

**SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA**

392
(1861)



FROM: Economic Development Agency

SUBMITTAL DATE:
August 23, 2016

SUBJECT: Riverside University Health System Emergency Department Expansion and Remodel Project - California Environmental Quality Act Exempt, Approval of Preliminary Project Budget, Amendment No. 1 for Kitchell CEM, Inc. for Construction Management Services, and Plans and Specifications, District 5, [\$12,774,578], CORAL Bond Proceeds-83%, RUHS Enterprise Fund 40050-17%

RECOMMENDED MOTION: That the Board of Supervisors:

1. Find that the Riverside University Health System (RUHS) Emergency Department (ED) Expansion and Remodel Project, located at 26520 Cactus Avenue, Moreno Valley, California, is exempt from the California Environmental Quality Act (CEQA) pursuant to State CEQA Guidelines Sections 15301 – Class 1 Existing Facilities Exemption and 15061 (b)(3) “Common Sense” Exemption;
2. Approve a preliminary project budget of \$12,774,578 and find that RUHS is authorized to use RUHS Enterprise Fund 40050 and CORAL Bond Proceeds and reimburse the Economic Development Agency (EDA) for incurred project expenses;

(Continued)

Robert Field
Assistant County Executive Officer/EDA

FINANCIAL DATA	Current Fiscal Year:	Next Fiscal Year:	Total Cost:	Ongoing Cost:	POLICY/CONSENT (per Exec. Office)
COST	\$ 6,000,000	\$ 6,774,578	\$ 12,774,578	\$ 0	Consent <input type="checkbox"/> Policy <input checked="" type="checkbox"/>
NET COUNTY COST	\$ 0	\$ 0	\$ 0	\$ 0	

SOURCE OF FUNDS: CORAL Bond Proceeds-83%, RUHS Enterprise Fund 40050-17%	Budget Adjustment: No
	For Fiscal Year: 2016/17-17/18

C.E.O. RECOMMENDATION: APPROVE APPROVE

BY: **Ivan M. Chand** BY: **Rohini Dasika**

County Executive Office Signature 8/17/2016

MINUTES OF THE BOARD OF SUPERVISORS

On motion of Supervisor Ashley, seconded by Supervisor Benoit and duly carried by unanimous vote, IT WAS ORDERED that the above matter is approved as recommended.

Ayes: Jeffries, Tavaglione, Washington, Benoit and Ashley
Nays: None
Absent: None
Date: August 23, 2016
xc: EDA

Kecia Harper-Ihem
Clerk of the Board
By: Deputy

Prev. Agn. Ref.: 3-42 of 3/29/16; 3-11 of 12/08/15 **District:** 5 **Agenda Number:**

3-34

FORM APPROVED COUNTY COUNSEL
 BY: GREGORY P. PRIAMOS
 DATE: 8/10/16
 Departmental Concurrence
 By: Zareh Sarrafian, Chief Executive Officer
 Riverside University Health System

A-30 Positions Added
 4/5 Vote Change Order

SUBMITTAL TO THE BOARD OF SUPERVISORS, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

Economic Development Agency

FORM 11: Riverside University Health System Emergency Department Expansion and Remodel Project - California Environmental Quality Act Exempt, Approval of Preliminary Project Budget, Amendment No. 1 for Kitchell CEM, Inc. for Construction Management Services, and Plans and Specifications, District 5, [\$12,774,578], CORAL Bond Proceeds-83%, RUHS Enterprise Fund 40050-17%

DATE: August 23, 2016

PAGE: 2 of 4

RECOMMENDED MOTION: (Continued)

3. Approve the attached Amendment No. 1 to the construction management services agreement between the County of Riverside (County) and Kitchell CEM, Inc. (Kitchell) in the credit amount of (\$185,250) for the project and authorize the Chairman of the Board to execute the Amendment on behalf of the County;
4. Authorize the Assistant County Executive Officer/EDA to administer Amendment No. 1 for Kitchell in accordance with applicable Board policies;
5. Approve the plans and specifications for the bidding and construction of the RUHS ED Expansion and Remodel Project using the approved pre-qualified list of the Office of Statewide Health Planning and Development (OSHPD) Level II contractors, and authorize the Clerk of the Board to advertise for bids;
6. Upon completion of the bid process, authorize the Assistant County Executive Officer/EDA to submit the contract for award of the bid to the lowest responsive and responsible pre-qualified OSHPD bidder to the Chairman of the Board, and authorize the Chairman to execute the agreement on behalf of the Board provided that, if any of the following occur, the award will be submitted to the Board for action: there is a bid protest, the lowest bid exceeds the estimated construction budget, the low bidder is disqualified, two or more bids are the same and are the lowest, or a bidder requests relief from its bid due to an error; and
7. Delegate project management authority for the project to the Assistant County Executive Officer/EDA in accordance with applicable Board policies.

BACKGROUND:

Summary

On March 29, 2016, the Board of Supervisors (Board) approved a construction management services agreement between the County and Kitchell in the amount of \$1,245,795, plus a reimbursable amount of \$30,000. Amendment No. 1 for Kitchell will reduce the CM service contract by \$185,250 to a revised amount of \$1,090,545; Kitchell's scope of work has been reduced by changing the delivery method from CM multi-prime to CM agency.

On December 8, 2015, the Board approved the pre-qualified general contractors list for OSHPD projects for the County ranging from \$175,000 to \$30,000,000. HKS Architects has completed the bid documents and are ready for advertisement. In order to keep the project moving forward and meet project schedule commitments, EDA recommends the Board authorize the Assistant County Executive Officer/EDA, or designee, to determine award of the project in accordance with Board Policy B-11 and authorize the Chairman of the Board to execute the agreement on behalf of the Board, provided that the lowest bid falls within the allotted project budget.

(Continued)

SUBMITTAL TO THE BOARD OF SUPERVISORS, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

Economic Development Agency

FORM 11: Riverside University Health System Emergency Department Expansion and Remodel Project - California Environmental Quality Act Exempt, Approval of Preliminary Project Budget, Amendment No. 1 for Kitchell CEM, Inc. for Construction Management Services, and Plans and Specifications, District 5, [\$12,774,578], CORAL Bond Proceeds-83%, RUHS Enterprise Fund 40050-17%

DATE: August 23, 2016

PAGE: 3 of 4

BACKGROUND:

Summary (Continued)

EDA requests Board approval to solicit bids from the pre-qualified prime contractors for OSHPD Level II and authorize the Clerk of the Board to advertise the Notice of Inviting bids for construction of the project. EDA will return to the Board under separate cover to execute other project related agreements.

The remodel and addition would occur on previously developed land, would not substantially increase or expand the use of the site, and is limited to the continued use of the site in a similar capacity. No direct or indirect physical environmental impacts are anticipated from the remodel and limited expansion.

Impact on Citizens and Businesses

Riverside County residents will experience improved wait times, direct access to a Level I Trauma facility and have an overall positive patient care experience as a result of these improvements for emergency services.

Construction Management Agreement History

DESCRIPTION	AMOUNT	PERCENT	DESCRIPTION
Base Service Contract Reimbursable	1,245,795 30,000	0.00%	Base contract for construction management services plus reimbursable.
Amendment No. 1 Service Contract	(185,250)	(14.52)%	Reduction of scope of work in the delivery method from multi-prime to agency.
TOTAL	\$ 1,090,545	(14.52)%	

Additional Fiscal Information

(Commences on Page 4)

SUBMITTAL TO THE BOARD OF SUPERVISORS, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

Economic Development Agency

FORM 11: Riverside University Health System Emergency Department Expansion and Remodel Project - California Environmental Quality Act Exempt, Approval of Preliminary Project Budget, Amendment No. 1 for Kitchell CEM, Inc. for Construction Management Services, and Plans and Specifications, District 5, [\$12,774,578], CORAL Bond Proceeds-83%, RUHS Enterprise Fund 40050-17%

DATE: August 23, 2016

PAGE: 4 of 4

Additional Fiscal Information

The approximate allocation of the preliminary project budget is as follows:

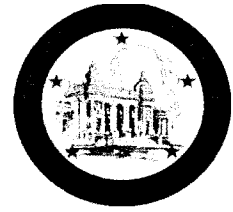
PROJECT BUDGET LINE ITEMS	BUDGET CATEGORY	PROJECT BUDGET AMOUNT
Architectural Design	1	994,033
Construction Management	2	1,090,545
Construction Contract	3	8,770,000
Offsite Construction	4	0
Project Management	5	250,000
Fixtures, Furnishings, Equipment	6	400,000
Other Soft Costs / Specialty Consultants	7	500,000
Project Contingency	8	770,000
Minor Construction	9	0
Project Budget		\$12,774,578

Expenditures for FY 2016/17 are estimated at \$6,000,000; expenditures for FY 2017/18 are estimated at \$6,774,578. All costs associated with this project will be 83% funded through CORAL Bond Proceeds and 17% funded through RUHS Enterprise Fund 40050. Due to ongoing project commitments of CORAL Bond Proceeds, any project shortfalls will be covered by use of RUHS Enterprise Fund 40050. No departmental budget adjustment is required at this time.

Attachments:

Notice of Exemption
Amendment No. 1 for Kitchell CEM, Inc.
Specifications

SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA



FROM:Riverside University Health System and EDA

SUBMITTAL DATE:
July 8, 2016

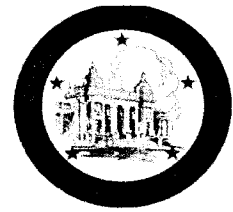
SUBJECT: Riverside University Health System Emergency Department Expansion and Remodel Project - California Environmental Quality Act Exempt, Approval of Preliminary Project Budget, Amendment No. 1 for Kitchell CEM, Inc. for Construction Management Services, and Plans and Specifications, District 5, [\$12,774,578], CORAL Bond Proceeds-83%, RUHS Enterprise Fund 40050-17%

RECOMMENDED MOTION: That the Board of Supervisors:

1. Find that the Riverside University Health System (RUHS) Emergency Department (ED) Expansion and Remodel Project, located at 26520 Cactus Avenue, Moreno Valley, California, is exempt from the California Environmental Quality Act (CEQA) pursuant to State CEQA Guidelines Sections 15301 – Class 1 Existing Facilities Exemption and 15061 (b)(3) “Common Sense” Exemption;
2. Approve a preliminary project budget of \$12,774,578 and find that RUHS is authorized to use RUHS Enterprise Fund 40050 and CORAL Bond Proceeds and reimburse the Economic Development Agency (EDA) for incurred project expenses;
3. Approve the attached Amendment No. 1 to the construction management services agreement between the County of Riverside (County) and Kitchell CEM, Inc. (Kitchell) in the credit amount of (\$185,250) for the project and authorize the Chairman of the Board to execute the Amendment on behalf of the County;
4. Authorize the Assistant County Executive Officer/EDA to administer Amendment No. 1 for Kitchell in accordance with applicable Board policies;
5. Approve the plans and specifications for the bidding and construction of the RUHS ED Expansion and Remodel Project using the approved pre-qualified list of the Office of Statewide Health Planning and Development (OSHPD) Level II contractors, and authorize the Clerk of the Board to advertise for bids;

(Continued)

SUBMITTAL TO THE BOARD OF SUPERVISORS
 COUNTY OF RIVERSIDE, STATE OF CALIFORNIA



RECOMMENDED MOTION: (Continued)

6. Upon completion of the bid process, authorize the Assistant County Executive Officer/EDA to submit the contract for award of the bid to the lowest responsive and responsible pre-qualified OSHPD bidder to the Chairman of the Board, and authorize the Chairman to execute the agreement on behalf of the Board provided that, if any of the following occur, the award will be submitted to the Board for action: there is a bid protest, the lowest bid exceeds the estimated construction budget, the low bidder is disqualified, two or more bids are the same and are the lowest, or a bidder requests relief from its bid due to an error; and

7. Delegate project management authority for the project to the Assistant County Executive Officer/EDA in accordance with applicable Board policies.

Policy

FINANCIAL DATA	Current Fiscal Year:	Next Fiscal Year:	Total Cost:	Ongoing Cost
COST	\$ 6,000,000	\$ 6,774,578	\$ 12,774,578	\$ 0
NET COUNTY COST	\$ 0	\$ 0	\$ 0	\$ 0
SOURCE OF FUNDS: CORAL Bond Proceeds-83%, RUHS Enterprise Fund 40050-17%			Budget Adjustment:	No
			For Fiscal Year: 2016/17-17/18	

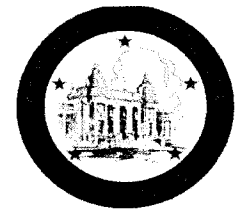
C.E.O. RECOMMENDATION: [CEO use]

BACKGROUND:

Summary

On March 29, 2016, the Board of Supervisors (Board) approved a construction management services agreement between the County and Kitchell in the amount of \$1,245,795, plus a reimbursable amount of \$30,000. Amendment No. 1 for Kitchell will reduce the service contract by \$185,250 for a revised amount of \$1,090,545, due to a reduction of the scope of work in the delivery method from multi-prime to agency. Please add a sentence or two that discusses the difference between multi-prime vs. agency delivery method, and why this saves money.

(Continued)



BACKGROUND:

Summary (Continued)

On December 8, 2015, the Board approved the pre-qualified general contractors list for OSHPD projects for the County ranging from \$175,000 to \$30,000,000. HKS Architects has completed the bid documents and are ready for advertisement. In order to keep the project moving forward and meet project schedule commitments, EDA recommends the Board authorize the Assistant County Executive Officer/EDA, or designee, to determine award of the project in accordance with Board Policy B-11 and authorize the Chairman of the Board to execute the agreement on behalf of the Board, provided that the lowest bid falls within the allotted project budget.

