **III.EXECUTION**

#### 1. INSTALLATION

- A. Examine roughing-in for water piping systems to verify actual locations and sizes of piping connections and that locations and sizes match those indicated, before water heater installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine plenum area and walls for suitable conditions where water heaters are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. WATER HEATER INSTALLATION

- A. Assemble water heaters, trim, fittings, and other components according to manufacturers' written instructions.
- B. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
- C. Install water heaters level and plumb according to manufacturers' written instructions and roughing-in drawings.
- D. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Install stops in locations where they can be easily reached for operation.
  - 1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture.
- E. Install to requirements of authorities having jurisdiction, and recommendations of equipment manufacturer.

#### 3. CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.

C. Ground equipment.

# 4. FIELD QUALITY CONTROL

- A. Verify that installed water heaters are categories and types specified for locations where installed.
- B. Inspect installed water heaters for damage. Replace damaged fixtures and components.
- C. Test installed water heaters after water systems are pressurized for proper operation. Replace malfunctioning water heaters and components, then retest. Repeat procedure until units operate properly.

# **SECTION 15815 - METAL DUCTS**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes metal ducts for supply, return, outside, and exhaust air-distribution systems in pressure classes from minus 2- to plus 10-inch wg (minus 500 to plus 2500 Pa). Metal ducts include the following:
  - 1. Rectangular ducts and fittings.
  - 2. Double-wall, round, and flat-oval spiral-seam ducts and formed fittings.

# 3. SUBMITTALS

- A. Shop Drawings: CAD-generated and drawn to propper scale. Show fabrication and installation details for metal ducts.
  - 1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
  - 2. Duct layout indicating sizes and pressure classes.
  - 3. Elevations of top and bottom of ducts.
  - 4. Dimensions of main duct runs from building grid lines.
  - 5. Fittings.
  - 6. Reinforcement and spacing.
  - 7. Seam and joint construction.
  - 8. Penetrations through fire-rated and other partitions.
  - 9. Equipment installation based on equipment being used on Project.
  - 10. Duct accessories, including access doors and panels.
  - 11. Hangers and supports, including methods for duct and building attachment, vibration isolation, and seismic restraints.

# 4. QUALITY ASSURANCE

- A. NFPA Compliance:
  - 1. NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
  - 2. NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Ch. 3, "Duct System," for range hood ducts, unless otherwise indicated.

# **II.PRODUCTS**

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

# 2. SHEET METAL MATERIALS

- A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 (Z180) or G90 (Z275) coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.
- C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

#### 3. SEALANT MATERIALS

- A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.
- B. Joint and Seam Tape: 2 inches (50 mm) wide; glass-fiber-reinforced fabric.
- C. Tape Sealing System: Woven-fiber tape impregnated with gypsum mineral compound and modified acrylic/ silicone activator to react exothermically with tape to form hard, durable, airtight seal.
- D. Water-Based Joint and Seam Sealant: Flexible, adhesive sealant, resistant to UV light when cured, UL 723 listed, and complying with NFPA requirements for Class 1 ducts.
- E. Solvent-Based Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant formulated with a minimum of 75 percent solids.
- F. Flanged Joint Mastic: One-part, acid-curing, silicone, elastomeric joint sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.
- G. Flange Gaskets: Butyl rubber or EPDM polymer with polyisobutylene plasticizer.

# 4. HANGERS AND SUPPORTS

A. See drawing details.

#### 5. RECTANGULAR DUCT FABRICATION

- A. Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" and complying with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.
  - 1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure class.
  - 2. Deflection: Duct systems shall not exceed deflection limits according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."
- B. Transverse Joints: Prefabricated slide-on joints and components constructed using manufacturer's guidelines for material thickness, reinforcement size and spacing, and joint reinforcement.
  - a) Ductmate Industries, Inc.
  - b) Nexus Inc.
  - c) Ward Industries, Inc.
- C. Formed-On Flanges: Construct according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," Figure 1-4, using corner, bolt, cleat, and gasket details.
  - 1. Available Manufacturers:
    - a) Ductmate Industries, Inc.
    - b) Lockformer.
  - 2. Duct Size: Maximum 30 inches (750 mm) wide and up to 2-inch wg (500-Pa) pressure class.
  - 3. Longitudinal Seams: Pittsburgh lock sealed with noncuring polymer sealant.
- D. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches (480 mm) and larger and 0.0359 inch (0.9 mm) thick or less, with more than 10 sq. ft. (0.93 sq. m) of nonbraced panel area unless ducts are lined.

# 6. ROUND AND FLAT-OVAL DUCT AND FITTING FABRICATION

- A. Diameter as applied to flat-oval ducts in this Article is the diameter of a round duct with a circumference equal to the perimeter of a given size of flat-oval duct.
- B. Flat-Oval, Longitudinal- and Spiral Lock-Seam Ducts: Fabricate supply ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Fabricate ducts larger than 72 inches (1830 mm) in diameter with butt-welded longitudinal seams.
  - 1. Available Manufacturers:
    - a) McGill AirFlow Corporation.
    - b) SEMCO Incorporated.
- C. Duct Joints:

- 1. Flat-Oval Ducts: Prefabricated connection system consisting of two flanges and one synthetic rubber gasket.
  - a) Available Manufacturers:
    - (1) Ductmate Industries, Inc.
    - (2) McGill AirFlow Corporation.
    - (3) SEMCO Incorporated.
- D. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal-seam straight ducts.
- E. Diverging-Flow Fittings: Fabricate with reduced entrance to branch taps and with no excess material projecting from fitting onto branch tap entrance.
- F. Fabricate elbows using die-formed, gored, pleated, or mitered construction. Bend radius of die-formed, gored, and pleated elbows shall be 1-1/2 times duct diameter. Unless elbow construction type is indicated, fabricate elbows as follows:
  - 1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
  - 2. Flat-Oval Mitered Elbows: Welded construction with same metal thickness as longitudinal-seam flat-oval duct.
  - 3. 90-Degree, 2-Piece, Mitered Elbows: Use only for supply systems or for material-handling Class A or B exhaust systems and only where space restrictions do not permit using radius elbows. Fabricate with single-thickness turning vanes.
  - 4. Flat-Oval Elbow Metal Thickness: Same as longitudinal-seam flat-oval duct specified above.
  - 5. Pleated Elbows for Sizes through 14 Inches (355 mm) in Diameter and Pressures through 10-Inch wg (2500 Pa): 0.022 inch (0.55 mm).

# 7. DOUBLE-WALL DUCT AND FITTING FABRICATION

A. Available Manufacturers:

- 1. Lindab Inc.
- 2. McGill AirFlow Corporation.
- 3. SEMCO Incorporated.

#### **III.EXECUTION**

#### 1. DUCT APPLICATIONS

- A. Static-Pressure Classes: Unless otherwise indicated, construct ducts according to the following:
  - 1. Supply Ducts: 2-inch wg (500 Pa).
  - 2. Supply Ducts (before Air Terminal Units): 2-inch wg (500 Pa).
  - 3. Supply Ducts (after Air Terminal Units): 1-inch wg (250 Pa).
  - 4. Supply Ducts (in Mechanical Equipment Rooms): 2-inch wg (500 Pa).
  - 5. Return Ducts (Negative Pressure): 1/2-inch wg (125 Pa).
  - 6. Exhaust Ducts (Negative Pressure): 1-inch wg (250 Pa).

# 2. DUCT INSTALLATION

- A. Construct and install ducts according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
- B. Install round and flat-oval ducts in lengths not less than 12 feet (3.7 m) unless interrupted by fittings.
- C. Install ducts with fewest possible joints.
- D. Install fabricated fittings for changes in directions, size, and shape and for connections.
- E. Install couplings tight to duct wall surface with a minimum of projections into duct. Secure couplings with sheet metal screws. Install screws at intervals of 12 inches (300 mm), with a minimum of 3 screws in each coupling.
- F. Install ducts, unless otherwise indicated, vertically and horizontally and parallel and perpendicular to building lines; avoid diagonal runs.

- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
- I. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions unless specifically indicated.
- J. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.
- K. Seal all joints and seams. Apply sealant to male end connectors before insertion, and afterward to cover entire joint and sheet metal screws.
- L. Electrical Equipment Spaces: Route ducts to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
- M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls and are exposed to view, conceal spaces between construction openings and ducts or duct insulation with sheet metal flanges of same metal thickness as ducts. Overlap openings on 4 sides by at least 1-1/2 inches (38 mm).
- N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire dampers, sleeves, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Through-Penetration Firestop Systems."
- O. Install ducts with hangers and braces designed to withstand, without damage to equipment, seismic force required by applicable building codes. Refer to SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems." NUSIG.
- P. Protect duct interiors from the elements and foreign materials until building is enclosed. Follow SMACNA's "Duct Cleanliness for New Construction."
- Q. Paint interiors of metal ducts, that do not have duct liner, for 24 inches (600 mm) upstream of registers and grilles. Apply one coat of flat, black, latex finish coat over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

#### 3. UNDERSLAB DUCTS, SPECIAL INSTALLATION REQUIREMENTS

- A. Verify undamaged condition of ducts before enclosure with fill or encasement.
- B. Protect ducts from damage by equipment used in placing fill materials and concrete on or around ducts.
- C. Protect duct openings from damage and prevent entrance of foreign materials.

#### 4. SEAM AND JOINT SEALING

- A. Seal duct seams and joints according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for duct pressure class indicated.
  - 1. For pressure classes lower than 2-inch wg (500 Pa), seal transverse joints.
- B. Seal ducts before external insulation is applied.

#### 5. HANGING AND SUPPORTING

- A. Support horizontal ducts within 24 inches (600 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.
- B. Support vertical ducts at maximum intervals of 16 feet (5 m) and at each floor.
- C. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.
- D. Install concrete inserts before placing concrete.
- E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

1. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.

# 6. CONNECTIONS

- A. Make connections to equipment with flexible connectors according to Division 15 Section "Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

#### 7. FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections according to SMACNA's "HVAC Air Duct Leakage Test Manual" and prepare test reports:
  - 1. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
  - Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If pressure classes are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.
  - 3. Maximum Allowable Leakage: Comply with requirements for Leakage Class 3 for round and flat-oval ducts, Leakage Class 12 for rectangular ducts in pressure classes lower than and equal to 2-inch wg (500 Pa) (both positive and negative pressures), and Leakage Class 6 for pressure classes from 2- to 10-inch wg (500 to 2500 Pa).
  - 4. Remake leaking joints and retest until leakage is equal to or less than maximum allowable.

#### 8. CLEANING NEW SYSTEMS

- A. Mark position of dampers and air-directional mechanical devices before cleaning, and perform cleaning before air balancing.
- B. Use service openings, as required, for physical and mechanical entry and for inspection.
  - 1. Create other openings to comply with duct standards.
  - 2. Disconnect flexible ducts as needed for cleaning and inspection.
  - 3. Remove and reinstall ceiling sections to gain access during the cleaning process.
- C. Vent vacuuming system to the outside. Include filtration to contain debris removed from HVAC systems, and locate exhaust down wind and away from air intakes and other points of entry into building.
- D. Clean the following metal duct systems by removing surface contaminants and deposits:
  - 1. Air outlets and inlets (registers, grilles, and diffusers).
  - 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
  - 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
  - 4. Coils and related components.
  - 5. Return-air ducts, dampers, and actuators except in ceiling plenums and mechanical equipment rooms.
  - 6. Supply-air ducts, dampers, actuators, and turning vanes.
- E. Mechanical Cleaning Methodology:
  - 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
  - 2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
  - 3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
  - 4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet.
  - 5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
- F. Cleanliness Verification:

- Visually inspect metal ducts for contaminants.
   Where contaminants are discovered, re-clean and reinspect ducts.

# SECTION 15855 - DIFFUSERS, REGISTERS, AND GRILLES

# I.GENERAL

# 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.

# 2. SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

# 3. SUBMITTALS

- A. Product Data: For each product indicated, include the following:
  - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
  - 2. Diffuser, Register, and Grille Schedule: Indicate Drawing designation, room location, quantity, model number, size, and accessories furnished.
- B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

# **II.PRODUCTS**

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

# 2. GRILLES AND REGISTERS

- A. Adjustable Bar: As indicated in drawings.
  - 1. Available Manufacturers:
    - a) A-J Manufacturing Co., Inc.
    - b) Anemostat; a Mestek Company.
    - c) Carnes.
    - d) Dayus Register & Grille.
    - e) Hart & Cooley, Inc.; Hart & Cooley Div.
    - f) Krueger.
    - g) METALAIRE, Inc.; Metal Industries Inc.
    - h) Nailor Industries of Texas Inc.
    - i) Price Industries.
    - j) Titus.
    - k) Tuttle & Bailey.
  - 2. Material: Aluminum.
  - 3. Finish: Baked enamel, white, unless otherwise indicated.
- B. Fixed Face: As indicated in drawings.
  - 1. Available Manufacturers:
    - a) A-J Manufacturing Co., Inc.
    - b) Anemostat; a Mestek Company.
    - c) Carnes.
    - d) Dayus Register & Grille.
    - e) Hart & Cooley, Inc.; Hart & Cooley Div.
    - f) Krueger.
    - g) Nailor Industries of Texas Inc.
    - h) Price Industries.
    - i) Titus.

- j) Tuttle & Bailey.
- 2. Material: Aluminum.
- 3. Finish: Baked enamel, white, unless otherwise indicated.

# 3. LINEAR SLOT OUTLETS

- A. Linear Bar Grille or Diffuser: As indicated in drawings.
  - 1. Available Manufacturers:
    - a) Air Research Diffuser Products, Inc.
    - b) Anemostat; a Mestek Company.
    - c) Carnes.
    - d) Dayus Register & Grille.
    - e) Hart & Cooley, Inc.; Hart & Cooley Div.
    - f) Krueger.
    - g) METALAIRE, Inc.; Metal Industries Inc.
    - h) Nailor Industries of Texas Inc.
    - i) Price Industries.
    - j) Titus.
    - k) Tuttle & Bailey.
  - 2. Material: Aluminum .
  - 3. Finish: Baked enamel, white, unless otherwise indicated.
- B. Linear Slot Diffuser: As indicated in drawings.
  - 1. Available Manufacturers:
    - a) Air Research Diffuser Products, Inc.
    - b) Anemostat; a Mestek Company.
    - c) Carnes.
    - d) Hart & Cooley, Inc.; Hart & Cooley Div.
    - e) Krueger.
    - f) METALAIRE, Inc.; Metal Industries Inc.
    - g) Nailor Industries of Texas Inc.
    - h) Price Industries.
    - i) Titus.
    - j) Tuttle & Bailey.
  - 2. Material Shell: Aluminum,
  - 3. Material Pattern Controller and Tees: Aluminum.
  - 4. Finish: Baked enamel, white, unless otherwise indicated.

# 4. CEILING DIFFUSER OUTLETS

- A. Rectangular and Square Ceiling Diffusers: As indicated in drawings.
  - 1. Available Manufacturers:
    - a) A-J Manufacturing Co., Inc.
    - b) Anemostat; a Mestek Company.
    - c) Carnes.
    - d) Hart & Cooley, Inc.; Hart & Cooley Div.
    - e) Krueger.
    - f) METALAIRE, Inc.; Metal Industries Inc.
    - g) Nailor Industries of Texas Inc.
    - h) Price Industries.
    - i) Titus.
    - j) Tuttle & Bailey.
  - 2. Material: Aluminum.
  - 3. Finish: Baked enamel, white, unless otherwise indicated.
- B. Perforated Diffuser: As indicated in drawings.
  - 1. Available Manufacturers:
    - a) Air Research Diffuser Products, Inc.
    - b) A-J Manufacturing Co., Inc.
    - c) Anemostat; a Mestek Company.

- d) Carnes.
- e) Hart & Cooley, Inc.; Hart & Cooley Div.
- f) Krueger.
- g) METALAIRE, Inc.; Metal Industries Inc.
- h) Nailor Industries of Texas Inc.
- i) Price Industries.
- j) Titus.
- k) Tuttle & Bailey.
- I) Warren Technology.
- 2. Material: Steel backpan and pattern controllers, with aluminum face.
- 3. Finish: Baked enamel, white, unless otherwise indicated.