EDA requests Board approval to solicit bids from the pre-qualified prime contractors for OSHPD Level II and authorize the Clerk of the Board to advertise the Notice of Inviting bids for construction of the project. EDA will return to the Board under separate cover to execute other project related agreements.

The remodel and addition would occur on previously developed land, would not substantially increase or expand the use of the site, and is limited to the continued use of the site in a similar capacity. No direct or indirect physical environmental impacts are anticipated from the remodel and limited expansion.

Impact on Residents and Businesses

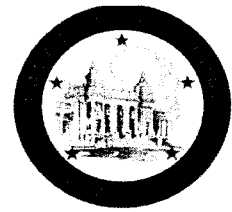
Riverside County residents will experience improved wait times, direct access to a Level I Trauma facility and have an overall positive on patient care experience as a result of these improvements for emergency services.

Construction Management Agreement History

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TOTAL	\$ 1,090,545	(14.52)%	

Additional Fiscal Information
 (Commences on Page 4)

SUBMITTAL TO THE BOARD OF SUPERVISORS
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA



Additional Fiscal Information

The approximate allocation of the preliminary project budget is as follows:

PROJECT BUDGET LINE ITEMS	BUDGET CATEGORY	PROJECT BUDGET AMOUNT
Architectural Design	1	994,033
Construction Management	2	1,090,545
Construction Contract	3	8,770,000
Offsite Construction	4	0
Project Management	5	250,000
Fixtures, Furnishings, Equipment	6	400,000
Other Soft Costs / Specialty Consultants	7	500,000
Project Contingency	8	770,000
Minor Construction	9	0
Project Budget		\$12,774,578

Expenditures for FY 2016/17 are estimated at \$6,000,000; expenditures for FY 2017/18 are estimated at \$6,774,578. All costs associated with this project will be 83% funded through CORAL Bond Proceeds and 17% funded through RUHS Enterprise Fund 40050. Due to ongoing project commitments of CORAL Bond Proceeds, any project shortfalls will be covered by use of RUHS Enterprise Fund 40050. No departmental budget adjustment is required at this time.

Attachments:

Notice of Exemption
Amendment No. 1 for Kitchell CEM, Inc.
Specifications



Original Negative Declaration/Notice of Determination was routed to County Clerks for posting on.

8/26/16 KB
Date Initial

NOTICE OF EXEMPTION

July 7, 2016

Project Name: County of Riverside, Riverside University Health System-Emergency Department Expansion and Remodel

Project Number: FM8430005088

Project Location: 26516 Cactus Avenue, west of Nason Street, APN 486-280-037, Moreno Valley, California 92555

Description of Project: The County of Riverside (County) intends to expand and remodel the existing Emergency Department (ED) at the Riverside University Health System (RUHS) Medical Center located at 26516 Cactus Avenue, Moreno Valley, California APN 486-280-037. The remodel would consist of 6,733 square feet of existing floor area and the expansion would consist of 1,819 square feet of new space. Since it was signed into law March 23, 2010 and took effect January 1, 2014, the Affordable Care Act fundamentally changed the structure of healthcare delivery systems in this country, prompting hospitals to evaluate and assess their strengths and weaknesses, while cultural shifts, technological advances and economic factors put pressure on the bottom line. In a series of reports issued in 2014, Huron Consulting Group presented their facility and market assessment and made recommendations on expanding certain service lines and developing new service lines, to better meet the healthcare needs of the primary service area over the next 5 years.

The RUHS ED remodel and expansion is part of the existing Medical Center that meets one of the aforementioned service lines. The project encompasses the expansion of the existing waiting area for a new registration check-in area, six Rapid Medical Evaluation exam rooms, public waiting with approximately 34 seats in addition to patient results waiting area, and four public toilets. Additionally it includes the renovation of existing treatment bays, offices, and storage into two Trauma rooms, five additional treatment bays, one new nurse station, storage, renovation of the existing darkroom to offices, and renovation of two existing offices into one work room. Support space is on the basement for the emergency power and roof for the HVAC systems. The remodel and expansion of the ED is identified as the proposed project under CEQA. The expansion of use would not be substantial and would be within the limits identified for the use of a Categorical Exemption under CEQA. No direct or indirect physical environmental impacts are anticipated from the remodel and limited expansion.

Name of Public Agency Approving Project: County of Riverside, Economic Development Agency

Name of Person or Agency Carrying Out Project: County of Riverside, Economic Development Agency

Exempt Status: State California Environmental Quality Act (CEQA) Guidelines, Section 15301, Class 1, Existing Facilities Exemption; Section 15061(b) (3), General Rule or "Common Sense" Exemption, Codified under Title 14, Article 19, Sections 15061 and 15300 to 15333.

AUG 23 2016 3:34

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|-----------------------|------------------------|-------------------------------|-----------------------|
| Administration | Housing | Economic Development | Parking |
| Aviation | Housing Authority | Edward-Dean Museum | Project Management |
| Business Intelligence | Information Technology | Environmental Planning | Purchasing Group |
| Cultural Services | Maintenance | Fair & National Date Festival | Real Property |
| Community Services | Marketing | Foreign Trade | Redevelopment Agency |
| Custodial | | Graffiti Abatement | Workforce Development |

Reasons Why Project is Exempt: The proposed project is categorically exempt from the provisions of CEQA specifically by the State CEQA Guidelines as identified below. The project will not result in any specific or general exceptions to the use of the categorical exemption as detailed under State CEQA Guidelines Section 15300.2. The project will not cause an impact to an environmental resource of hazardous or critical concern nor would the project include unusual circumstances which could potentially have a significant effect on the environment. The project would not result in impacts to scenic highways, hazardous waste sites, historic resources, or other sensitive natural environments, or have a cumulative effect to the environment. No significant environmental impacts are anticipated to occur with the remodel and limited expansion of the existing ED at RUHS.

- **Section 15301 – Class 1 Existing Facilities Exemption:** This categorical exemption includes the operation, repair, maintenance, leasing, or minor alteration of existing public or private structures or facilities, provided the exemption only involves negligible or no expansion of the previous site's use. The project, as proposed, is the remodel of the existing ED and minor expansion resulting in an additional 1,819 square feet of floor area. The remodel and addition would occur on previously developed land, would not substantially increase or expand the use of the site, and is limited to the continued use of the site in a similar capacity; therefore, the project is exempt as the project meets the scope and intent of the Class 1 Exemption identified in Section 15301, Article 19, Categorical Exemptions of the CEQA Guidelines.
- **Section 15061 (b) (3) – “Common Sense” Exemption:** In accordance with CEQA, the use of the Common Sense Exemption is based on the “general rule that CEQA applies only to projects which have the potential for causing a significant effect on the environment.” State CEQA Guidelines, Section 15061(b) (3). The use of this exemption is appropriate if “it can be seen with certainty that there is no possibility that the activity in question may have a significant effect on the environment.” *Ibid*. This determination is an issue of fact and if sufficient evidence exists in the record that the activity cannot have a significant effect on the environment, then the exemption applies and no further evaluation under CEQA is required. See *No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal. 3d 68. The ruling in this case stated that if a project falls within a category exempt by administrative regulation or 'it can be seen with certainty that the activity in question will not have a significant effect on the environment', no further agency evaluation is required. With certainty, there is no possibility that the project may have a significant effect on the environment. The proposed remodel and minor expansion will not result in any direct or indirect physical environmental impacts. The additional 1,819 square feet of expansion would require some minor alterations to internal circulation, but would not alter the function or use of the site or have any external physical effects. The use and operation of the facility will be substantially similar to the existing use and will not create any new environmental impacts. No alterations and no impacts beyond the ongoing, existing use of the site would occur. Therefore, in no way, would the project as proposed have the potential to cause a significant environmental impact and the project is exempt from further CEQA analysis.

Based upon the identified exemptions above, the County of Riverside, Economic Development Agency hereby concludes that no physical environmental impacts are anticipated to occur and the project as proposed is exempt under CEQA. No further environmental analysis is warranted.

Signed: _____

Date: _____

Mike Sullivan, Senior Environmental Planner
County of Riverside, Economic Development Agency

RIVERSIDE COUNTY CLERK & RECORDER

**AUTHORIZATION
TO BILL
BY JOURNAL VOUCHER**

Project Name: Riverside University Health System Emergency Department Expansion and Remodel Project

Accounting String: 542040-30100-7200800000- FM084300005088

DATE: July 7, 2016

AGENCY: Riverside County Economic Development Agency

THIS AUTHORIZES THE COUNTY CLERK & RECORDER TO BILL FOR FILING AND HANDLING FEES FOR THE ACCOMPANYING DOCUMENT(S).

NUMBER OF DOCUMENTS INCLUDED: One (1)

AUTHORIZED BY: Mike Sullivan, Senior Environmental Planner, Economic Development Agency

Signature:  _____

PRESENTED BY: Charles Waltman, Supervising Facilities Project Manager, Economic Development Agency

-TO BE FILLED IN BY COUNTY CLERK-

ACCEPTED BY: -

DATE: -

RECEIPT # (S) -



Date: July 7, 2016

To: Mary Ann Meyer, Office of the County Clerk

From: Mike Sullivan, Senior Environmental Planner, Project Management Office

Subject: **County of Riverside Economic Development Agency Project # FM084300005088**
Riverside University Health System Emergency Department Expansion and Remodel Project

The Riverside County's Economic Development Agency's Project Management Office is requesting that you post the attached Notice of Exemption. Attached you will find an authorization to bill by journal voucher for your posting fee.

After posting, please return the document to:

Mail Stop #1330

Attention: Mike Sullivan, Senior Environmental Planner,

Economic Development Agency,

3403 10th Street, Suite 400, Riverside, CA 92501

If you have any questions, please contact Mike Sullivan at 955-8009.

Attachment

cc: file

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**AMENDMENT No. 1, TO AGREEMENT
BETWEEN THE COUNTY OF RIVERSIDE AND KITCHELL CEM, INC.**

THE COUNTY OF RIVERSIDE and KITCHELL CEM, Inc. of Sacramento, CA hereby agree to amend that certain agreement for Construction Management Services associated with the Riverside University Health System Emergency Department Expansion and Remodel (FM08430005088) approved on March 29, 2016, Agenda Item 3-42 as follows:

Due to a change in the project's "Delivery Method" from a CM Multi-Prime to CM Agency, Exhibit "N" to the contract titled "Construction Manager's Staffing Fee Schedule" (refer to attached three page "Revised EXHIBIT "N") has been revised from a total value of \$1,245,795.00 down to \$1,060,545.00. The additional \$30,000 reimbursement budget is still additive to the \$1,060,545.00 Staffing Fee Schedule:

All other terms and conditions of the agreement shall remain the same and in full force and effect.

Remainder of Page Intentionally Left Blank
(Signatures on following page)

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COUNTY Approvals

APPROVED AS TO FORM:

GREGORY P. PRIAMOS, COUNTY COUNSEL

BY:

Marsha L. Victor Dated: 8/11/16
Marsha L. Victor, Principal Deputy County Counsel

APPROVAL BY THE BOARD OF SUPERVISORS

John J. Benoit Dated: AUG 23 2016
John J. Benoit
PRINTED NAME
Chairman, Riverside County Board of Supervisors

ATTEST:

Kecia Harper-Ihem Dated: AUG 23 2016
KECIA HARPER-IHEM
Clerk of the Board (SEAL)

KITCHELL CEM, INC., Approvals

By:

David Giannelli Dated: 7/6/2016
DAVID GIANNELLI
PRINTED NAME
S.V.C. PRESIDENT
TITLE

Address: 2750 GATEWAY CENTER, STE 300
SACRAMENTO, CA 95816

Revised EXHIBIT "N" per Amendment #1

CONSTRUCTION MANAGER'S STAFFING FEE SCHEDULE

Kitchell CEM, Inc.
 Emergency Department Renovation & Expansion
 Construction Management Fee

Kitchell proposes the following fee for the above referenced project. This fee is a professional services fee based upon the hourly rates set forth in the contract and the project schedule.

PreConstruction Fee	\$ 171,200
Construction Management Fee	\$ 850,720
<u>General Conditions Fee</u>	<u>\$ 38,625</u>
Total Fee	\$1,060,545

Our fees are inclusive of our home office overhead and non-reimbursable expenses per the contract.

PreConstruction Fee

- Complete one constructability review for 100% CD's
- Complete one estimate for 100% CD's
- Develop detailed project schedule
- Develop bid strategy, phasing, coordinate prequalification and manage bid process.

Pre Construction Services (7 Months)					
Estimate at 100% CD's	1	LS	\$ 35,000	\$ 35,000	Assumes one estimate at 100% CD's and then an estimate refresh with OSHPD back check comments.
Constructability Review at 100% CD's	1	LS	\$ 38,000	\$ 38,000	Assumes one constructability review at 100% CD's and then refresh with OSHPD back check comments.
Scheduling	110	Hours	\$ 135	\$ 14,850	20 hours per month for 7 months.
Pre Construction Project Management (Hilary Kingsley)	280	Hours	\$ 160	\$ 44,800	Managing the preconstruction including scheduling, estimates, bid packaging, bid phase, coordinating design team, coordinating contracting w/ sub-consultants. Manage overall project budget.
Construction Manager (Mike Wickham)	230	Hours	\$ 155	\$ 35,650	Developing bid packages, project phasing and logistics and preparation for construction.
Safety Officer	20	Hours	\$ 145	\$ 2,900	Develop project safety plan and incorporate into the bid packages.
Subtotal for Phase				\$ 171,200	

Revised EXHIBIT "N" per Amendment #1

CONSTRUCTION MANAGER'S STAFFING FEE SCHEDULE

Construction Management Fee

- Includes a full time Project Manager and Project Engineer for the Construction and Closeout phases of the project.
- Includes Senior Project Manager oversight for the duration of the project including coordination of end user move in and FFE& coordination.
- Fee assumes a 12 month construction duration and a 2 month closeout duration.

Construction Phase (12 Months)					
Project Manager (Hilary Kingsley)	520	Hours	\$ 160	\$ 83,200	PM oversight, end user interface and planning FF&E, transition planning, IT, budget oversight and cost management. 25% time
Construction Manager (Mike Wickham)	2080	Hours	\$ 155	\$ 322,400	Full time on site coordinating all aspects of work. Full time.
Project Engineer (TBD)	2080	Hours	\$ 110	\$ 228,800	Full time on site providing support to Construction Manager.
Scheduler	208	Hours	\$ 135	\$ 28,080	Ongoing project scheduling support.
Estimator	208	Hours	\$ 125	\$ 26,000	Ongoing cost estimating support.
Subtotal for Phase				\$ 668,480	
Construction Phase Closeout, FF&E Coordination, IT, Move Management & Licensing Coordination (2 Months)					
Project Manager (Hilary Kingsley)	348	Hours	\$ 160	\$ 55,680	Coordination of all transition planning activities.
Construction Manager (Mike Wickham)	348	Hours	\$ 155	\$ 53,940	Coordination of training, O&M, warranties, etc.
SWPPP Monitoring & Management	24	Hours	\$ 135	\$ 3,240	Weekly, monthly and quarterly monitoring & reporting.
Safety Officer	40	Hours	\$ 145	\$ 5,800	Monitoring safety.
Project Engineer (TBD)	348	Hours	\$ 110	\$ 38,280	Coordination of training, O&M, warranties, etc.
Scheduler	20	Hours	\$ 140	\$ 2,800	Detailed schedules for transition planning phase.
Estimator	20	Hours	\$ 125	\$ 2,500	Final cost reconciliation and project closeout.
Subtotal for Phase				\$ 162,240	
TOTAL CM FEE				\$ 850,720	

Revised EXHIBIT "N" per Amendment #1

CONSTRUCTION MANAGER'S STAFFING FEE SCHEDULE

General Conditions

- Our general conditions fee is based upon 12 months of construction, 2 months of closeout and 1 month of set up for a total of 15 months.
- The detail for the General conditions is itemized below.
- The General conditions will be billed at an equal rate each month per the contract.

General Conditions (15 Months)					
Office Trailer Alarm (includes commissioning)	15	Months	\$ 100	\$ 1,500	
Project Telephone/Internet	15	Months	\$ 300	\$ 4,500	
Cellular Phones	15	Months	\$ 150	\$ 2,250	
Computers / Laptops for Staff	15	Months	\$ 200	\$ 3,000	
Project Management Software Set Up	1	LS	\$ 10,000	\$ 10,000	
Project Management Software (Prolog)	15	Months	\$ 100	\$ 1,500	
Systems Installation/Network Config (Trailer)	1	Each	\$ 1,500	\$ 1,500	
Office Copier, Printer	15	Months	\$ 400	\$ 6,000	
Office Furnishings	1	Each	\$ 5,000	\$ 5,000	
Office Supplies	15	Months	\$ 100	\$ 1,500	
Office Cleaning	15	Months	\$ 50	\$ 750	
Drinking Water	15	Months	\$ 75	\$ 1,125	
Subtotal for Phase				\$ 38,625	
TOTAL PROPOSED FEE				\$	1,060,545

Costs Paid by Riverside County

Material Testing	Special Inspections
Soils Testing	Architect, Engineering & Design Consultants
Furniture, Fixtures & Equipment	OSHPD Permit Fees
Licensing Fees	Moving Costs
Temporary Office Space or Storage for Hospital Staff	Interest & Financing Costs
County Staff Costs	Bid Advertisement or Procurement Process Costs
Bid Document Reproduction	Reimbursable Costs

Scope included in General Contractor or Trade Contractor Bid Packages

Temp. Utilities & Service	CPM Schedule	Temp Power
Electronic File Archiving	Toilets / Hand Wash	Temp Lighting
Equipment & Fuel	Small Tools	Equipment Rental
Plans -- Printing	Photos / Video	Surveying
Signs	Storage	Dewatering
Infection Control	Recycling / Trash	Final Clean Up
Safety Equipment	Fire Prevention Equipment	Traffic Control
Dust Control	Construction Water	Hydrant Meter
SWPPP Implementation	Weather Protection	Temporary Heating / Cooling
Security	Temp Fencing	K-Rail
Office Trailer Mobilization & Set up & Tear Down	Electricity to Jobsite Trailer for Kitchell and IOR	Construction Camera Set up & Monthly Fee
Office Trailer Rental and Expenses for Kitchell and IOR		



PROJECT MANUAL

**RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA**

**BACK CHECK #3 SUBMITTAL
OSHPD PROJECT NUMBER: H152811-33-00
VOLUME 2 (DIVISIONS 21-33)**

HKS

HKS, INC.
AUGUST 02, 2016
HKS 12215.004

AUG 28 2016 334

FORM APPROVED COUNTY COUNSEL
BY: Marshall Victor 8/10/16
MARSHAL VICTOR DATE

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

TABLE OF CONTENTS

LEGEND

- FIRST COLUMN: DATE OF LATEST SECTION
- SECOND COLUMN: SHADED INDICATES SECTION IS INCLUDED IN CURRENT PRINTING
- THIRD COLUMN: REVISION NUMBER ("0" INDICATES ORIGINAL, REVISIONS ARE NUMBERED CONSECUTIVELY)
- FOURTH COLUMN: SPECIFICATION SECTION NUMBER
- FIFTH COLUMN: SPECIFICATION SECTION TITLE

NOTE FOR REVISED SPECIFICATION SECTIONS

1. DELETED INFORMATION IS INDICATED BY A STRIKETHROUGH (IE, ~~THIS IS DELETED~~).
2. NEW INFORMATION IS INDICATED BY A DOUBLE UNDERLINE (IE, THIS IS ADDED).
3. ALL REVISED INFORMATION IS FURTHER IDENTIFIED BY A HEAVY VERTICAL LINE TO THE RIGHT OF ALL REVISIONS IN EACH INDIVIDUAL SPECIFICATION SECTION (REFER TO HEAVY BOLD LINE TO THE RIGHT FOR AN EXAMPLE).

ISSUES OF SPECIFICATIONS SECTIONS

Date	Description
2014-12-24	OSHPD Submittal
2015-10-30	Back Check #1 Submittal
2016-08-02	Back Check #3 Submittal

VOLUME 1

DIVISION 00 - PROCUREMENT AND CONTRACT REQUIREMENTS

	<input checked="" type="checkbox"/>	0		Bid Instructions and Forms
2014-12-24	<input checked="" type="checkbox"/>	0	00 7200	General Conditions
2014-12-24	<input checked="" type="checkbox"/>	0	00 7300	Supplementary Conditions
2016-08-02	<input checked="" type="checkbox"/>	0	00 7400	Available Project Information

DIVISION 01 - GENERAL REQUIREMENTS

2014-12-24	<input checked="" type="checkbox"/>	0	01 1000	Summary
2014-12-24	<input type="checkbox"/>	0	01 2500	Substitution Procedures
2014-12-24	<input type="checkbox"/>	0	01 2600	Contract Modification Procedures
2014-12-24	<input type="checkbox"/>	0	01 2900	Payment Procedures
2016-08-02	<input checked="" type="checkbox"/>	0	01 3100	Project Management and Coordination
2014-12-24	<input checked="" type="checkbox"/>	0	01 3200	Construction Progress Documentation
2014-12-24	<input checked="" type="checkbox"/>	0	01 3300	Submittal Procedures
2014-12-24	<input checked="" type="checkbox"/>	0	01 4000	Quality Requirements
2014-12-24	<input checked="" type="checkbox"/>	0	01 4200	References
2014-12-24	<input checked="" type="checkbox"/>	0	01 4516	Field Test for Water Leakage
2014-12-24	<input checked="" type="checkbox"/>	0	01 5000	Temporary Facilities and Controls
2014-12-24	<input checked="" type="checkbox"/>	0	01 6000	Product Requirements
2014-12-24	<input checked="" type="checkbox"/>	0	01 7300	Execution
2014-12-24	<input checked="" type="checkbox"/>	0	01 7419	Construction Waste Management and Disposal
2014-12-24	<input checked="" type="checkbox"/>	0	01 7700	Closeout Procedures
2014-12-24	<input checked="" type="checkbox"/>	0	01 7823	Operation and Maintenance Data
2014-12-24	<input checked="" type="checkbox"/>	0	01 7839	Project Record Documents

HKS 12215.004

2014-12-24

2016-08-02

TABLE OF CONTENTS

2014-12-24 ☒ 0 01 7900 Demonstration and Training

DIVISION 02 - EXISTING CONDITIONS

2016-08-02 ☒ 0 02 4116 Structure Demolition
 2014-12-24 ☒ 0 02 4119 Selective Demolition

DIVISION 03 - CONCRETE

2014-12-24 ☒ 0 03 1000 Concrete Forms and Accessories
 2014-12-24 ☒ 0 03 2000 Concrete Reinforcement
 2014-12-24 ☒ 0 03 3000 Cast-In-Place Concrete
 2014-12-24 ☒ 0 03 3900 Concrete Curing
 2014-12-24 ☒ 0 03 6323 Cast-In-Place Drilled Piers

DIVISION 04 - MASONRY

2015-10-30 ☒ 0 04 7500 Adhered Masonry Veneer

DIVISION 05 - METALS

2014-12-24 ☒ 0 05 1200 Structural Steel
 2014-12-24 ☒ 0 05 1210 Welding
 2014-12-24 ☒ 0 05 3000 Metal Decking
 2014-12-24 ☒ 0 05 5000 Metal Fabrications
 2014-12-24 ☒ 0 05 7500 Ornamental Formed Metal

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

2014-12-24 ☒ 0 06 1053 Miscellaneous Rough Carpentry
 2014-12-24 ☒ 0 06 1643 Exterior Gypsum Sheathing
 2014-12-24 ☒ 0 06 4100 Custom Cabinets
 2014-12-24 ☒ 0 06 6410 Fiber Reinforced Laminate (FRL) Panels

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

2014-12-24 ☒ 0 07 2100 Thermal Insulation
 2014-12-24 ☒ 0 07 2617 Below Slab Vapor Retarders
 2014-12-24 ☒ 0 07 2720 Air and Water Barriers
 2015-10-30 ☒ 0 07 4213 Formed Metal Wall Panels
 2014-12-24 ☒ 0 07 4243 Composite Metal Wall Panels
 2014-12-24 ☒ 0 07 5013 Single-Ply Membrane Roofing
 2014-12-24 ☒ 0 07 5113 Built-Up Asphalt Roofing
 2014-12-24 ☒ 0 07 6200 Flashing and Sheet Metal
 2014-12-24 ☒ 0 07 7200 Roof Accessories
 2014-12-24 ☒ 0 07 8116 Cementitious Fireproofing
 2014-12-24 ☒ 0 07 8413 Penetration Firestopping
 2014-12-24 ☒ 0 07 8446 Fire Resistive Joint Firestopping
 2014-12-24 ☒ 0 07 9200 Joint Sealants

HKS 12215.004
 2014-12-24
 2016-08-02

TABLE OF CONTENTS

DIVISION 08 - OPENINGS

2014-12-24	☒	0	08 1114	Interior Hollow Metal Frames
2014-12-24	☒	0	08 1416	Prefinished Flush Wood Doors
2014-12-24	☒	0	08 3113	Access Doors and Frames
2016-08-02	☒	0	08 3323	Overhead Coiling Doors
2016-08-02	☒	0	08 4229	Automatic Entrances
2014-12-24	☒	0	08 4243	Medical Specialty Sliding Entrances
2014-12-24	☒	0	08 4400	Glazed Aluminum Framing Systems
2016-08-02	☒	0	08 7100	Door Hardware
2016-08-02	☒	0	08 8000	Glazing
2014-12-24	☒	0	08 8113	Decorative Glass

DIVISION 09 - FINISHES

2015-10-30	☒	0	09 2400	Portland Cement Plastering
2014-12-24	☒	0	09 2900	Gypsum Board Assemblies
2014-12-24	☒	0	09 3000	Tiling
2016-08-02	☒	0	09 5113	Acoustical Panel Ceilings
2014-12-24	☒	0	09 5423	Linear Metal Ceilings
2014-12-24	☒	0	09 6510	Resilient Flooring
2014-12-24	☒	0	09 6513	Resilient Base and Accessories
2016-08-02	☒	0	09 6800	Carpeting
2014-12-24	☒	0	09 7200	Hygienic Vinyl Wall Covering
2014-12-24	☒	0	09 9100	Painting

DIVISION 10 - SPECIALTIES

2016-08-02	☒	0	10 1006	Miscellaneous Specialties
2016-08-02	☒	0	10 1100	Visual Display Surfaces
2014-12-24	☒	0	10 1400	Interior Signage
2014-12-24	☒	0	10 2115	Cubicle Specialties
2014-12-24	☒	0	10 2613	Wall and Corner Guards
2014-12-24	☒	0	10 2813	Toilet Accessories
2016-08-02	☒	0	10 4400	Fire Protection Specialties