# 5. SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

#### **III.EXECUTION**

#### 1. EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 2. INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

# 3. ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.
# **SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS**

# I. 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. Raceways.
  - 2. Building wire and connectors.
  - 3. Supporting devices for electrical components.
  - 4. Electrical identification.
  - 5. Electricity-metering components.
  - 6. Concrete equipment bases.
  - 7. Electrical demolition.
  - 8. Cutting and patching for electrical construction.
  - 9. Touchup painting.

# **1.3 DEFINITIONS**

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

#### 1.4 SUBMITTALS

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity- metering equipment.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

# **1.5 QUALITY ASSURANCE**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

# **1.6 COORDINATION**

A.Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

- 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical service connections to components furnished by utility companies.
  - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
  - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.

- D. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
- E. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- F. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.

#### **II.PRODUCTS**

#### 2.1 RACEWAYS

- A. EMT: ANSI C80.3, zinc-coated steel, with set-screw or compression fittings.
- B. FMC: Zinc-coated steel.
- C. IMC: ANSI C80.6, zinc-coated steel, with threaded fittings.
- D. LFMC: Zinc-coated steel with sunlight-resistant and mineral-oil-resistant plastic jacket.
- E. Raceway Fittings: Specifically designed for the raceway type with which used.

#### **2.2 CONDUCTORS**

- A. Conductors, No. 10 AWG and Smaller: Solid or stranded copper.
- B. Conductors, Larger Than No. 10 AWG: Stranded copper.
- C. Insulation: Thermoplastic, rated at 75 deg C minimum.
- D. Wire Connectors and Splices: Units of size, ampacity rating, material, type, and class suitable for service indicated.

#### 2.3 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- diameter slotted holes at a maximum of 2 inches o.c., in webs.
- D. Slotted-Steel Channel Supports: Comply with Division 5 Section "Metal Fabrications" for slotted channel framing.
  - 1. Channel Thickness: Selected to suit structural loading.
  - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- A. Nonmetallic Channel and Angle Systems: Structural-grade, factory-formed, glass-fiber- resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least one surface.
  - 1. Fittings and Accessories: Products of the same manufacturer as channels and angles.
  - 2. Fittings and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
- B. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring- steel clamps or click-type hangers.
- C. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- E. Expansion Anchors: Carbon-steel wedge or sleeve type.
- F. Toggle Bolts: All-steel springhead type.
- G. Powder-Driven Threaded Studs: Heat-treated steel.

#### 2.4 ELECTRICAL IDENTIFICATION

- A. Identification Devices: A single type of identification product for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.
- B. Raceway and Cable Labels: Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway and cable size.
  - 1. Type: Pretensioned, wraparound plastic sleeves. Flexible, preprinted, color- coded, acrylic band sized to suit the diameter of the item it identifies.
  - 2. Type: Preprinted, flexible, self-adhesive, vinyl. Legend is overlaminated with a clear, weather- and chemical-resistant coating.
  - 3. Color: Black letters on orange background.
  - 4. Legend: Indicates voltage.
- C. Colored Adhesive Marking Tape for Raceways, Wires, and Cables: Self-adhesive vinyl tape, not less than 1 inch wide by 3 mils thick.
- D. Underground Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
  - 1. Not less than 6 inches wide by 4 mils thick.
  - 2. Compounded for permanent direct-burial service.
  - 3. Embedded continuous metallic strip or core.
  - 4. Printed legend that indicates type of underground line.
- E. Tape Markers for Wire: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.
- F. Color-Coding Cable Ties: Type 6/6 nylon, self-locking type. Colors to suit coding scheme.
- G. Engraved-Plastic Labels, Signs, and Instruction Plates: Engraving stock, melamine plastic laminate punched or drilled for mechanical fasteners 1/16-inch minimum thickness for signs up to 20 sq. in. and 1/8-inch minimum thickness for larger sizes. Engraved legend in black letters on white background.
- A. Interior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Preprinted, aluminum, baked-enamel-finish signs, punched or drilled for mechanical fasteners, with colors, legend, and size appropriate to the application.
- B. Exterior Warning and Caution Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch, galvanized-steel backing, with colors, legend, and size appropriate to the application. 1/4-inch grommets in corners for mounting.
- C. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

#### 2.5 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

- A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
- B. Meter Sockets: Comply with requirements of electrical power utility company.
- C. Modular Meter Centers: Factory-coordinated assembly of a main meter center circuit- breaker unit with wireways, tenant meter socket modules, and tenant branch circuit breakers arranged in adjacent vertical sections, complete with interconnecting buses.
  - 1. Housing: NEMA 250, [Type 1 or Type 3R] enclosure.
  - 2. Tenant Branch Circuit Breakers: Series combination rated to protect circuit

breakers in downstream panelboards that have 10,000-A interrupting capacity, minimum.

#### **2.6 CONCRETE BASES**

- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast- in-Place Concrete."
- B. Concrete: 3000-psi, 28-day compressive strength as specified in Division 3 Section "Cast-in-Place Concrete."

#### 2.7 TOUCHUP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

#### **III.EXECUTION**

#### 3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

#### 3.2 RACEWAY APPLICATION

- A. Use the following raceways for outdoor installations:
  - 1. Exposed: IMC.
  - 2. Concealed: IMC.
  - 3. Underground, Single Run: RNC.
  - 4. Underground, Grouped: RNC.
  - 5. Connection to Vibrating Equipment: LFMC.
  - 6. Boxes and Enclosures: NEMA 250, Type 3R or Type 4.
- B. Use the following raceways for indoor installations:
  - 1. Exposed: EMT.
  - 2. Concealed: EMT .
  - 3. Connection to Vibrating Equipment: FMC; except in wet or damp locations, use LFMC.
  - 4. Damp or Wet Locations: IMC.
  - 5. Boxes and Enclosures: NEMA 250, Type 1, unless otherwise indicated.

#### 3.3 RACEWAY AND CABLE INSTALLATION

- A. Conceal raceways and cables, unless otherwise indicated, within finished walls, ceilings, and floors.
- B. Install raceways and cables at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Locate horizontal raceway runs above water and steam piping.
- C. Use temporary raceway caps to prevent foreign matter from entering.
- D. Make conduit bends and offsets so ID is not reduced. Keep legs of bends in the same plane and straight legs of offsets parallel, unless otherwise indicated.
- E. Use raceway and cable fittings compatible with raceways and cables and suitable for use and location.
- F. Install raceways embedded in slabs in middle third of slab thickness where practical, and leave at least 1inch concrete cover.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - Install conduit larger than 1-inch trade size parallel to or at right angles to main reinforcement. Where conduit is at right angles to reinforcement, place conduit close to slab support.
  - 4. Transition from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above floor.
  - 5. Make bends in exposed parallel or banked runs from same centerline to make bends parallel. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for exposed parallel raceways.
- G. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of the pull wire.

- H. Install telephone and signal system raceways, 2-inch trade size and smaller, in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements, in addition to requirements above.
- I. Connect motors and equipment subject to vibration, noise transmission, or movement with a maximum of 72-inch flexible conduit. Install LFMC in wet or damp locations. Install separate ground conductor across flexible connections.
- J. Set floor boxes level and trim after installation to fit flush to finished floor surface.

#### 3.4 WIRING METHODS FOR POWER, LIGHTING, AND CONTROL CIRCUITS

- A. Feeders: Type THHN/THWN insulated conductors in raceway.
- B. Underground Feeders and Branch Circuits: Type THWN or single-wire, Type UF insulated conductors in raceway.
- C. Branch Circuits: Type THHN/THWN insulated conductors in raceway.
- D. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed. Metal-clad cable where concealed in ceilings and gypsum board partitions.
- E. Branch Circuits: Type THW or THHN/THWN insulated conductors in raceway where exposed. Armored or nonmetallic sheathed cable where permitted by authorities having jurisdiction and where concealed in ceilings and gypsum board partitions.
- F. Remote-Control Signaling and Power-Limited Circuits: Type THHN/THWN insulated conductors in raceway for Classes 1, 2, and 3, unless otherwise indicated.

#### 3.5 WIRING INSTALLATION

- A. Install splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- B. Install wiring at outlets with at least 12 inches of slack conductor at each outlet.
- C. Connect outlet and component connections to wiring systems and to ground. Tighten electrical connectors and terminals, according to manufacturer's published torque- tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A.

#### 3.6 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Selection of Supports: Comply with manufacturer's written instructions.
- D. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

#### 3.7 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- diameter or larger threaded steel hanger rods, unless otherwise indicated.

- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheetmetal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
  - 1. Wood: Fasten with wood screws or screw-type nails.
  - 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
  - 3. New Concrete: Concrete inserts with machine screws and bolts.
  - 4. Existing Concrete: Expansion bolts.
  - 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
  - 6. Steel: Welded threaded studs or spring-tension clamps on steel.
    - a. Field Welding: Comply with AWS D1.1.
  - 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
  - 8. Light Steel: Sheet-metal screws.
  - 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

# **3.8 IDENTIFICATION MATERIALS AND DEVICES**

- A. Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations indicated in the Contract Documents or required by codes and standards. Use consistent designations throughout Project.
- C. Self-Adhesive Identification Products: Clean surfaces before applying.
- D. Identify raceways and cables with color banding as follows:
  - 1. Bands: Pretensioned, snap-around, colored plastic sleeves or colored adhesive marking tape. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
  - 2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
  - 3. Colors: As follows:
    - a. Fire Alarm System: Red.
    - b. Security System: Blue and yellow.
    - c. Telecommunication System: Green and yellow.
- E. Tag and label circuits designated to be extended in the future. Identify source and circuit numbers in each cabinet, pull and junction box, and outlet box. Color-coding may be used for voltage and phase identification.

- F. Install continuous underground plastic markers during trench backfilling, for exterior underground power, control, signal, and communication lines located directly above power and communication lines. Locate 6 to 8 inches below finished grade. If width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches, overall, use a single line marker.
- G. Color-code 208/120-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
  - 1. Phase A: Black.
  - 2. Phase B: Red.
  - 3. Phase C: Blue.
- H. Color-code 480/277-V system secondary service, feeder, and branch-circuit conductors throughout the secondary electrical system as follows:
  - 1. Phase A: Yellow.
  - 2. Phase B: Brown.
  - 3. Phase C: Orange.
- I. Install warning, caution, and instruction signs where required to comply with 29 CFR, Chapter XVII, Part 1910.145, and where needed to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- J. Install engraved-laminated emergency-operating signs with white letters on red background with minimum 3/8-inch- high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

#### 3.9 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

#### 3.10 FIRESTOPPING

A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."

#### 3.11 CONCRETE BASES

A. Construct concrete bases of dimensions indicated, but not less than 4 inches larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

#### 3.12 DEMOLITION

- A. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.
- B. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety.

C. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

- A. Remove demolished material from Project site.
- B. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

#### 3.13 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

# 3.14 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
  - 1. Raceways.
  - 2. Building wire and connectors.
  - 3. Supporting devices for electrical components.
  - 4. Electrical identification.
  - 5. Electricity-metering components.
  - 6. Concrete bases.
  - 7. Electrical demolition.
  - 8. Cutting and patching for electrical construction.
  - 9. Touchup painting.
- B. Test Owner's electricity-metering installation for proper operation, accuracy, and usability of output data.
  - 1. Connect a load of known kW rating, 1.5 kW minimum, to a circuit supplied by the metered feeder.
  - 2. Turn off circuits supplied by the metered feeder and secure them in the "off" condition.
  - 3. Run the test load continuously for eight hours, minimum, or longer to obtain a measurable meter indication. Use a test load placement and setting that ensure continuous, safe operation.
  - 4. Check and record meter reading at end of test period and compare with actual electricity used based on test load rating, duration of test, and sample measurements of supply voltage at the test load connection. Record test results.
  - 5. Repair or replace malfunctioning metering equipment or correct test setup; then retest. Repeat for each meter in installation until proper operation of entire system is verified.

# 3.15 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."

- 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
- 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
- 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
- 4. Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

# 3.16 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

# END OF SECTION 16050

# **SECTION 16120 - CONDUCTORS AND CABLES**

# I.GENERAL

# 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.

# 2. SUMMARY

A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.

# 3. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field Quality-Control Test Reports: From a qualified testing and inspecting agency engaged by, Contractor.

# 4. QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the InterNational Electrical Testing Association and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

# II.PRODUCTS

# 1. MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

# 2. CONDUCTORS AND CABLES

- A. Available Manufacturers:
  - 1. Nexan.
  - 2. Condumex.
  - 3. Phelp Dodge
  - 4. Southwire Company.
- B. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- C. Conductor Material: Copper complying with NEMA WC 7; stranded conductor Conductor Insulation Types: Type THHN-THWN, XHHW, UF, USE, and, SO, complying with NEMA WC 7.
- D. Multiconductor Cable: Metal-clad cable, Type MC Type SO and Type USE with ground wire.

# 3. CONNECTORS AND SPLICES

- A. Available Manufacturers:
  - 1. AFC Cable Systems, Inc.
  - 2. AMP Incorporated/Tyco International.
  - 3. Hubbell/Anderson.
  - 4. O-Z/Gedney; EGS Electrical Group LLC.

- 5. 3M Company; Electrical Products Division.
- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

#### **III.EXECUTION**

#### 1. CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type RHH, single conductors in raceway
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspaces: Type THHN-THWN, single conductors in raceway.
- D. Exposed Branch Circuits, including in Crawlspaces: Type THHN-THWN, single conductors in raceway, Metal-clad cable, Type MC, Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway Branch Circuits
- E. Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- F. Underground Feeders and Branch Circuits: Type RHH-2 RHW-2, single conductors in raceway.
- G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord.
- H. Fire Alarm Circuits: Power-limited, fire-protective, signaling circuit cable.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway

#### 2. INSTALLATION

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 16 Section "Basic Electrical Materials and Methods."
- F. Seal around cables penetrating fire-rated elements according to Division 7 Section "Through-Penetration Firestop Systems."
- G. Identify and color-code conductors and cables according to Division 16 Section "Basic Electrical Materials and Methods, Electrical Identification,."

#### 3. CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
  - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches, 12 inches, of slack.

#### 4. FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified testing agency to perform the following field quality-control testing:

- B. Testing: Engage a qualified testing agency to perform the following field quality-control testing:
- C. Testing: Perform the following field quality-control testing:
  - 1. After installing conductors and cables and before electrical circuitry has been energized, test for compliance with requirements.
  - 2. Perform each electrical test and visual and mechanical inspection stated in NETA ATS, Section 7.3.1. Certify compliance with test parameters.
- D. Test Reports: Prepare a written report to record the following:
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

#### **END OF SECTION 16120**

# SECTION 16131 - RACEWAYS AND BOXES (NO PVC)

# I.GENERAL

# 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.

# 2. SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

# 3. DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.

# 4. SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: Show fabrication and installation details of components for raceways, fittings, boxes, enclosures, and cabinets.
- C. Shop Drawings: Signed and sealed by a qualified professional engineer.
  - 1. Design Calculations: Calculate requirements for selecting seismic restraints.
  - 2. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
- D. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceilingmounted items. Show the following:
  - 1. Ceiling suspension assembly members.
  - 2. Method of attaching hangers to building structure.
  - 3. Size and location of initial access modules for acoustical tile.
  - 4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- E. Manufacturer Seismic Qualification Certification: Submit certification that enclosures, cabinets, accessories, and components will withstand seismic forces defined in Division 16 Section "Electrical Supports and Seismic Restraints." Include the following:
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
    - a) The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
    - b) The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

# 5. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

# 6. COORDINATION

A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

#### **II.PRODUCTS**

#### 1. MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.

#### 2. METAL CONDUIT AND TUBING

- A. Available Manufacturers:
  - 1. Wheatland Tube Co.
  - 2. Allied
  - 3. Condunite
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Aluminum Rigid Conduit: ANSI C80.5.
- D. IMC: ANSI C80.6.
- E. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- F. Plastic-Coated IMC and Fittings: NEMA RN 1.
- G. EMT and Fittings: ANSI C80.3.1. Fittings: Set-screw, type.
- H. FMC: Zinc-coated steel.
- I. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

# 3. NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers:
  - 1. Prime Conduit
  - 2. Hesistate
  - 3. Vasallo
- B. ENT: NEMA TC 13.
- C. ENT and RNC Fittings: NEMA TC 3; match to conduit or tubing type and material.
- D. LFNC: UL 1660.