DIVISION 11 – EQUIPMENT

2014-12-24	☒	0	11 7000	Medical Equipment
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DIVISION 12 – FURNISHINGS

2014-12-24	☒	0	12 2413	Roller Window Shades
2014-12-24	☒	0	12 3661	Simulated Stone Countertops
2014-12-24	☒	0	12 4816	Entrance Floor Grilles

DIVISION 13 - SPECIAL CONSTRUCTION

2016-08-02	☒	0	13 0700	Bullet Resistant Partitions and Equipment
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DIVISION 14 - CONVEYING EQUIPMENT

NO SECTIONS

DIVISIONS 15 - 20

NO SECTIONS

VOLUME 2

DIVISION 21 – FIRE SUPPRESSION

2014-12-24	<input checked="" type="checkbox"/>	0	21 1300	Wet-Pipe Sprinkler System
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DIVISION 22 – PLUMBING

2014-12-24	<input checked="" type="checkbox"/>	0	22 0516	Expansion Fittings and Loops for Plumbing Piping
2014-12-24	<input checked="" type="checkbox"/>	0	22 0517	Sleeves and Sleeve Seals for Plumbing Piping
2014-12-24	<input checked="" type="checkbox"/>	0	22 0518	Escutcheons for Plumbing Piping
2014-12-24	<input checked="" type="checkbox"/>	0	22 0523	General-Duty Valves for Plumbing Piping
2014-12-24	<input checked="" type="checkbox"/>	0	22 0529	Hangers and Supports for Plumbing Piping and Equipment
2014-12-24	<input checked="" type="checkbox"/>	0	22 0549	Seismic Restraint of Suspended Plumbing Utilities
2014-12-24	<input checked="" type="checkbox"/>	0	22 0553	Identification for Plumbing Piping and Equipment
2014-12-24	<input checked="" type="checkbox"/>	0	22 0719	Plumbing Piping Insulation
2014-12-24	<input checked="" type="checkbox"/>	0	22 1116	Domestic Water Piping
2014-12-24	<input checked="" type="checkbox"/>	0	22 1119	Domestic Water Piping Specialties
2014-12-24	<input checked="" type="checkbox"/>	0	22 1316	Sanitary Waste and Vent Piping
2014-12-24	<input checked="" type="checkbox"/>	0	22 1319	Sanitary Waste Piping Specialties
2014-12-24	<input checked="" type="checkbox"/>	0	22 1413	Storm Drainage Piping
2014-12-24	<input checked="" type="checkbox"/>	0	22 1423	Storm Drainage Piping Specialties
2014-12-24	<input checked="" type="checkbox"/>	0	22 4300	Plumbing Fixtures
2014-12-24	<input checked="" type="checkbox"/>	0	22 4713	Drinking Fountains
2014-12-24	<input checked="" type="checkbox"/>	0	22 4723	Remote Water Coolers
2014-12-24	<input checked="" type="checkbox"/>	0	22 6113	Compressed-Air Piping for Healthcare Facilities
2014-12-24	<input checked="" type="checkbox"/>	0	22 6213	Vacuum Piping for Healthcare Facilities
2014-12-24	<input checked="" type="checkbox"/>	0	22 6313	Medical Gas Piping for Healthcare Facilities

DIVISION 23 – HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

2014-12-24	<input checked="" type="checkbox"/>	0	23 0513	Common Motor Requirements for HVAC Equipment
2014-12-24	<input checked="" type="checkbox"/>	0	23 0516	Expansion Fittings and Loops for HVAC Piping
2014-12-24	<input checked="" type="checkbox"/>	0	23 0517	Sleeves and Sleeve Seals for HVAC Piping
2014-12-24	<input checked="" type="checkbox"/>	0	23 0519	Meters and Gages for HVAC Piping
2014-12-24	<input checked="" type="checkbox"/>	0	23 0523	General-Duty Valves for HVAC Piping
2014-12-24	<input checked="" type="checkbox"/>	0	23 0529	Hangers and Supports for HVAC Piping and Equipment
2014-12-24	<input checked="" type="checkbox"/>	0	23 0548	Vibration Controls for HVAC
2014-12-24	<input checked="" type="checkbox"/>	0	23 0549	Seismic Restraint of Suspended Mechanical Utilities
2014-12-24	<input checked="" type="checkbox"/>	0	23 0553	Identification for HVAC Piping and Equipment
2014-12-24	<input checked="" type="checkbox"/>	0	23 0593	Testing Adjusting and Balancing for HVAC
2014-12-24	<input checked="" type="checkbox"/>	0	23 0713	Duct Insulation

HKS 12215.004
 2014-12-24
 2016-08-02

TABLE OF CONTENTS

2014-12-24	☒	0	23 0716	HVAC Equipment Insulation
2014-12-24	☒	0	23 0719	HVAC Piping Insulation
2014-12-24	☒	0	23 0923	Direct Digital Control System for HVAC
2014-12-24	☒	0	23 2113	Hydronic Piping
2014-12-24	☒	0	23 2113.13	Underground Hydronic Piping
2014-12-24	☒	0	23 2116	Hydronic Piping Specialties
2014-12-24	☒	0	23 2123	Hydronic Pumps
2014-12-24	☒	0	23 2923	Variable-Frequency Motor Controllers
2014-12-24	☒	0	23 3113	Metal Ducts
2014-12-24	☒	0	23 3300	Air Duct Accessories
2014-12-24	☒	0	23 3423	HVAC Power Ventilators
2014-12-24	☒	0	23 3600	Air Terminal Units
2014-12-24	☒	0	23 3713	Diffusers, Registers, and Grilles
2014-12-24	☒	0	23 4100	Particulate Air Filtration
2014-12-24	☒	0	23 4133	High-Efficiency Particulate Filtration
2014-12-24	☒	0	23 6423	Scroll Water Chillers
2014-12-24	☒	0	23 7313	Custom Rooftop Air-Handling Units
2014-12-24	☒	0	23 8216.11	Hydronic Air Coils
2014-12-24	☒	0	23 8219	Fan-Coil Units

DIVISION 26 – ELECTRICAL

2014-12-24	☒	0	26 0100	Basic Electrical Requirements
2014-12-24	☒	0	26 0110	Basic Electrical Materials and Methods
2014-12-24	☒	0	26 0519	Low-Voltage Electrical Power Conductors and Cables
2014-12-24	☒	0	26 0526	Grounding and Bonding for Electrical Systems
2014-12-24	☒	0	26 0529	Hangers and Supports for Electrical Systems
2014-12-24	☒	0	26 0533	Raceways and Boxes for Electrical Systems
2014-12-24	☒	0	26 0544	Sleeves and Sleeve Seals for Electrical Raceways and Cabling
2014-12-24	☒	0	26 0549	Seismic Restraint of Suspended Electrical Utilities
2014-12-24	☒	0	26 0550	Vibration Controls for Electrical Systems
2014-12-24	☒	0	26 0553	Identification for Electrical Systems
2014-12-24	☒	0	26 0573	Overcurrent Protective Device Coordination Study
2014-12-24	☒	0	26 0573.13	Overcurrent Protective Device Short-Circuit Study
2014-12-24	☒	0	26 0574	Overcurrent Protective Device Arc-Flash Study
2014-12-24	☒	0	26 2200	Low-Voltage Transformers
2014-12-24	☒	0	26 2413	Switchboards
2014-12-24	☒	0	26 2416	Panelboards
2014-12-24	☒	0	26 2726	Wiring Devices
2014-12-24	☒	0	26 2813	Fuses
2014-12-24	☒	0	26 2816	Enclosed Switches and Circuit Breakers
2014-12-24	☒	0	26 3600	Transfer Switches
2014-12-24	☒	0	26 5100	Interior Lighting
2014-12-24	☒	0	26 5600	Exterior Lighting

DIVISION 27 – COMMUNICATIONS

2008-11-10	☒	0	27 0000	Telecommunications Infrastructure Specifications
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HKS 12215.004
 2014-12-24
 2016-08-02

TABLE OF CONTENTS

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

2014-12-24	<input checked="" type="checkbox"/>	0	28 0500	Common Work Results for Electronic Safety and Security
2014-12-24	<input checked="" type="checkbox"/>	0	28 0513	Conductors and Cable for Electronic Safety and Security
2014-12-24	<input checked="" type="checkbox"/>	0	28 0526	Grounding and Bonding for Electronic Safety and Security
2014-12-24	<input checked="" type="checkbox"/>	0	28 0533	Raceways and Boxes for Electronic Safety and Security
2014-12-24	<input checked="" type="checkbox"/>	0	28 1300	Access Control System
2014-12-24	<input checked="" type="checkbox"/>	0	28 2300	Video Surveillance System
2014-12-24	<input checked="" type="checkbox"/>	0	28 3100	Digital Addressable Fire-Alarm System

DIVISIONS 29 – 30

NO SECTIONS

DIVISION 31 - EARTHWORK

2014-12-24	<input checked="" type="checkbox"/>	0	31 2000	Earth Moving
2014-12-24	<input checked="" type="checkbox"/>	0	31 3116	Termite Control

DIVISION 32 - EXTERIOR IMPROVEMENTS

2014-12-24	<input checked="" type="checkbox"/>	0	32 1216	Hot-Mix Asphalt Paving
2014-12-24	<input checked="" type="checkbox"/>	0	32 1313	Concrete Paving
2014-12-24	<input checked="" type="checkbox"/>	0	32 1373	Concrete Paving Joint Sealants

DIVISION 33 - UTILITIES

2014-12-24	<input checked="" type="checkbox"/>	0	33 4100	Storm Utility Drainage Piping
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END OF TABLE OF CONTENTS

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 21 1300

WET-PIPE SPRINKLER SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Hydraulic Calculations and general provisions of the Contract and Agreement apply to this Section.
- B. Project Manual

1.02 SUMMARY

- A. Drawings supplied with this specification shall be used as a reference for the requirement and location of system components. Work includes visiting the site to observe the existing conditions, and confirmation of the required quantities of devices and specific options for locations of the same. The contractor shall not use the drawings only to infer quantities of sprinklers for price quotation.
- B. At the time of bid, all exceptions taken to these Specifications, variances from these Specifications and all substitutions of equipment specified shall be listed in writing and forwarded to the Architect. Any such exceptions, variances, or substitutions, which were not listed at the time of bid shall not be approved or considered.
- C. The Work includes all labor, materials, tools, transportation, and temporary construction necessary to design, fabricate, install, test and flush a fully operational and code compliant automatic wet-pipe fire sprinkler system in the Riverside County Regional Medical Center. The sprinkler contractor shall be responsible for all new above ground piping as shown on the drawings.
- D. The Work includes furnishing and installing sprinklers including piping, hangers and other associated components in areas of the building discovered during survey or installation that are not necessarily represented on the design drawings that are required to be provided with sprinkler protection at no additional cost to the owner.
- E. The Work includes installing sprinklers in the center of acoustic ceiling tiles.
- F. The Work includes fire stopping, patching and painting of all penetrations that were made for installation of new sprinkler piping through existing interior and exterior building walls. The fire stopping shall be conducted by a manufacturer's trained personnel.
- G. The Work includes all fees and activities required to secure approvals for necessary State and Local permits.
- H. The Work includes submitting detailed Working Plans, Hydraulic Calculations and Product Data to the Engineer for review prior to submitting same to local officials for permit. Contractor shall not fabricate piping, assemble components or begin installation until HAI has approved the submittal documents.
- I. The Work includes performing field quality control and commissioning activities.
- J. The Work includes documenting and submitting the results of integrity and functional testing.
- K. The Work includes submitting As-built Plans and closeout documentation to Hughes for review prior to scheduling Owner demonstration training.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- L. The Work includes training Owner's personnel on the operation of the system, required maintenance tasks and frequencies, and the locations of all spare tools and equipment, valves, flow switches, risers and equipment necessary to maintain and operate the sprinkler system.

1.03 PERFORMANCE REQUIREMENTS

- A. Wet-pipe, hydraulically calculated automatic fire sprinkler system shall be installed in areas of the building.

- B. Water Flow Test Data #1:

- 1. Location:
- 2. Date:
- 3. Performed by:
- 4. Static Pressure at Residual Fire Hydrant 1: psi
- 5. Measured Flow at Flow Fire Hydrant 2: gpm
- 6. Residual Pressure at Residual Fire Hydrant 1: psi

- C. Pipe sizes for piping downstream control valve assemblies shall be determined by hydraulic calculations in accordance with NFPA 13-2013. Verify that field modifications to the system, which require the addition of fittings and pipe do not affect the hydraulic demand of the automatic fire sprinkler system.

- 1. If, given the available water supply as indicated on the drawings, the automatic fire sprinkler system cannot be designed in compliance with this specification and the applicable codes and standards, provide a report to the Owner documenting the design options that have been investigated. Additionally, copies of the hydraulic calculations, which demonstrate the inability of the water distribution system to supply the necessary water for the sprinkler system demand, shall be submitted for each option.