# 4. METAL WIREWAYS

- A. Available Manufacturers:
  - 1. Hoffman.
  - 2. Square D.
- B. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1, 3R.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- E. Wireway Covers: Screw-cover type
- F. Finish: Manufacturer's standard enamel finish.

#### 5. NONMETALLIC WIREWAYS

- A. Available Manufacturers:
  - 1. Hoffman.
  - 2. Lamson & Sessions; Carlon Electrical Products.
- B. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

#### 6. SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating Coordinate subparagraph and associated subparagraphs below with Part 2 "Manufacturers" Article. Retain "Available" for nonproprietary and delete for semiproprietary specifications.
  - 1. Available Manufacturers:
    - a) Airey-Thompson Sentinel Lighting; Wiremold Company (The).
    - b) Thomas & Betts Corporation.
    - c) Walker Systems, Inc.; Wiremold Company (The).
    - d) Wiremold Company (The); Electrical Sales Division.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

# 7. BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers:
  - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
  - 2. Emerson/General Signal; Appleton Electric Company.
  - 3. Erickson Electrical Equipment Co.
  - 4. Hoffman.
  - 5. Hubbell, Inc.; Killark Electric Manufacturing Co.
  - 6. O-Z/Gedney; Unit of General Signal.
  - 7. RACO; Division of Hubbell, Inc.
  - 8. Robroy Industries, Inc.; Enclosure Division.
  - 9. Scott Fetzer Co.; Adalet-PLM Division.
  - 10. Spring City Electrical Manufacturing Co.
  - 11. Thomas & Betts Corporation.
  - 12. Walker Systems, Inc.; Wiremold Company (The).
  - 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
- B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Floor Boxes: Cast metal, fully adjustable, rectangular.
- F. Floor Boxes: Nonmetallic, nonadjustable, round.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

- H. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- I. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
  - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- J. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.

#### 8. FACTORY FINISHES

A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

#### **III.EXECUTION**

#### 1 **RACEWAY APPLICATION**

- A. Outdoors:
  - 1. Exposed: Rigid steel or IMC.
  - Concealed: Rigid steel or IMC.
     Underground, Single Run: RNC.
     Underground, Grouped: RNC.

  - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
  - 6. Boxes and Enclosures: NEMA 250, Type 3R, 4.
- B. Indoors:
  - 1. Exposed: EMT, or, RNC.
  - 2. Concealed: EMT, ENT, or, RNC.
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
  - 4. Damp or Wet Locations: Rigid steel conduit.
  - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
    - a) Damp or Wet Locations: NEMA 250, Type 4, stainless steel, nonmetallic.
- C. Minimum Raceway Size: 3/4-inch trade size (DN 21).
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits embedded in or in contact with concrete.

#### 2. INSTALLATION

- A. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in Division 16 Section "Electrical Supports and Seismic Restraints."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

- 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches of concrete cover.
  - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
  - 2. Space raceways laterally to prevent voids in concrete.
  - 3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 4. Change from nonmetallic tubing to Schedule 80 nonmetallic conduit, rigid steel conduit, or IMC before rising above the floor.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
  - 1. Run parallel or banked raceways together on common supports.
  - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
  - 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:
  - 1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
  - 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- N. Telephone and Signal System Raceways, 2-Inch Trade Size (DN 53) and Smaller: In addition to above requirements, install raceways in maximum lengths of 150 feet and with a maximum of two 90-degree bends or equivalent. Separate lengths with pull or junction boxes where necessary to comply with these requirements.
- O. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where otherwise required by NFPA 70.
- P. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- Q. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- R. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- S. Set floor boxes level and flush with finished floor surface.
- T. Set floor boxes level. Trim after installation to fit flush with finished floor surface.
- U. Install hinged-cover enclosures and cabinets plumb. Support at each corner.

# 3. PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
  - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

# 4. CLEANING

A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

# END OF SECTION 16131

# **SECTION 16140 - WIRING DEVICES**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following:
  - 1. Single and duplex receptacles, ground-fault circuit interrupters, integral surge suppression units, and isolated-ground receptacles.
  - 2. Single- and double-pole snap switches and dimmer switches.
  - 3. Device wall plates.
  - 4. Pin and sleeve connectors and receptacles.
  - 5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

# 3. DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. TVSS: Transient voltage surge suppressor.
- E. UTP: Unshielded twisted pair.

# 4. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.
- D. Field quality-control test reports.

# 5. QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

# 6. COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.1. Cord and Plug Sets: Match equipment requirements.

# **II.PRODUCTS**

# 1. MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Wiring Devices:
    - a) Bryant Electric, Inc./Hubbell Subsidiary.
    - b) Eagle Electric Manufacturing Co., Inc.
    - c) Hubbell Incorporated; Wiring Device-Kellems.
    - d) Leviton Mfg. Company Inc.
    - e) Pass & Seymour/Legrand; Wiring Devices Div.
  - 2. Wiring Devices for Hazardous (Classified) Locations:

- a) Crouse-Hinds/Cooper Industries, Inc.; Arrow Hart Wiring Devices.
- b) EGS/Appleton Electric Company.
- c) Killark Electric Manufacturing Co./Hubbell Incorporated.
- 3. Multioutlet Assemblies:
  - a) Hubbell Incorporated; Wiring Device-Kellems.
  - b) Wiremold Company (The).
- 4. Poke-Through, Floor Service Outlets and Telephone/Power Poles:
  - a) Hubbell Incorporated; Wiring Device-Kellems.
  - b) Pass & Seymour/Legrand; Wiring Devices Div.
  - c) Square D/Groupe Schneider NA.
  - d) Thomas & Betts Corporation.
  - e) Wiremold Company (The).

#### 2. RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
- B. Straight-Blade and Locking Receptacles: Heavy Duty grade.
- C. Straight-Blade Receptacles: Hospital grade.
- D. GFCI Receptacles: Straight blade, feed, through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- deep outlet box without an adapter.
- E. Isolated-Ground Receptacles: Straight blade, Heavy-Duty grade, duplex receptacle, with equipment grounding contacts connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap.
  - 1. Devices: Listed and labeled as isolated-ground receptacles.
  - 2. Isolation Method: Integral to receptacle construction and not dependent on removable parts.
- F. TVSS Receptacles: Straight blade, NEMA WD 6, Configuration 5-20R, with integral TVSS in line to ground, line to neutral, and neutral to ground.
  - 1. TVSS Components: Multiple metal-oxide varistors; with a nominal clamp level rating of 500 volts and minimum single transient pulse energy dissipation of 140 J line to neutral, and 70 J line to ground and neutral to ground.
  - 2. Active TVSS Indication: Visual only, with light visible in face of device to indicate device is "active" or "no longer in service."
  - 3. Receptacle Type: Heavy-Duty grade, with isolated-ground terminal,.
  - 4. Identification: Distinctive marking on face of device to denote TVSS-type unit.
- G. Industrial Heavy-Duty Pin and Sleeve Devices: Comply with IEC 309-1.
- H. Hazardous (Classified) Location Receptacles: Comply with NEMA FB 11.

# 3. PENDANT CORD/CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector, NEMA WD 6, Configurations L5-20P and L5-20R, Heavy-Duty grade.
  - 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
  - 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

# 4. CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
  - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
  - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

# 5. SWITCHES

A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.

- B. Snap Switches: Heavy, General,-Duty grade, quiet type.
- C. Combination Switch and Receptacle: Both devices in a single gang unit with plaster ears and removable tab connector that permit separate or common feed connection.
  - 1. Switch: 20 A, 120/277-V ac.
  - 2. Receptacle: NEMA WD 6, Configuration 5-15R.
- D. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on/off switches and audible frequency and EMI/RFI filters.
  - 1. Control: Continuously adjustable slider, toggle switch, rotary knob,; with single-pole or three-way switching to suit connections.
  - Incandescent Lamp Dimmers: Modular, 120 V, 60 Hz with continuously adjustable rotary knob, toggle switch, or slider; single pole with soft tap or other quiet switch; EMI/RFI filter to eliminate interference; and 5-inch wire connecting leads.
  - 3. Fluorescent Lamp Dimmer Switches: Modular; compatible with dimmer ballasts; trim potentiometer to adjust low-end dimming; dimmer-ballast combination capable of consistent dimming with low end not greater than 20 percent of full brightness.