- D. Sprinkler system shall be designed according to the following:

- 1. A minimum 10% or 10 psi margin of safety shall be provided between the residual water supply pressure and the required sprinkler system demand pressure at the calculated system design flow, including all hose allowances.
- 2. Sprinkler Occupancy Hazard Classifications shall be as follows:
 - a. Light Hazard
 - 1. Offices,
 - 2. Common corridors,
 - 3. Patient treatment rooms,
 - 4. Waiting areas,
 - 5. Restrooms
 - b. Ordinary Hazard, Group 1
 - 1. Storage areas,

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

2. Mechanical equipment rooms,
3. Electrical equipment rooms
3. Minimum Density for Automatic-Sprinkler System Piping Design:
 - a. Light-Hazard Occupancy: 0.10-gpm over 1500- sq. ft.area
 - b. Ordinary-Hazard, Group 1 Occupancy: 0.15-gpm over 1500- sq. ft.area.
 - c. Ordinary-Hazard, Group 2 Occupancy: 0.20-gpm over 1500- sq. ft.area;
 - d. Design areas shall be modified as necessary to comply with the requirements for specific building or system features identified in NFPA 13-2013, such as non-sprinklered concealed combustible spaces that do not conform to the exceptions outlined in NFPA 13 under special conditions, sloped ceilings/roofs, or the installation of a dry pipe sprinkler system.
4. Maximum Protection Area per Sprinkler:
 - a. Light Hazard Areas: 225-sq. ft. (20.9-sq. m) unless otherwise indicated on drawings.
 - b. Ordinary Hazard Areas: 130-sq. ft. (9.3-sq. m).
 - c. All obstruction rules shall be strictly adhered to. Additional sprinklers shall be added, where required for compliance with NFPA 13-2013, at no additional cost to the owner.
5. Calculate pressure loss due to elevation and friction loss through all fittings, pipes, valves and backflow prevention devices in accordance with NFPA 13-2013.
6. Hose Allowance:
 1. Light Hazard Areas: 100-gpm outside hose allowance.
 2. Ordinary Hazard Areas: 250-gpm outside hose allowance.
- b. Components shall be capable of producing piping systems with 175-psig (1200-kPa) minimum working-pressure rating, unless otherwise indicated.

1.04 ORDER OF PRECEDENCE

- A. Should conflicts arise out of discrepancies between documents referenced in this specification, the most stringent requirement shall apply; however, should a level of stringency be indeterminable, the discrepancies shall be resolved as follows:
 1. State and local codes shall take precedence over this specification.
 2. The National Fire Protection Association Standards shall take precedence over this specification.
 3. This specification shall take precedence over the drawings.

1.05 SUBMITTALS

- A. Pre-Installation Documentation: Absolutely no work or material fabrication shall be conducted prior to submittal and approval by the Engineer.
 1. Product Data: For each product specified in Part 2. Submittal shall indicate listing and approvals, selected options, finishes, etc. and electrical characteristics.
 2. Working Plans: Minimum 1/8"=1'-0" scale inclusive of information required by NFPA 13-2013 requirements.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3. Electronic Working Plans: Minimum 1/8"=1'-0" scale inclusive of information required by NFPA 13-2013 requirements. The electronic versions of the hard-copy plans shall be submitted on compact disks in PDF format
4. Hydraulic Calculations: Prepared in accordance with NFPA 13-2013 requirements. Minimum one (1) calculation for each hazard on each level.

B. Acceptance Documentation:

1. Field Test Reports and Certificates (Aboveground): Completed NFPA 13-2013 "Contractor's Material and Test Certificate for Aboveground Piping" including dates of successful hydrostatic tests, functional waterflow tests, and other fire alarm supervisory tests. Tests and documents shall be witnessed and countersigned by the Owner's designee. Annotate portions of the Certificate form that do not apply to the project as "not applicable". Make submittal after commissioning and prior to acceptance testing.
2. Testing documentation of the backflow prevention device.
3. Statement of Completion: Upon completion of the installation of the automatic sprinkler system, a signed written statement, substantially in the form as follows:
 - a. "The undersigned, having been engaged as the Sprinkler Contractor for the automatic sprinkler systems for the Riverside County Regional Medical Center, confirms that the automatic fire sprinkler system equipment was installed in accordance with the diagrams, instructions, directions, and technical specifications provided to us by the Manufacturer and the Owner."

C. Closeout Documentation:

1. Maintenance Data: The maintenance manual shall describe in detail the purpose and function of all sprinkler system devices and valves. The manual shall also include all necessary inspection, testing and maintenance forms. Include one (1) original, soft-bound copy of California Edition NFPA 25-2006, *Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*, in addition to the maintenance manual.
2. As-Built Drawings: Showing all field changes from original Working Plans. Submit full-size hard copy and electronic AutoCAD files on compact disk. Coordinate AutoCAD version with Owner at time of submittal.
3. Valve Chart: Provide a drawing on 11-inch x 17-inch paper identifying the location of the control valves for the fire sprinkler system shown on the floor plan of the building. This valve chart shall be framed and permanently installed adjacent to the fire alarm control unit.
4. Statement of Warranty.

1.06 QUALITY ASSURANCE

- A. Equipment and devices shall be labeled and listed for the intended use in the Underwriters Laboratories, Inc. (UL), UL FPED-2014 *Fire Protection Equipment Directory* and 2009 FM Global Approval Guide.
- B. Electrical components, devices, and accessories shall be Listed and labeled as defined in California Electric Code and the NEC, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- C. All materials and equipment shall be new and unused.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

D. All equipment shall be first quality and capable of complying with all requirements of this specification and shall have been in continuous production and in service in commercial applications for at least one year. Obsolete equipment shall not be used.

E. Installer Qualifications:

1. Licensed in the State of California (C-16) and experienced in the installation of automatic fire sprinkler systems in buildings similar to the Work described herein and has obtained design and inspection approvals for similar projects from authorities having jurisdiction.
2. Foreman: Provide proof of competence of both their company and the individual foreman that will be assigned to this project, in the area of installing automatic fire sprinkler systems for at least five (5) years and acceptable to Owner. Once assigned, the foreman shall not be changed without the approval of the Owner.
3. Service Organization: Capable of providing a service technician on-site within 4 hours of a request for on-site service.

F. The automatic fire sprinkler systems shall comply with all applicable state and local codes, including the California Building Code (CBC) and California Fire Code (CFC).

G. Products, installation and testing shall be in accordance with the applicable provisions of the following as referenced by the CBC/CFC:

1. National Fire Protection Association (NFPA) 13-2013, *Standard for the Installation of Sprinkler Systems*.
2. NFPA 24-2013, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*.
3. California Amended, NFPA 25-2006, *Standard for Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*.
4. California Electric Code
5. NFPA 72-2013, *National Fire Alarm Code*.

1.07 COORDINATION

- A. Coordinate sprinkler location and installation with existing conditions and other portions of the Work to ensure sprinkler locations are at the highest possible elevations and generally located to minimize the risk of mechanical damage.
- B. Coordinate sprinkler installation with existing conditions and other portions of the Work to comply with NFPA 13-2013 requirements for obstruction to sprinkler discharge.
- C. Coordinate pipe installation with existing conditions and other portions of the Work to facilitate suspended ceiling installation, proper pitch and accessibility for components installed.
- D. Coordinate with the Fire Alarm portion of the Work for the connection and testing of water-flow, pressure and valve supervisory switches.

1.08 EXTRA MATERIALS

- A. Furnish extra materials described below that match the products installed and that are packaged with protective covering for storage and identified with labels describing the contents.
 1. Sprinkler Cabinet: Finished, wall-mounting steel cabinet and hinged cover, with space for a minimum of six (6) spare sprinklers for each type, model and temperature rating, plus a sprinkler wrench for each model.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1.09 WARRANTY

- A. Guarantee equipment installed to be free from defects in workmanship and inherent mechanical defects for a period of one (1) year from the date of substantial completion of the project. See Part 1 "Submittals".

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with the requirements of this section, product selection shall be limited to those offered by manufacturers included in the "Available Manufacturer" lists in each Part 2 article. Substitution of the products listed requires approval by the Owner in writing prior to installation.
- B. Where lists are not indicated, products, subject to compliance with the requirements of this section, may be obtained from an approved domestic manufacturer.

2.02 PIPE AND TUBE

- A. Standard-Weight Steel Pipe:
 - 1. Schedule 10 ASTM A135, or ASTM A795
 - 2. Schedule 40ASTM A135

2.03 PIPE AND TUBE FITTINGS

- A. Cast-Iron Threaded Fittings: ASME B16.4; Class 125 or Class 250 pattern as required by application.
- B. Malleable-Iron Threaded Fittings: ASME B16.3; ASME B16.4; Class 125 or Class 250 pattern as required by application.
- C. Steel Threaded Couplings: ASTM A865; ASME B16.4; Class 125 or Class 250 pattern as required by application.
- D. Steel Welding Fittings: ASTM A234/A 234M, ASME B16.9, or ASME B16.11; 300-psi pressure rating.
- E. Cast-Iron Threaded Flanges: ASME B16.1; ASME B16.4; Class 125 plain face or Class 250 raised face pattern as required by application.
- F. Steel Flanges and Flanged Fittings: ASME B16.5; ASME B16.4; Class 125 plain-face or Class 250 raised face pattern as required by application.
- G. Flange Gaskets and Bolts
 - 1. Plain-face Flanges: ASME B18.2.2 heavy-series hex-nuts and ASME B18.22.1 plain washers with ASME B16.21 1/8" full-face rubber gasket.
 - 1. Raised-face Flanges: ASME B18.2.2 heavy-series hex-nuts and ASME B18.22.1 plain washers with ASME B16.20 1/8" spiral wound gasket.
- H. Mechanical Grooved-End Fittings:
 - 1. Assembly Pressure Rating: 300-psi
 - 2. Fittings and Couplings: UL 213; ASTM A536 ductile iron body.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3. Couplings: UL 213; ASTM A536 ductile iron rigid or flexible pattern as required by application.
4. Gaskets and Bolts: Pre-lubricated EPDM gaskets with ASTM A183 zinc-plated nuts and bolts.
5. Available Manufacturers
 - a. Tyco Fire and Building Products.
 - b. Victaulic Corporation of America.

2.04 VALVES

- A. General: Minimum 175-psig (1200-kPa) non-shock working-pressure rating unless higher pressure rating is required by application or otherwise indicated. Valves for grooved-end pipe may be furnished with grooved ends instead of flanged ends.
- B. Riser Check Valve: 175-psig (1200-kPa) working pressure, designed for horizontal or vertical installation (UL 312), with mechanical inlet and outlet, bronze grooved seat O-ring seals, and single-hinge pin and lath design. Include gauges and 2-inch drain trim piped to exterior.
- C. Gate Valves; NPS 2 (DN50) and Smaller: UL 262; cast-bronze, threaded ends; solid wedge; OS&Y; and pre-grooved rising stem. NPS 2-1/2 (DN65) and Larger: UL 262, iron body, bronze mounted, tapered wedge, OS&Y, and pre-grooved rising stem. Include replaceable, bronze, wedge facing rings and flanged ends.
 1. Available Manufacturers
 - a. McWane, Inc; Kennedy Valve Div.
 - b. Mueller Co.
 - c. NIBCO Inc.
 - d. Stockham Valves & Fittings
- D. Swing Check Valves; NPS 2 (DN50) and Smaller: UL 312; cast-bronze, threaded ends. NPS 2-1/2 (DN65) and Larger: UL 312, cast-iron body and bolted cap, with bronze disc or cast-iron disc with bronze-disc ring and flanged ends.
 1. Available Manufacturers
 - a. Grinnell Corp.
 - b. McWane, Inc; Kennedy Valve Div.
 - c. Mueller Co.
 - d. NIBCO Inc.
 - e. Stockham Valves & Fittings
 - f. Victaulic Co.
 - g. Viking Corp.
- E. Indicating Valves; NPS 2 (DN65) and Smaller: UL 1091; butterfly or ball-type, bronze body with threaded ends; and integral indicating device and pre-wired supervisory switch. NPS 2-1/2 (DN65) and Larger: UL 1091; butterfly-type, ductile-iron body with grooved ends; and integral indicating device and pre-wired supervisory switch.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1. Available Manufacturers

- a. NIBCO Inc.
- b. Tyco Fire and Building Products.
- c. Milwaukee Valve Co.
- d. Reliable Sprinkler Co.
- e. Victaulic Co.
- f. Viking Corp.

F. Ball Drip Valves: UL 1726, automatic drain valve, NPS 3/4 (DN20), ball check device with threaded ends.

2.05 SPRINKLERS

A. General: UL 199 nominal 1/2-inch (12.7-mm) orifice standard-spray pattern sprinklers with "Ordinary" temperature classification rating, unless otherwise indicated or required by application.

B. Pressure Rating: 175-psi (1200kPa) minimum unless otherwise indicated or required by application.

C. Operating Element: Quick Response (QR) as indicated or required by application, eutectic metal type thermal operating mechanism or frangible glass bulb.

D. Sprinkler Types and Features; include the following:

- 1. Upright sprinkler.
- 2. Pendent sprinkler with escutcheon plate.
- 3. Recessed pendent sprinkler.

E. Sprinkler Finishes; include the following:

- 1. Rough-brass (bronze)
- 2. Chrome-plated.
- 3. White.

F. Sprinkler Guards: Wire-cage type with red finish, including fastening device for attaching to sprinkler.

G. Available Manufacturers

- 1. Tyco Fire and Building Products.
- 2. Reliable Sprinkler Co.
- 3. Victaulic Co.
- 4. Viking Corp.

2.06 PIPE SLEEVES

A. General: Provide pipe sleeves where piping passes entirely through walls, floors and partitions. Secure sleeves in position during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, floors and roofs. Provide 1 inch minimum clearance

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

between exterior of piping and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of the sleeve or core-drilled hole with plastic waterproof cement, which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric material. Penetrations of fire-rated barriers, wall and floor assemblies shall be sealed with a listed through penetration fire stopping assembly

1. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core-drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.
2. Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide 26 gauge galvanized steel sheet

2.07 PRESSURE GAGES

- A. Water Pressure Gages: UL 393, 3-1/2- to 4-1/2-inch- (90- to 115-mm-) diameter dial with dial range of 0 to 250 psig (0 to 1725 kPa).