#### 6. WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Finished Spaces: satin-finished stainless steel
  - 3. Material for Unfinished Spaces: stainless steel.
  - 4. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

#### 7. FLOOR SERVICE FITTINGS

- A. Type: Modular, flush-type dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Service Plate: Round, solid brass with satin finish.
- D. Power Receptacle: NEMA WD 6, Configuration 5-20R, gray finish, unless otherwise indicated.
- E. Voice and Data Communication Outlet: Blank cover with bushed cable opening

# 8. MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- B. Raceway Material: Metal, with manufacturer's standard finish.
- C. Wire: No. 12 AWG.

#### 9. FINISHES

- A. Color:
  - 1. Wiring Devices Connected to Normal Power System: As selected by Designer
  - 2. Delete first subparagraph below and edit paragraph and subparagraph above if a separate emergency power system serving wiring devices is not provided.
  - 3. Wiring Devices Connected to Emergency Power System: Red.
  - 4. TVSS Devices: Blue.
  - 5. Isolated-Ground Receptacles: Orange

#### **III.EXECUTION**

- 1. INSTALLATION
  - A. Install devices and assemblies level, plumb, and square with building lines.
  - B. Install wall dimmers to achieve indicated rating after derating for ganging according to manufacturer's written instructions.

- C. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- E. Remove wall plates and protect devices and assemblies during painting.
- F. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

# 2. IDENTIFICATION

- A. Comply with Division 16 Section "Electrical Identification."
  - 1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

# 3. CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

# 4. FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
  - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

# END OF SECTION 16140

# **SECTION 16145 - LIGHTING CONTROL DEVICES**

# I.GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following lighting control devices:
  - 1. Time switches.
  - 2. Outdoor photoelectric switches.
  - 3. Switch-box occupancy sensors.
  - 4. Indoor occupancy sensors.
  - 5. Outdoor motion sensors.
  - 6. Multipole contactors.

# 3. DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

#### 4. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
  - 1. Lighting plan showing location, orientation, and coverage area of each sensor.
    - 2. Interconnection diagrams showing field-installed wiring.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

# 5. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

# 6. COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

#### II.PRODUCTS

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

# 2. GENERAL LIGHTING CONTROL DEVICE REQUIREMENTS

A. Line-Voltage Surge Protection: An integral part of the devices for 120- and 277-V solid-state equipment. For devices without integral line-voltage surge protection, field-mounting surge protection shall comply with IEEE C62.41 and with UL 1449.

# 3. TIME SWITCHES

- A. Available Manufacturers:
  - 1. Intermatic, Inc.

- 2. Leviton Mfg. Company Inc.
- 3. Lightolier Controls; a Genlyte Company.
- 4. Lithonia Lighting.
- 5. Paragon Electric Co.
- 6. Square D.
   7. TORK.
- 8. Watt Stopper (The).
- B. Digital Time Switches: Electronic, solid-state programmable units with alphanumeric display complying with UL 917.
  - 1. Contact Configuration: As indicated
  - 2. Contact Rating: 30-A inductive or resistive, 277-V ac.
  - 3. Program: 2 on-off set points on a 24-hour schedule, allowing different set points for each day of the week
  - 4. Programs: single channel.
  - 5. Circuitry: Allow connection of a photoelectric relay as substitute for on and off function of a program
  - 6. Astronomical Time: All or Selected channels.
  - 7. Battery Backup: For schedules and time clock.

#### **OUTDOOR PHOTOELECTRIC SWITCHES** 4.

- A. Available Manufacturers:
  - 1. Area Lighting Research, Inc.
  - 2. Fisher Pierce.
  - 3. Grasslin Controls Corporation.
  - 4. Intermatic, Inc.
  - 5. Lithonia Lighting.
  - 6. Novitas, Inc.
  - 7. Paragon Electric Co.
  - 8. Square D.
  - 9. TORK.
  - 10. Touchplate Technologies, Inc.
  - 11. Watt Stopper (The).
- B. Description: Solid state, with SPST or DPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; and complying with UL 773.
  - 1. Light-Level Monitoring Range: 1.5 to 10 fc (16 to 108 lx), with an adjustment for turn-on and turn-off levels within that range.
  - 2. Time Delay: 15-second minimum, to prevent false operation.
  - 3. Lightning Arrester: Air-gap type.
  - 4. Mounting: Twist lock complying with IEEE C136.10, with base. Provide with stem mounting or stemand-swivel mounting accessories as required to direct sensor to the North sky exposure.

#### 5. INDOOR PHOTOELECTRIC SWITCHES

- A. Ceiling-Mounting Photoelectric Switch: Solid-state, light-level sensor unit, with separate relay unit mounted on luminaire, to detect changes in lighting levels that are perceived by the eye. Cadmium sulfide photoresistors are not acceptable.
  - 1. Sensor Output: Contacts rated to operate the associated relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  - 2. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
  - 3. Light-Level Monitoring Range: 10 to 200 fc (108 to 2150 lx) or 100 to 1000 fc (1080 to 10 800 lx), with an adjustment for turn-on and turn-off levels within that range.
  - 4. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling, with deadband adjustment.
  - 5. Indicator: Two LEDs to indicate the beginning of on and off cycles.

#### 6. SWITCH-BOX OCCUPANCY SENSORS

A. Available Manufacturers:

- 1. Bryant Electric; a Hubbell Company.
- 2. Hubbell Lighting Inc.
- 3. Leviton Mfg. Company Inc.
- 4. Lightolier Controls; a Genlyte Company.
- Lithonia Lighting.
   MYTECH Corporation.
- 7. Novitas, Inc.
- 8. RAB Electric Manufacturing, Inc.
- 9. Sensor Switch, Inc.
- 10. TORK.
- 11. Unenco Electronics; a Hubbell Company.
- 12. Watt Stopper (The).
- B. Description: PIR type with integral power-switching contacts rated for 800 W at 120-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/6-hp motors; and rated for 1000 W at 277-V ac, suitable for incandescent light fixtures, flourescent light fixtures with magnetic or electronic ballasts, or 1/3-hp motors, minimum.
  - 1. Include ground wire.
  - 2. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (215 to 2150 lx); keeps lighting off when selected lighting level is present.

#### INDOOR OCCUPANCY SENSORS 7.

- A. Available Manufacturers:
  - 1. Hubbell Lighting Inc.
  - 2. Leviton Mfg. Company Inc.
  - 3. Lithonia Lighting.
  - 4. MYTECH Corporation.
  - 5. Novitas, Inc.
  - 6. RAB Electric Manufacturing, Inc.
  - 7. Sensor Switch, Inc.
  - 8. TORK.
  - 9. Unenco Electronics: a Hubbell Company.
  - 10. Watt Stopper (The).
- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
  - 1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied: with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  - 2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  - 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA. Class 2 power source as defined by NFPA 70.
  - 4. Mountina:
    - Sensor: Suitable for mounting in any position on a standard outlet box. a)
    - b) Relay: Externally mounted though a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
    - c) Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  - 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
  - 6. Bypass Switch: Override the on function in case of sensor failure.
  - Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (215 to 2150 lx); keeps lighting off when 7. selected lighting level is present.
- C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage
  - 1. Detector Sensitivity: Detect occurrences of 6-inch (150-mm) minimum movement of any portion of a human body that presents a target of at least 36 sq. in. (232 sq. cm).
  - 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

- 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.
- D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
  - 1. Detector Sensitivity: Detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (.
  - 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
  - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on an 8-foot- high ceiling.
  - 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
  - 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foothigh ceiling in a corridor not wider than 14 feet.
- E. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on and off functions shall be selectable in the field by operating controls on unit.
  - 1. Sensitivity Adjustment: Separate for each sensing technology.
  - 2. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in., and detect a person of average size and weight moving at least 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches.
  - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

#### 8. OUTDOOR MOTION SENSORS (PIR)

- A. Available Manufacturers:
  - 1. Bryant Electric; a Hubbell Company.
  - 2. Hubbell Lighting Inc.
  - 3. Lithonia Lighting.
  - 4. Paragon Electric Co.
  - 5. RAB Electric Manufacturing, Inc.
  - 6. TORK.
  - 7. Watt Stopper (The).
- B. General Description: Suitable for operation in ambient temperatures ranging from minus 40 deg F to 130 deg F, UL 773A rated as raintight.
  - 1. Operation: Turn lights on when sensing infrared energy changes between background and moving body in area of coverage; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  - Sensor Output: Suitable for switching 300 W of tungsten load at 120- or 277-V ac. Lampholders shall comply with UL 1571, UL 1598 for wet locations.
  - 3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
  - 4. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
  - 5. Mounting:
    - a) Sensor: Suitable for mounting in any position on a standard outdoor junction box.
    - b) Relay: Internally mounted in a standard weatherproof electrical enclosure.
    - c) Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
  - 6. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
  - 7. Bypass Switch: Override the on function in case of sensor failure.
  - 8. Automatic Light-Level Sensor: Adjustable from 1 to 20 fc (11 to 215 lx); keeps lighting off during daylight hours.