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Coordinate examinations with the Owner.
- B. Examine and verify actual locations of risers, mains and branchline piping prior to preparing pre-installation submittal.
- C. Examine and verify points of connection to existing system components.
- D. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing and other conditions where pipes, risers and cross-mains are to be installed prior to preparing pre-installation submittal.
- E. Promptly report conflicts with proposed solutions.

3.02 PREPARATION

- A. Prepare and submit a minimum of six (6) complete three ring bound "Pre-Installation Documentation" submittal packages to the Engineer for review prior to submitting same to local officials for approval and permit. Resubmit portions or entirety of submittal to address Engineer comments prior to submitting package to local officials for approval and permit. See Part 1 "Submittals" for submittal content.
- B. Obtain authority approval and permits with reviewed "Pre-Installation Documentation" submittal package.

3.03 PIPING APPLICATIONS

- A. Use the following:
 1. NPS 6 (DN150) to NPS 2.5 (DN65): Schedule 10 steel pipe with roll grooved ends; steel, grooved-end fittings with rubber gaskets; and grooved joint couplings.
 2. NPS 2 (DN50) and Smaller: Schedule 40 steel pipe with threaded ends, cast- or malleable-iron threaded fittings, and threaded joints.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- B. Branch Line Connections to Cross Mains shall be shop welded or cast- or malleable-iron threaded fittings, and threaded joints.

3.04 PIPING INSTALLATION

- A. Refer to manufacturer's specifications and NFPA 13-2013 for basic piping installation.
- B. Where shown to install exposed piping in normally occupied areas as tight to ceiling as possible. Rise with elbows in series as necessary to adjust final height of piping. Cut hanger rods to length that allows nuts to be tightened flush with ceiling and leaves band hangers at the highest elevation possible.
- C. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 (DN50) and smaller. Unions are not required on flanged devices or in piping installations using grooved joints.
- E. Install flanges or flange adapters on valves, apparatus, and equipment having NPS 2-1/2 (DN65) and larger connections.
- F. Install sprinkler piping with drains for complete system drainage. All drain piping shall be routed to a location approved by the Owner.
- G. Install "Inspector's Test Connections" in sprinkler piping, complete with shutoff valve, sized and located according to NFPA 13-2013. The outlet shall discharge to the exterior of the building.
- H. Install alarm devices in piping systems.
- I. Hangers and Supports: Install according to NFPA 13-2013 for sprinkler piping.
- J. Seismic Restraint: Restrain new piping according to NFPA 13-2013 requirements for protection against earthquake damage.
- K. Install piping with grooved joints according to manufacturer's written instructions. Construct rigid piping joints, unless otherwise required by NFPA 13-2013 for protection against Earthquake damage through masonry penetrations. Provide flexible couplings on piping penetrating rigid walls (i.e. masonry walls), within 1-foot on each side of the penetration.
- L. Welded joints shall not be used with galvanized steel pipe.
- M. Flanges, unions, and transition and special fittings with pressure ratings the same as or higher than the systems pressure rating may be used in aboveground applications, unless otherwise indicated.
- N. Pipe Painting
 - 1. Sprinkler System Risers, Mains, and Branchlines shall be painted to match the existing conditions in public areas where exposed. Painting shall be performed by a qualified subcontractor approved by the Owner. Paint colors shall be coordinated with the Owner.
 - 2. Pipe shall be provided with a first coat of primer prior to application of the final coat.
 - 3. Contractor shall paint sample section of pipe and obtain approval from the owner prior to proceeding with final coat.

3.05 JOINT CONSTRUCTION

- A. Refer to manufacturer's specifications for basic piping joint construction.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- B. Steel-Piping, Grooved Joints: Use Schedule 40 steel pipe with threaded ends or Schedule 10 steel pipe with roll-grooved ends; steel, grooved-end fittings; and groove couplings. Assemble joints with couplings, gaskets, lubricant, and bolts according to manufacturer's written instructions.
 - C. Dissimilar-Piping-Material Joints: Construct joints using adapters or couplings compatible with both piping materials. Use dielectric fittings if both piping materials are metal.
 - D. Refer to Manufacturer's specifications for grooved pipe fittings, pipe-flange gasket materials and welding filler metals.
 - E. Joint compound or tape shall be applied to male pipe threads only for all threaded joints.
 - F. Transition Couplings: AWWA C219, sleeve type, or other manufactured fitting the same size as, with pressure rating at least equal to, and with ends compatible with piping to be joined.
- 3.06 VALVE APPLICATIONS
- A. Drawings indicate valve types to be used.
- 3.07 VALVE INSTALLATION
- A. Install valves in accessible locations with indicators clearly visible from floor level.
- 3.08 SPRINKLER APPLICATIONS
- A. Drawings indicate sprinkler types to be used.
 - B. Use QR sprinklers in Light Hazard and Ordinary Hazard areas.
 - C. Use SR sprinklers in Extra Hazard areas.
- 3.09 SPRINKLER INSTALLATION
- A. Install sprinklers in accordance with NFPA 13-2013 and in the patterns indicated on the working drawings.
 - B. Install upright sprinklers where ceiling is exposed to structure at the highest elevation possible while observing the NFPA 13-2013 requirements for obstructions to sprinkler discharge. Do not lower the elevation of sprinklers to locate deflector below solid-continuous obstructions in lieu of providing adequate horizontal clearance in accordance with NFPA 13-2013 §8.6.5.1.
 - C. Install sprinklers in the center of suspended ceiling tiles where such ceilings exist or are planned.
 - D. Use sprinkler guards listed for use with sprinkler where indicated on drawings and where sprinkler is subject to mechanical damage. At a minimum, provide caged upright or pendent sprinklers in closets, beneath stair landings, storage areas and mechanical areas. Use sprinkler guards where sprinklers are installed at an elevation of 7 ft. or less above the finished floor.
 - E. Do not install sprinklers, mains or branchline pipes in locations where likely to be inadvertently damaged, such as in front of access hatches, doors, cabinets, etc.
- 3.10 EXTERIOR WALL PENETRATIONS
- A. All exterior wall penetrations for drain piping and fire department connections shall be water tight sealed.
- 3.11 LABELING AND IDENTIFICATION

DCGA 14044
2014-12-24

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- A. Install labeling, signs and pipe markers on valves, equipment and piping in accordance with NFPA 13-2013.
- B. Signs and label styles and locations shall be coordinated with and approved by the Owner and the authorities having jurisdiction prior to installation.
- C. Install hydraulic design information sign on the "main system riser".

3.12 FIELD QUALITY CONTROL

- A. Perform hydrostatic test of entire sprinkler system and inspect sprinkler piping according to NFPA 13-2013, "System Acceptance". Coordinate hydrostatic test date(s) and time(s) with the Owner's designee.
 - 1. Replace piping system components that do not pass test procedures and retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.
 - 2. Use the NFPA 13-2013 "Contractor's Material and Test Certificate for Aboveground Piping" to document the hydrostatic test results. Prepare a separate form for each sprinkler zone. Obtain dated signature from Owner's designee for each test. Tests that are not witnessed must be repeated.

3.13 COMMISSIONING

- A. Verify that specialty valves, trim, fittings, controls, and accessories are installed and operate correctly.
- B. Verify that specified tests of piping are complete.
- C. Verify that damaged sprinklers and sprinklers with paint or coating not specified, are replaced with new, correct type.
- D. Verify that sprinklers are correct types, have correct finishes and temperature ratings, and have guards as required for each application.
- E. Verify that potable-water supplies have correct types of backflow prevention devices and have been tested.
- F. Verify that spare sprinkler cabinet is installed with correct number of wrenches and spare sprinklers.
- G. Verify that labeling, identification and signage is installed.
- H. Energize circuits to electrical equipment and devices.
- I. Coordinate with fire alarm pre-acceptance tests. Operate as required.
 - 1. Use the NFPA 13-2013 "Contractor's Material and Test Certificate for Aboveground Piping" to document the waterflow switch activation times and other functional test results. Obtain dated signature from Owner's designee for each test. Tests that are not witnessed must be repeated. Use common form for each zone that indicates results of previous hydrostatic testing and fire alarm functional tests.

3.14 CLEANING AND PROTECTION

- A. Clean dirt and debris from sprinklers.
- B. Remove and replace sprinklers having paint other than factory applied finish.
- C. Wipe all excess pipe joint compound from threaded pipe joints.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- D. Wipe all excess oil from the exterior surface of sprinkler mains and branchline pipes.
- E. Protect sprinklers from damage until substantial completion by other trades.

3.15 AUTHORITY HAVING JURISDICTION FINAL SYSTEM ACCEPTANCE

- A. Prepare and submit a minimum of six (6) complete three ring bound "Approval Documentation" submittal packages to the Owner's representative for review prior to submitting same to local officials for final system approval. Resubmit portions or entirety of submittal to address Owner's representative comments prior to submitting package to local officials. See Part 1 "Submittals" for submittal content.
- B. Submit reviewed "Approval Documentation" submittal package to authority and coordinate scheduling of common fire sprinkler and fire alarm system acceptance testing.
- C. Coordinate with fire alarm portion of final acceptance tests. Operate as required. Demonstrate system components to authority having jurisdiction as necessary.

3.16 PROJECT CLOSEOUT PROCEDURES

- A. Prepare and submit a minimum of six (6) three ring bound closeout documentation packages to the Owner's representative for review prior to scheduling Owner demonstration and training. Resubmit portions or entirety of submittal to address Owner's representative comments prior to scheduling demonstration and training. See Part 1 "Submittals" for submittal content.
- B. Schedule Owner demonstration and training with the Owner. Provide at least five (5) working days notice.
- C. Demonstrate equipment, specialties, and accessories with the Owner. Review operating and maintenance information with the Owner.

END OF SECTION

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
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MORENO VALLEY, CALIFORNIA

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SECTION 22 0516

EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Flexible-hose packless expansion joints.
 - 2. Metal-bellows packless expansion joints.
 - 3. Rubber packless expansion joints.
 - 4. Grooved-joint expansion joints.
 - 5. Pipe loops and swing connections.
 - 6. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

- A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.
- B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
 - 2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
 - 3. Alignment Guide Details: Detail field assembly and attachment to building structure.
 - 4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of expansion joint, from manufacturer.

DCGA 14044
2014-12-24

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For expansion joints to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

- A. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Flex-Hose Co., Inc.
 - b. Flexicraft Industries.
 - c. Flex Pression Ltd.
 - d. Metraflex, Inc.
 - e. Unisource Manufacturing, Inc.
2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.
 - a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.
 - b. Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F and 500 psig at 450 deg F ratings.
5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 420 psig at 70 deg F and 315 psig at 450 deg F ratings.
6. Expansion Joints for Steel Piping NPS 2 and Smaller: Stainless-steel fittings with threaded end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 700 psig at 70 deg F and 515 psig at 600 deg F ratings.
 - 7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Stainless-steel fittings with flanged end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 275 psig at 70 deg F and 200 psig at 600 deg F ratings.
 - 8. Expansion Joints for Steel Piping NPS 8 to NPS 12: Stainless-steel fittings with flanged end connections.
 - a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F and 90 psig at 600 deg F ratings.
 - b. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F and 120 psig at 600 deg F ratings.
- B. Metal-Bellows Packless Expansion Joints:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adesco Manufacturing LLC.
 - b. American BOA, Inc.
 - c. Badger Industries, Inc.
 - d. Expansion Joint Systems, Inc.
 - e. Flex-Hose Co., Inc.
 - f. Flexicraft Industries.
 - g. Flex Pression Ltd.
 - h. Flex-Weld, Inc.
 - i. Flo Fab inc.
 - j. Hyspan Precision Products, Inc.
 - k. Metraflex, Inc.
 - l. Proco Products, Inc.
 - m. Senior Flexonics Pathway.
 - n. Tozen Corporation.
 - o. Unaflex.
 - p. Unisource Manufacturing, Inc.
 - q. Universal Metal Hose; a subsidiary of Hyspan Precision Products, Inc.
 - r. U.S. Bellows, Inc.
 - s. WahlicoMetroflex.
 - 2. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
 - 3. Type: Circular, corrugated bellows with external tie rods.
 - 4. Minimum Pressure Rating: 150 psig unless otherwise indicated.
 - 5. Configuration: Single joint with base class(es) unless otherwise indicated.
 - 6. Expansion Joints for Copper Tubing: Single- or multi-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.
 - a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint or threaded.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: Solder joint or threaded.
- c. End Connections for Copper Tubing NPS 5 and Larger: Flanged.