- C. Detector Sensitivity: Detect occurrences of 6-inch minimum movement of any portion of a human body that presents a target of at least 36 sq. in..
- D. Detection Coverage: Up to 35 feet, with a field of view of 90 degrees

# 9. MULTIPOLE CONTACTORS

- A. Available Manufacturers:
  - 1. Allen-Bradley/Rockwell Automation.
  - 2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
  - 3. Cutler-Hammer; Eaton Corporation.
  - 4. Fisher Pierce.
  - 5. GE Industrial Systems; Total Lighting Control.
  - 6. Grasslin Controls Corporation.
  - 7. Hubbell Lighting Inc.
  - 8. Lithonia Lighting.
  - 9. MicroLite Corporation.
  - 10. TORK.
  - 11. Touchplate Technologies, Inc.
  - 12. Watt Stopper (The).
- B. Description: Electrically operated and mechanically or electrically held, complying with NEMA ICS 2 and UL 508.
  - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
  - 2. Control-Coil Voltage: Match control power source.

#### 10. CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 16 Section " Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 18 AWG, complying with Division 16 Section "Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded copper conductors not smaller than No. 14 AWG, complying with Division 16 Section "Conductors and Cables."
- D. Install unshielded, twisted-pair cable for control and signal transmission conductors, complying with Division 16 Section "Voice and Data Communication Cabling."

# **III.EXECUTION**

#### 1. SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve at least 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

# 2. WIRING INSTALLATION

- A. Wiring Method: Comply with Division 16 Section "Conductors and Cables." Minimum conduit size shall be 1/2 inch.
- B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Install field-mounting transient voltage suppressors for lighting control devices in Category A locations that do not have integral line-voltage surge protection.
- D. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

#### 3. IDENTIFICATION

- A. Identify components and power and control wiring according to Division 16 Section "Basic Electrical Materials and Methods and Electrical Identification."
- B. Label time switches and contactors with a unique designation.

#### 4. FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
  - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
  - 2. Operational Test: Verify actuation of each sensor and adjust time delays.
- B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

# 5. ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide onsite assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

#### **END OF SECTION 16145**

# **SECTION 16511 - INTERIOR LIGHTING**

# I. GENERAL

# 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.

# 2. SUMMARY

- A. This Section includes the following:
  - 1. Interior lighting fixtures with lamps and ballasts.
  - 2. Lighting fixtures mounted on exterior building surfaces.
  - 3. Emergency lighting units.
  - 4. Exit signs.
  - 5. Accessories.

# 3. DEFINITIONS

- A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.
- B. CRI: Color rendering index.
- C. CU: Coefficient of utilization.
- D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
  - 1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.
- E. RCR: Room cavity ratio.

# 4. SUBMITTALS

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of fixture, including dimensions and verification of indicated parameters.
  - 2. Emergency lighting unit battery and charger.
  - 3. Fluorescent and high-intensity-discharge ballasts.
  - 4. Air and Thermal Performance Data: For air-handling fixtures. Furnish data required in "Submittals" Article in Division 15 Section "Diffusers, Registers, and Grilles."
  - Sound Performance Data: For air-handling fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Division 15 Section "Diffusers, Registers and Grilles."
  - 6. Lamps.
- B. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section Operation and Maintenance Data," include the following:
  - 1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.
- C. Warranties: Special warranties specified in this Section.

# 5. QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicted, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 70.
- E. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- F. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

# 6. COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

#### 7. WARRANTY

- A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
- B. Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for T8 Fluorescent Lamps: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
  - 1. Warranty Period: One year from date of Substantial Completion.

# II. PRODUCTS

# 1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

#### 2. FIXTURES AND COMPONENTS, GENERAL

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
  - 1. White Surfaces: 85 percent.
  - 2. Specular Surfaces: 83 percent.
  - 3. Diffusing Specular Surfaces: 75 percent.
  - 4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
  - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    - a) Lens Thickness: At least 0.125 inch minimum unless different thickness is scheduled.
    - b) UV stabilized.
  - 2. Glass: Annealed crystal glass, unless otherwise indicated.
- J. Electromagnetic-Interference Filters: A component of fixture assembly. Suppress conducted electromagnetic-interference as required by MIL-STD-461D. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.
- K. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for air return and heat extraction and for attaching an air-diffuser-boot assembly specified in Division 15 Section "Diffusers, Registers, and Grilles."
  - 1. Air Supply Units: Slots in one or both side trims join with air-diffuser-boot assemblies.
  - 2. Heat Removal Units: Air path leads through lamp cavity.
  - 3. Combination Heat Removal and Air Supply Unit: Heat is removed through lamp cavity at both ends of the fixture door with air supply same as for air supply units.
  - 4. Dampers: Operable from outside fixture for control of return-air volume.
  - 5. Static Fixtures: Air supply slots are blanked off, and fixture appearance matches active units.

#### 3. FLUORESCENT LAMP BALLASTS

- A. Description: Include the following features, unless otherwise indicated:
  - 1. Designed for type and quantity of lamps indicated at full light output except for emergency lamps powered by in-fixture battery-packs.
  - 2. Externally fused with slow-blow type rated between 2.65 and 3.0 times the line current.
- B. Electronic ballasts for linear lamps shall include the following features, unless otherwise indicated:
  - 1. Comply with ANSI C82.1.
  - 2. Ballast Type: Rapid start, unless otherwise indicated.
  - 3. Programmed Start: Ballasts with two-step lamp starting to extend life of frequently started lamps.
  - 4. Sound Rating: A
  - 5. Total harmonic distortion rating of less than 10 percent according to NEMA C82.11.
  - 6. Transient Voltage Protection: IEEE C62.41, Category A.
- C. Ballasts for compact lamps fixtures shall have the following features, unless otherwise indicated:
  - 1. Type: Electronic
  - 2. Power Factor: 90 percent, minimum.
  - 3. Flicker: Less than 5 percent.
  - 4. Lamp end-of-life detection and shutdown circuit.
  - 5. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
  - 6. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
- D. Ballasts for dimmer-controlled fixtures shall comply with general and fixture-related requirements above for electronic ballasts and the following features:
  - 1. Dimming Range: 100 to 5 percent of rated lamp lumens.
  - 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
  - 3. Compatibility: Certified by manufacturer for use with specific dimming system indicated.
- E. Ballasts for Low-Temperature Environments:
  - 1. Temperatures 0 deg F (Minus 17 deg C) and Higher: Electronic or electromagnetic type rated for 0 deg Fminus 17 deg C starting temperature.
  - 2. Temperatures Minus 20 deg FMinus 29 deg C and Higher: Electromagnetic type designed for use with high-output lamps.

#### 4. HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

- A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated.
  - 1. Type: Constant-wattage autotransformer or regulating high-power-factor type.
  - 2. Minimum Starting Temperature: Minus 22 deg FMinus 30 deg C for single-lamp ballasts.
  - 3. Normal Ambient Operating Temperature: 104 deg F40 deg C.
  - 4. Open-circuit operation that will not reduce average life.
- B. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.
- C. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.
- D. High-Pressure-Sodium Ballasts: Solid-state igniter/starter with an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 deg C.
  - 1. Instant Restrike Device: Solid-state potted module, mounted inside high-pressure-sodium fixture and compatible with high-pressure-sodium lamps, ballasts, and sockets up to 150 W.
    - a) Restrike Range: 105- to 130-V ac.
    - b) Maximum Voltage: 250-V peak or 150-V ac RMS.