C. Rubber Packless Expansion Joints:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Amber/Booth Company, Inc.; a div. of Vibration Isolation Products of Texas, Inc.
 - b. Flex-Hose Co., Inc.
 - c. Flexicraft Industries.
 - d. Flex-Weld, Inc.
 - e. Garlock Sealing Technologies.
 - f. General Rubber Corporation.
 - g. Mason Industries, Inc.; Mercer Rubber Co.
 - h. Metraflex, Inc.
 - i. Proco Products, Inc.
 - j. Red Valve Company, Inc.
 - k. Tozen Corporation.
 - l. Unaflex.
 - m. Unisource Manufacturing, Inc.
- 2. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
- 3. Material: Fabric-reinforced rubber complying with FSA-NMEJ-703.
- 4. Arch Type: Single or multiple arches with external control rods.
- 5. Spherical Type: Single or multiple spheres with external control rods.
- 6. Minimum Pressure Rating for NPS 1-1/2 to NPS 4: 150 psig at 220 deg F.
- 7. Minimum Pressure Rating for NPS 5 and NPS 6: 140 psig at 200 deg F.
- 8. Minimum Pressure Rating for NPS 8 to NPS 12: 140 psig at 180 deg F.
- 9. Material for Fluids Containing Acids, Alkalies, or Chemicals: EPDM.
- 10. Material for Fluids Containing Gas, Hydrocarbons, or Oil: Buna-N.
- 11. Material for Water: EPDM.
- 12. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.2 GROOVED-JOINT EXPANSION JOINTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Anvil International, Inc.
 - 2. Shurjoint Piping Products.
 - 3. Victaulic Company.
- B. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
- C. Standard: AWWA C606, for grooved joints.
- D. Nipples: Galvanized, ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.
- E. Couplings: Five, flexible type for steel-pipe dimensions. Include ferrous housing sections, EPDM gasket suitable for cold and hot water, and bolts and nuts.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

2.3 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Adscos Manufacturing LLC.
 - b. Advanced Thermal Systems, Inc.
 - c. Flex-Hose Co., Inc.
 - d. Flexicraft Industries.
 - e. Flex-Weld, Inc.
 - f. Hyspan Precision Products, Inc.
 - g. Metraflex, Inc.
 - h. Senior Flexonics Pathway.
 - i. Unisource Manufacturing, Inc.
2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Stud: Threaded, zinc-coated carbon steel.
 - b. Expansion Plug: Zinc-coated steel.
 - c. Washer and Nut: Zinc-coated steel.
5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.
 - a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
 - b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
 - c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

- A. Install expansion joints of sizes matching sizes of piping in which they are installed.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
 - C. Install rubber packless expansion joints according to FSA-NMEJ-702.
 - D. Install grooved-joint expansion joints to grooved-end steel piping
- 3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION
- A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.
 - B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.
 - C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.
 - D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.
- 3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION
- A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.
 - B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.
 - C. Attach guides to pipe and secure guides to building structure.
 - D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.
 - E. Anchor Attachments:
 - 1. Anchor Attachment to Black-Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
 - 2. Anchor Attachment to Galvanized-Steel Pipe: Attach with pipe hangers. Use MSS SP-69, Type 42, riser clamp welded to anchor.
 - 3. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.
 - F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.
 - 1. Anchor Attachment to Steel Structural Members: Attach by welding.
 - 2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
 - G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 22 0517

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Sleeves.
 - 2. Sleeve-seal systems.
 - 3. Grout.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

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

2.2 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. CALPICO, Inc.
 - 3. Metraflex Company (The).
 - 4. Pipeline Seal and Insulator, Inc.
 - 5. Proco Products, Inc.
- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
 - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
 - 2. Pressure Plates: Glass reinforced plastic.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 GROUT

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

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 078413 "Penetration Firestopping."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3.3 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
2. Exterior Concrete Walls below Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs-on-Grade:
 - a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
 - 1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

END OF SECTION

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

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ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 22 0518

ESCUTCHEONS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Escutcheons.
 - 2. Floor plates.

1.3 ACTION SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.
- C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

2.2 FLOOR PLATES

- A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.
- B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
 - 1. Escutcheons for New Piping:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
 - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
 - g. Bare Piping in Equipment Rooms: One-piece, cast-brass or split-casting brass type with rough-brass finish.
- C. Install floor plates for piping penetrations of equipment-room floors.
- D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.
- 1. New Piping: One-piece, floor-plate type.
- 3.2 FIELD QUALITY CONTROL
- A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 22 0523

GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Bronze ball valves.
- 2. Iron, single-flange butterfly valves.
- 3. Iron, grooved-end butterfly valves.
- 4. Bronze gate valves.
- 5. Iron gate valves.
- 6. Lubricated plug valves.

B. Related Sections:

- 1. Division 2 "Water Distribution" for valves applicable only to this piping.
- 2. Division 22 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
- 3. Division 22 "Domestic Water Piping" for valves applicable only to this piping.
- 4. Division 22 "Compressed-Air Piping for Healthcare Facilities" for valves applicable only to this piping.
- 5. Division 22 "Vacuum Piping for Healthcare Facilities" for valves applicable only to this piping.
- 6. Division 22 "Oxygen Piping for Healthcare Facilities" for valves applicable only to this piping.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. NRS: Nonrising stem.
- E. RS: Rising stem.
- F. SWP: Steam working pressure.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1.4 ACTION SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

- B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 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.

- 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.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Refer to valve schedule articles for applications of valves.
- B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- C. Valve Sizes: Same as upstream piping unless otherwise indicated.
- D. Valve Actuator Types:
1. Handwheel: For valves other than quarter-turn types.
 2. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.
 3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 10 plug valves, for each size square plug-valve head.

DCGA 14044
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RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
 - 1. Gate Valves: With rising stem.
 - 2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
 - 3. Butterfly Valves: With extended neck.
- F. Valve-End Connections:
 - 1. Flanged: With flanges according to ASME B16.1 for iron valves.
 - 2. Grooved: With grooves according to AWWA C606.
 - 3. Solder Joint: With sockets according to ASME B16.18.
 - 4. Threaded: With threads according to ASME B1.20.1.
- G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

- A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.
 - b. Hammond Valve.
 - c. Milwaukee Valve Company.
 - d. NIBCO INC.
 - e. Red-White Valve Corporation.
 - f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 2. Description:
 - a. Standard: MSS SP-110.
 - b. SWP Rating: 150 psig.
 - c. CWP Rating: 600 psig.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded.
 - g. Seats: PTFE or TFE.
 - h. Stem: Bronze.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

- A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Conbraco Industries, Inc.; Apollo Valves.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- b. Hammond Valve.
- c. Kitz Corporation.
- d. Milwaukee Valve Company.
- e. NIBCO INC.
- f. Red-White Valve Corporation.
- g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-67, Type I.
- b. CWP Rating: 200 psig.
- c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
- d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
- e. Seat: EPDM.
- f. Stem: One- or two-piece stainless steel.
- g. Disc: Aluminum bronze.

2.4 IRON, GROOVED-END BUTTERFLY VALVES

A. 175 CWP, Iron, Grooved-End Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Kennedy Valve; a division of McWane, Inc.
- b. Shurjoint Piping Products.
- c. Tyco Fire Products LP; Grinnell Mechanical Products.
- d. Victaulic Company.

2. Description:

- a. Standard: MSS SP-67, Type I.
- b. CWP Rating: 175 psig.
- c. Body Material: Coated, ductile iron.
- d. Stem: Two-piece stainless steel.
- e. Disc: Coated, ductile iron.
- f. Seal: EPDM.

2.5 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Hammond Valve.
- b. Kitz Corporation.
- c. Milwaukee Valve Company.
- d. NIBCO INC.
- e. Red-White Valve Corporation.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

- a. Standard: MSS SP-80, Type 1.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
- d. Ends: Threaded or solder joint.
- e. Stem: Bronze.
- f. Disc: Solid wedge; bronze.
- g. Packing: Asbestos free.
- h. Handwheel: Malleable iron, bronze, or aluminum.

2.6 LUBRICATED PLUG VALVES

A. Class 125, Regular-Gland, Lubricated Plug Valves with Threaded Ends:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Nordstrom Valves, Inc.

2. Description:

- a. Standard: MSS SP-78, Type II.
- b. CWP Rating: 200 psig.
- c. Body Material: ASTM A 48/A 48M or ASTM A 126, cast iron with lubrication-sealing system.
- d. Pattern: Regular or short.
- e. Plug: Cast iron or bronze with sealant groove.

PART 3 - EXECUTION

3.1 EXAMINATION

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

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

3.3 ADJUSTING

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

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball, butterfly, or gate, gate, or plug valves.
 - 2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
 - 3. Throttling Service: Globe or angle or ball or butterfly, ball, or butterfly valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves, except wafer types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 - 4. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 5. For Grooved-End Copper Tubing and Steel Piping: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 2 and Smaller:
 - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
 - 2. Bronze Angle Valves: Class 125, bronze disc.
 - 3. Ball Valves: Two piece, full port, bronze with bronze trim.
 - 4. Bronze Swing Check Valves: Class 125, bronze disc.
 - 5. Bronze Gate Valves: Class 125, NRS.
 - 6. Bronze Globe Valves: Class 125, bronze disc.
- B. Pipe NPS 2-1/2 and Larger:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1. Iron Valves, NPS 2-1/2 to NPS: May be provided with threaded ends instead of flanged ends.
2. Iron Ball Valves: Class 150.
3. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, stainless-steel disc.
4. Iron, Grooved-End Butterfly Valves: 175 CWP.
5. Iron Gate Valves: Class 125, NRS.

END OF SECTION

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 22 0529

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Fiberglass pipe hangers.
4. Metal framing systems.
5. Fiberglass strut systems.
6. Thermal-hanger shield inserts.
7. Fastener systems.
8. Pipe positioning systems.

B. Related Sections:

1. Division 05 "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 22 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.
3. Division 22 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
 1. Trapeze pipe hangers.
 2. Metal framing systems.
 3. Fiberglass strut systems.
- C. Delegated-Design Submittal: For trapeze hangers indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 1. Detail fabrication and assembly of trapeze hangers.
 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
- B. Stainless-Steel Pipe Hangers and Supports:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
3. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface or piping, i.e. felt coated.

2.2 TRAPEZE PIPE HANGERS

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

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.
 - c. Flex-Strut Inc.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut Corporation; Tyco International, Ltd.
 - g. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with intumed lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
7. Metallic Coating: Electroplated zinc.
8. Plastic Coating: PVC.

B. Non-MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Anvil International; a subsidiary of Mueller Water Products Inc.
 - b. Empire Industries, Inc.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- c. ERICO International Corporation.
 - d. Haydon Corporation; H-Strut Division.
 - e. NIBCO INC.
 - f. PHD Manufacturing, Inc.
 - g. PHS Industries, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
 3. Standard: Comply with MFMA-4.
 4. Channels: Continuous slotted steel channel with inturned lips.
 5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
 6. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.
 7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Carpenter & Paterson, Inc.
 2. Clement Support Services.
 3. ERICO International Corporation.
 4. National Pipe Hanger Corporation.
 5. PHS Industries, Inc.
 6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
 7. Piping Technology & Products, Inc.
 8. Rilco Manufacturing Co., Inc.
 9. Value Engineered Products, Inc.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.
- C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal 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 the building structure.
- B. Metal 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 for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- 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.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- G. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches 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 Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- I. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- J. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- K. 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.
- L. Install lateral bracing with pipe hangers and supports to prevent swaying.
- M. 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 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.
- N. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- O. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- P. Insulated Piping:
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 allowed by 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 and larger if pipe is installed on rollers.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

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 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/: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
6. Shield and insert lengths may be reduced to a minimum of 6" long (3" in each direction from the centerline of the hanger) at locations where obstructions prevent the shield and insert from being installed to the full length. All other locations shall conform to the specifications.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.
- 3.5 PAINTING
- A. Touchup: 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 a minimum dry film thickness of 2.0 mils.
 - B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 "Exterior Painting."
 - C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.
- 3.6 HANGER AND SUPPORT SCHEDULE
- A. Specific hanger and support requirements are 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 carbon-steel pipe hangers and supports and attachments for general service applications.
 - F. Use stainless-steel pipe hangers and stainless-steel attachments for hostile environment applications.
 - G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.
 - H. Use padded hangers for piping that is subject to scratching.
 - I. Use thermal-hanger shield inserts for insulated piping and tubing.
 - J. 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.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, 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.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 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, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 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, from two 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 24, 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 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 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 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- K. 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 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F 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 piping installations.
- M. 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-joint 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.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 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.
- N. 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.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- O. 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.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 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 allow 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 allow 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 allow expansion and contraction of piping system from trapeze support.
 8. 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.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

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RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 22 0549

SEISMIC RESTRAINT OF SUSPENDED PLUMBING UTILITIES

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Provide engineered seismic restraint systems for suspended Plumbing Piping and Plumbing Equipment utilities compliant with the currently adopted version of the California Building Code (CBC) with OSHPD amendments.
- B. At seismic restraint installation locations, provide vertical support systems engineered to accommodate dead load plus seismic force reactions.

1.2 RELATED SPECIFICATION SECTIONS

- 1. 22 1116 Domestic Water Piping
- 2. 22 1316 Sanitary Waste & Vent Piping
- 3. 22 1413 Storm Drainage Piping
- 4. 22 6113 Compressed Air Piping for Healthcare Facilities
- 5. 22 6213 Vacuum Piping for Healthcare Facilities
- 6. 22 6313 Medical Gas Piping For Healthcare Facilities

1.3 REFERENCES

- A. Publications, codes and standards listed below form a part of this specification to the extent referenced.
 - 1. *OSHPD Pre-Approved Applications, Design and Inspection Manual -Engineered Seismic Bracing of Suspended Utilities-* 2007 California Building Code Edition, OPA-0485-07 International Seismic Application Technology (ISAT)
Vol. 2 – HVAC Duct, Mechanical Piping, Plumbing, Process Piping & Equipment
 - 2. OSHPD Pre-Approved Seismic Bracing Manual, OPA-0349, Mason Industries.
 - 3. 2007 California Building Code (CBC) - Title 24, Part 2, Volume 2, Chapter 16A
 - 4. ASCE 7-05, Chapter 13, Minimum Design Loads For Buildings and Other Structures, American Society of Civil Engineers (ASCE)
 - 5. ACI 318-05, Building Code Requirements for Structural Concrete, American Concrete Institute (ACI).

1.4 COMPONENT IMPORTANCE FACTOR

- A. In order to identify systems required seismic restraint and to define those from which restraints may be excluded, the design team has assigned an ASCE 7 Importance Factor (Ip) to utility components on the basis of the following:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

Ip = 1.5 Occupancy Category IV, essential facilities required for post earthquake recovery – all “Designated Seismic Systems” per CBC Chapter 17 required for the continued operation of the facility.

1.5 SUBMITTALS

- A. Contractor to identify and convey to the seismic bracing provider each overhead deck condition to which seismic attachments will be made. Information to include type and density of concrete, concrete thickness, size and gage of metal deck, type and size of steel member and any point load limitations or restrictions.
- B. Provide Seismic Design Force calculations per ASCE 7- 05, Formulas 13.3-1 thru 13.3-3 stamped by a qualified structural engineer licensed to practice in the State of California. For multi-story projects, provide calculated Seismic Design Force for each floor. Provide all OSHPD applications and forms to Architect as required for submission to OSHPD as a post approval document.
- C. If not already furnished in contract documents, submit seismic restraint layouts stamped by a qualified structural engineer licensed to practice in the State of California. Seismic restraint layouts to show:
 - 1. All vertical support and seismic brace locations.
 - 2. All anchorage connections to structure. Anchor brand, type, quantity and size.
 - 3. Vertical support and brace reaction point load at all connections to structure. For review by engineer of record in checking suitability of the building structure to accommodate imposed loads.
 - 4. Plan set sheets showing appropriate installation details reflecting actual job site conditions.
- D. Include cover sheet with Seismic Restraint Bracing Legend delineating:
 - 1. Maximum Allowable Size or Utility Weight (Lbs/Lf).
 - 2. Minimum Vertical Support Rod Diameter.
 - 3. Support Rod Total Vertical Load.
 - 4. Maximum Allowable Transverse Brace Spacing.
 - 5. Transverse Brace Reaction.
 - 6. Maximum Allowable Longitudinal Brace Spacing.
 - 7. Longitudinal Brace Reaction.
 - 8. Minimum Required Seismic Restraint Brace Arm Assembly.
 - 9. Minimum Required Seismic Restraint Anchorage To Overhead Structure.
 - 10. Installation Detail Drawing References

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Seismic restraint hardware and engineering to be that furnished by International Seismic Application Technology (ISAT) 877-999-4728, www.isatsb.com or by Mason Industries.
- B. Vertical support and seismic restraint anchorages are to utilize deck inserts or post installed anchors as approved by the seismic bracing manufacturer.

DCGA 14044
2014-12-24

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- C. Vertical support and seismic restraint connections to structural steel are to utilize Beam Clamp connections unless noted otherwise. Welded or bolted connections are an acceptable alternate provided the details employed are those pre-engineered by the seismic bracing manufacturer.
- D. The total cost of materials, installation, engineering, etc. shall be included in the contractors bid.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Vertical support and seismic restraint anchorages to be per the OSHPD pre-approved manual or calculations submitted for approval.
- B. For conditions not covered within the OSHPD pre-approved manual, provide project specific calculations and details.
- C. The seismic bracing manufacturer shall provide field installation training prior to commencement of install.
- D. Field relocation of any seismic installation points away from that shown on the furnished shop drawing layouts shall be coordinated with the seismic bracing manufacturer.
- E. Consult the seismic bracing manufacturer when field conditions prohibit compliance with the supplied installation details.
- F. In order to satisfy CBC 2007 requirements, the allowable brace spacing for non-ductile systems (eg. cast iron, plastic and glass pipe) shall be no more than half that for ductile systems.

3.2 EQUIPMENT CONNECTIONS

- A. Where seismic bracing is allowed to be omitted due to component size or proximity to overhead deck, all terminations to fixed equipment, panels, etc. or to other portions of the system requiring seismic restraint are to utilize flexible connectors.

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RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
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RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 22 0553

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Pipe labels.
 - 3. Valve tags.
 - 4. Warning tags.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:

DCGA 14044
2014-12-24

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 6 by 2 inch.
6. Minimum Letter Size: 1/2 inch for name of units if viewing distance is less than 24 inches, 2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

- B. Label Content: Include equipment's unique equipment number. See the following example:

MVP-1

Where multiple pieces of the same type of equipment are provided, include the areas served. See the following example:

WH-1 Patient Rooms	WH-2 Kitchen
-----------------------	-----------------

- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
- B. Letter Color: Black.
- C. Background Color: Yellow or orange.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- F. Minimum Letter Size: 1 1/2 inch for name of units if viewing distance is less than 24 inches, 2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- G. Fasteners: Stainless-steel rivets or self-tapping screws.
 - H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
 - I. Label Content: Include caution and warning information, plus emergency notification instructions.
- 2.3 PIPE LABELS
- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
 - B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive. Outdoor pipe labels shall be high performance over laminated polyester material.
 - C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
 - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
 - 2. Lettering Size: At least 1-1/2 incheshigh.
- 2.4 VALVE TAGS
- A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.
 - 1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
 - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
 - B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-tag schedule shall be included in operation and maintenance data.
- 2.5 WARNING TAGS
- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
 - 1. Size: 3 by 5-1/4 inches minimum.
 - 2. Fasteners: Brass grommet and wire.
 - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
 - 4. Color: Yellow background with black lettering.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.
- C. Install labels on each fire, smoke, or combination fire/smoke damper access door.

3.3 PIPE LABEL INSTALLATION

- A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 25 feet along each run. Reduce intervals to 10 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- B. Pipe Label Color Schedule:
 - 1. Domestic Water Piping:
 - a. Background Color: Blue.
 - b. Letter Color: White.
 - 2. Sanitary Waste and Storm Drainage Piping:
 - a. Background Color: Yellow.
 - b. Letter Color: Black.
 - 3. Medical Vacuum Piping:
 - a. Background Color: White.
 - b. Letter Color: Black.
 - 4. Medical Air Piping:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- a. Background Color: Yellow.
 - b. Letter Color: Black.
5. Oxygen Piping:
- a. Background Color: Green.
 - b. Letter Color: White.
6. Natural Gas Piping:
- a. Background Color: Yellow.
 - b. Letter Color: Black.
- 3.4 VALVE-TAG INSTALLATION
- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
 - B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
 - 1. Valve-Tag Size and Shape: 2 inches, round.
 - 2. Valve-Tag Color: Natural Brass
 - 3. Letter Color: Black
- 3.5 WARNING-TAG INSTALLATION
- A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

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RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

SECTION 22 0719

PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic hot-water piping.
 - 2. Domestic recirculating hot-water piping.
 - 3. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
 - 1. Division 23 "HVAC piping insulation."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at pipe expansion joints for each type of insulation.
 - 3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 4. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - 5. Detail application of field-applied jackets.
 - 6. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- C. Field quality-control reports.
- 1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
 - B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
 - C. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.
- 1.6 DELIVERY, STORAGE, AND HANDLING
- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.
- 1.7 COORDINATION
- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 "Hangers and Supports for Plumbing Piping and Equipment."
 - B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
 - C. Coordinate installation and testing of heat tracing.
- 1.8 SCHEDULING
- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
 - B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. See "Product Characteristics" Article in Evaluations for comparisons and temperature ranges for insulation material properties.
- C. Products shall not contain asbestos, lead, mercury, mercury compounds or PBDE's (Polybrominated Diphenyl Ethers) .
- D. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- E. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- F. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials *with insulation pipe hanger inserts, "Armafix" IPH or equal.* Comply with ASTM C 534, Type I for tubular materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex, *Armafix*.
 - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- H. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - 2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

DCGA 14044
2014-12-24

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1. Products: Subject to compliance with requirements, provide the following:
 - a. Ramco Insulation, Inc.; Super-Stik.

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
 1. Products: Subject to compliance with requirements, provide the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Flexible Elastomeric: Comply with MIL-A-24179A, Type II, Class I.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Aeroflex USA, Inc.; Aero seal.
 - b. Armacell LLC; Armaflex 520 Adhesive.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.
 - d. K-Flex USA; R-373 Contact Adhesive.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- E. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
 - d. Mon-Eco Industries, Inc.; 22-25.
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 2.4 MASTICS
- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.
- C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
 - b. Eagle Bridges - Marathon Industries; 501.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
 - d. Mon-Eco Industries, Inc.; 55-10.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 3. Service Temperature Range: 0 to 180 deg F.
 4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 5. Color: White.
- D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
 - b. Eagle Bridges - Marathon Industries; 570.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
 2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
 3. Service Temperature Range: Minus 50 to plus 220 deg F.
 4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
 5. Color: White.
- E. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
 - b. Eagle Bridges - Marathon Industries; 550.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
 - d. Mon-Eco Industries, Inc.; 55-50.
 - e. Vimasco Corporation; WC-1/WC-5.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.
 5. Color: White.
- 2.5 SEALANTS
- A. Joint Sealants:
1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, provide one of the following:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Permanently flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 100 to plus 300 deg F.
 5. Color: White or gray.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. FSK and Metal Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: Aluminum.
 6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 2.6 FACTORY-APPLIED JACKETS
- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C921, Type I, unless otherwise indicated.
- B. Metal Jacket
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.
 - 2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Indoor Applications: 1-mil-thick, heat-bonded polyethylene and kraft paper.
 - d. Moisture Barrier for Outdoor Applications: 3-mil-thick, heat-bonded polyethylene and kraft paper.
 - e. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 - 2. Width: 3 inches.
 - 3. Thickness: 11.5 mils.
 - 4. Adhesion: 90 ounces force/inch in width.

DCGA 14044
2014-12-24

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.9 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy stainless steel.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. C & F Wire.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Company.
 - b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing.
 - d. Plumberex.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- e. Truebro; a brand of IPS Corporation.
 - f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- B. Protective Shielding Piping Enclosures:
- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Truebro; a brand of IPS Corporation.
 - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
 - 2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing on grease waste piping. Comply with requirements for heat tracing that apply to insulation.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.
- 3.4 PENETRATIONS
- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Division 21 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.
- E. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 21 "Through-Penetration Firestop Systems."
- 3.5 GENERAL PIPE INSULATION INSTALLATION
- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.
- 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION
- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 3. Install insulation to flanges as specified for flange insulation application.
 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- 3.7 INSTALLATION OF MINERAL-FIBER INSULATION
- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

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

3.9 FINISHES

- A. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

- C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

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MORENO VALLEY, CALIFORNIA

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible elastomeric with insulated pipe hanger inserts.

B. Domestic Hot Water: (up to 140 degree F.)

1. NPS 1/2 to 2: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 2-1/2 and above: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

C. Domestic Hot Water Runouts: (A runout is a 1/2 inch pipe serving an individual fixture connection and shall not exceed 12'-0" in length).

1. NPS 1/2: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
 - b. Flexible Elastomeric: 1/2 inch thick.

D. Domestic Recirculated Hot Water: (up to 140 degree F.)

1. NPS 1/2 to 2: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. NPS 2-1/2 and above: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.

E. Indirect Drains from Ice Machines:

1. All sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
 - b. Flexible Elastomeric: 1/2 inch thick.

F. ADA Lavatory (Hot and cold water supply and drain):

1. All sizes: Insulation shall be the following:

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MORENO VALLEY, CALIFORNIA

- a. Manufactured plastic wraps.

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SECTION 22 1116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.

1.3 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
 - 2. Do not interrupt water service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

DCGA 14044
2014-12-24

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K water tube, annealed temper.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- F. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Solder-joint or threaded ends.
- G. Appurtenances for Grooved-End Copper Tubing:
 - 1. Manufacturers: Subject to compliance with requirements, products by one of the following:
 - a. Anvil International.
 - b. Shurjoint Piping Products.
 - c. Victaulic Company.
 - 2. Bronze Fittings for Grooved-End, Copper Tubing: ASTM B 75 copper tube or ASTM B 584 bronze castings.
 - 3. Mechanical Couplings for Grooved-End Copper Tubing:
 - a. Copper-tube dimensions and design similar to AWWA C606.
 - b. Ferrous housing sections.
 - c. EPDM-rubber gaskets suitable for hot and cold water.
 - d. Bolts and nuts.
 - e. Minimum Pressure Rating: 300 psig.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.

RIVERSIDE COUNTY REGIONAL MEDICAL CENTER
ED REMODEL
MORENO VALLEY, CALIFORNIA

- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- 2.4 TRANSITION FITTINGS
- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
 - B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 - C. Sleeve-Type Transition Coupling: AWWA C219.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Cascade Waterworks Manufacturing.
 - b. Dresser, Inc.; Piping Specialties Products.
 - c. Ford Meter Box Company, Inc. (The).
 - d. JCM Industries.
 - e. Romac Industries, Inc.
 - f. Smith-Blair, Inc.; a Sensus company.
 - g. Viking Johnson.
 - D. Plastic-to-Metal Transition Fittings:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Charlotte Pipe and Foundry Company.
 - b. Harvel Plastics, Inc.
 - c. Spears Manufacturing Company.
 - 2. Description:
 - a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
 - b. One end with threaded brass insert and one solvent-cement-socket or threaded end.
 - E. Plastic-to-Metal Transition Unions:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Colonial Engineering, Inc.
 - b. NIBCO Inc.
 - c. Spears Manufacturing Company.