# 5. EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  - 1. Lamps for AC Operation: Incandescent, 2 for each fixture, 50,000 hours of rated lamp life.
  - 2. Lamps for AC Operation: Fluorescent, 2 for each fixture, 20,000 hours of rated lamp life.
  - 3. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.
  - 4. Additional Lamps for DC Operation: Two minimum, bayonet-base type, for connection to external dc source.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
  - 1. Battery: Sealed, maintenance-free, nickel-cadmium type with special warranty.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 3. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.

# 6. EMERGENCY LIGHTING UNITS

- A. General: Self-contained units complying with UL 924.
  - 1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
  - 2. Charger: Fully automatic, solid-state type with sealed transfer relay.
  - 3. Operation: Relay automatically turns lamp on when power supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
  - 4. Wire Guard: Where indicated, heavy-chrome-plated wire guard protects lamp heads or fixtures.
  - 5. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; time delay permits high-intensity-discharge lamps to restrike and develop adequate output.

# 7. FLUORESCENT EMERGENCY LIGHTING FIXTURES

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
  - 1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  - 2. Night Light Connection: Operate one fluorescent lamp continuously.

- 3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
- 4. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
- 5. Charger: Fully automatic, solid-state, constant-current type.
- B. Central Type: Factory installed, full light output, fluorescent emergency ballast to operate lamps indicated from a remote emergency power source.
- C. External Type: Self-contained, modular, battery-inverter unit, suitable for powering one or more fluorescent lamps, remote mounted from light fixture. Comply with UL 924.
  - 1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  - 2. Night Light Connection: Operate one fluorescent lamp in a remote fixture continuously.
  - 3. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.
  - 4. Charger: Fully automatic, solid-state, constant-current type.
  - 5. Housing: NEMA 250, Class 1 enclosure.

#### FLUORESCENT LAMPS 8.

- A. Low-Mercury Lamps: Comply with Federal toxic characteristic leaching procedure test, and yield less than 0.2 mg of mercury per liter, when tested according to NEMA LL 1.
- B. T8 rapid-startlamps, rated 32 W maximum, 3100 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500K, and average rated life of 20,000 hours, unless otherwise indicated.
- C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches610 mm, 1300 initial lumens (minimum), CRI of 75 (minimum), color temperature of 3500K, and average rated life of 20,000 hours. unless otherwise indicated.
- D. Compact Fluorescent Lamps: CRI 80 (minimum), color temperature 3500, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.
  - 1. T4, Twin Tube: Rated 5 W, 250 initial lumens (minimum).
  - 2. T4, Twin Tube: Rated 7 W, 400 initial lumens (minimum).
  - 3. T4, Twin Tube: Rated 9 W, 600 initial lumens (minimum).
  - 4. T4, Twin Tube: Rated 13 W, 825 initial lumens (minimum).

  - T4, Double-Twin Tube: Rated 13 W, 900 initial lumens (minimum).
     T4, Double-Twin Tube: Rated 18 W, 1200 initial lumens (minimum).
  - 7. T4, Double-Twin Tube: Rated 26 W, 1800 initial lumens (minimum).

#### **HIGH-INTENSITY-DISCHARGE LAMPS** 9

- A. High-Pressure-Sodium Lamps: NEMA C78.42, wattage and burning position as scheduled, CRI 21 (minimum), color temperature 1900, and average rated life of 24,000 hours.
- B. Low-Pressure-Sodium Lamps: NEMA C78.41.
- C. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature 4000.

#### 10. FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 16 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage (2.68 mm)
- E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm) Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.

- F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- G. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

# 11. FINISHES

- A. Fixtures: Manufacturers' standard, unless otherwise indicated.
  - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
  - 2. Metallic Finish: Corrosion resistant.

# 12. LIGHTING CONTROL DEVICES

- A. Dimming Ballast Controls: Sliding-handle type with on/off control; compatible with ballast and having light output and energy input over the full dimming range.
- B. Light Level Sensor: Detect changes in ambient lighting level and provide dimming range of 20 to 100 percent in response to change.
  - 1. Sensor Capacity: At least 40 electronic dimming ballasts.
  - 2. Adjustable Ambient Detection Range: 10 to 100 fc (100 to 1000 lx) minimum.
- C. Occupancy Sensors: Adjustable sensitivity and off delay time range of 5 to 15 minutes.
  - 1. Device Color:
    - a) Wall Mounted: Ivory.
    - b) Ceiling Mounted: White.
  - 2. Occupancy detection indicator.
  - 3. Ultrasonic Sensors: Crystal controlled with circuitry that causes no detection interference between adjacent sensors.
  - 4. Infrared Sensors: With daylight filter and lens to afford coverage applicable to space to be controlled.
  - 5. Combination Sensors: Ultrasonic and infrared sensors combined.

#### 13. SOURCE QUALITY CONTROL

- A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.
- B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

# **III. EXECUTION**

# 1. INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
  - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
  - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
  - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
  - 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Fixture Support: As follows:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
  - 4. Continuous Rows: Suspend from cable.
- D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.

E. Adjust aimable fixtures to provide required light intensities.

# 2. CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

# 3. FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Verify normal operation of each fixture after installation.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
- E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

# END OF SECTION 16511

# UNIVERSIDAD DE PUERTO RICO EN PONCE

Junta de Subastas UPR-Ponce PO BOX 7186 Ponce, Puerto Rico 00732 Tel. (787) 844-8181 Ext. 2403

# PRESENTACIÓN DE OFERTA

Número:	Fecha entrega de propuesta:	Lugar:
SUBASTA-UPRP-22-03		Oficina de Compras
		UPR-Ponce

Este documento es un requisito de subasta. **Este debe ser el primer documento visible** de su licitación (puede incluir los anejos que estime pertinentes). Añada la hoja de cotejo con todos los documentos y certificaciones requeridas. Los precios cotizados deberán estar garantizados por ciento veinte (120) días a partir de la apertura de pliegos.

Renglón	Descripción General	Precio Subastado	Garantía
Renglón 1 Remodelación de baños en la Universidad de Puerto Rico en Ponce			Términos y condiciones

# FAVOR DE INCLUIR ADEMÁS:

- 1. Correo electrónico \_\_\_\_\_
- 2. Número de Teléfono \_\_\_\_
- 3. Seguro Social Patronal \_\_\_\_\_
- 4. Tiempo de entrega \_\_\_\_\_

Nombre del Licitador (Compañía) Nombre y puesto de quien presenta la oferta

Fecha

Firma autorizada



Junta de Subastas



Exts. 2400, 2403

# Hoja de Cotejo Subasta UPRP-22-03 Remodelación de Baños en UPR Ponce

Nombre de Licitador (compañía): \_\_\_\_\_

Documento	Cumplimiento (Completado por el proponente)	Revisión Oficina de Compras	Comentarios
1. Presentación de Oferta	SometidoN/A	_Cumple _No Cumple	
2. BID BOND (5%)	SometidoN/A	_Cumple _No Cumple	
<ol> <li>Certificación vigente del Registro Único de licitadore de la ASG</li> </ol>	esSometidoN/A	_Cumple _No Cumple	
<ol> <li>Memorando Explicativo (se requerido en pliego de subasta)</li> </ol>	gún SometidoN/A	_Cumple _No Cumple	
5. Cartas de referencia (tres)	SometidoN/A	_Cumple _No Cumple	
<ol> <li>Plan de trabajo (según requerido en pliego de subastas)</li> </ol>	SometidoN/A	_Cumple _No Cumple	
7. Estados financieros	SometidoN/A	_Cumple _No Cumple	
8. Otros:	SometidoN/A	_Cumple _No Cumple	
Otros:	SometidoN/A	_Cumple _No Cumple	
Otros:	SometidoN/A	_Cumple _No Cumple	

Sometido por: \_\_\_\_\_

Nombre

Fecha: \_\_\_\_\_

Firma: \_\_\_\_\_\_