



YSLETA
INDEPENDENT SCHOOL DISTRICT



TECHNICAL DESIGN STANDARDS



THEBOND2019

YSLETA INDEPENDENT SCHOOL DISTRICT

APRIL 9, 2020

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TECHNICAL DESIGN STANDARDS

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Acknowledgement

The team would like to extend our appreciation to the Ysleta Independent School District for choosing VLK Architects, to develop/update the Technical Design Standards supporting the School Facilities Master Plan. We must also thank the entire Capital Improvement, District Operations and Administrative Services staff who provided information and support throughout this process.

Board of Trustees and Project Management

Board of Trustees

Cruz A. Ochoa Jr., President
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Consultants

VLK Architects
Fluid Systems, Inc.
Borunda & Associates
Huitt- Zollars, Inc.
Fugro Consultants, Inc.
HKN Engineers
Food Service Design Professionals

Project Management and Coordination, Architectural
Mechanical and Plumbing
Electrical / Technology
Civil / Landscape
Geotechnical
Structural
Food Services

District Vision Statement

All students who enroll in our schools will graduate from high school, fluent in two or more languages, prepared and inspired to continue their education in a four-year college, university or institution of higher education so that they become successful citizens in their community.

Guiding Tenets

Respect

Offer those we serve the opportunity to perform at their highest levels

- Be truthful in all interactions with others.
- Value everyone's perspectives and opinions by actively listening and responding in a positive way.
- Honor all faces of diversity.
- Honor consensus decisions made for the organization.

Innovation

Consistently look for better ways to grow and change

- Look for the opportunity to do something unexpected.
- Continuously look ahead and predict future trends to anticipate the needs of students, families and employees of the Ysleta Independent School District. Be prepared to meet the future.
- Encourage diverse perspectives and thought to create better solutions. Collaborate to innovate.
- Think creatively. Reaching effective solutions requires thinking differently and being willing to take risks.

Stewardship

Own our actions as good stewards of resources

- Own your role and responsibilities for the district
 - Define your challenges
 - Seek solutions
 - Embrace the challenges
- Approach your daily work as an opportunity to serve others.
- Be generous with your knowledge and resources.
- Understand fiscal priorities of the district and influence thinking and decision-making based on the priorities of the district.

Accountability

Hold ourselves and others accountable for supporting students and families

- Own your own actions and look beyond your defined role to add value.
- Accept responsibility.
- Demonstrate, by the way you work, that students, families, and other employees can count on you.
- Be transparent in all actions/decisions.

Consistency

Engage in transparent and aligned communication practices for the good of the system

- Practice the defined customs and routines that are best practices and/or create efficient and effective procedures that support quality of service to all.
- Define the parameters of work and communicate clear expectations to support the important work of the district.
- Know how your individual goals support the goals of the district. Maintain a constant focus on your goals to achieve the goals of the district.
- Aim for goals that challenge us, as a district, and you, as part of the district.

Integrity

Trust that people do the right thing, at the right time, in the right way

- Always do the right thing in the right way at the right time.
- Be honest and transparent in all interactions with all individuals and groups.
- Benchmark actions using the highest moral and ethical standards.
- Be a professional in communicating and interacting with internal and external customers.

Collaboration

Make personal choice to engage with others in a positive way; work toward solutions with a team approach

- Work with your team to achieve shared goals.
- Seek input from others.
- Be dependable, trustworthy, and reliable as a member of the team.
- Listen actively and acknowledge the ideas of other team members.

Ysleta ISD Organizational Chart 2019-20



For the most current version, please go to

https://visdservices.visd.net/orgchart_community/OrgChart.aspx#/16/false/sldpts56KtCozPsQyOBd5ADzx2019928114535

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Ysleta ISD School Directory



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Hacienda Heights /108 7530 Acapulco Ave. 79915 Grades K-6	434-2500 Fax 434-2500	María Aguilar	Maria R. Rodriguez	Adriana Fierro
Lancaster/133 9230 Elgin Drive 79907 Grades K-5	434-3400 Fax 434-3410	Veronica Frias	Sara Luz Ramirez	Eleonora Arrieta
LeBarron Park/130 920 Burgundy Ave. 79907 Grades K-5	434-3500 Fax 434-3505	Maritza Balderrama	Valerie Chavez	Yvette Medina

Campus/Address/Area	Phone/FAX	Principal	Assistant Principal	Secretary
Loma Terrace/109 8200 Ryland Ct. 79907 Grades PreK-6	434-2600 Fax 434-2605	Alejandro Armendariz	Sandra Nava	Rosie Beltran
Marian Manor/110 8300 Forrest Haven Ct. 79907 Grades K-5	434-3600 Fax 434-3605	Natalie Alvarez	Noel Astorga	Isela Lucero
Mesa Vista/121 8032 Alamo Ave. 79907 Grades EC, K-6	434-2700 Fax 434-2705	Norma Sierra	Lori Kyle	Nancy Valenzuela
Mission Valley/135 8674 North Loop Dr. 79907 Grades EC, K-5	434-3700 Fax 434-3705	Veronica Alvidrez	Claudia Nuñez	Rosella G. Rodarte
North Loop/112 412 Emerson St. 79915 Grades K-6	434-2800 Fax 434-2805	Denise Jones	Irma Bustamante	Marisa Paz
North Star/142 5950 Sean Haggerty 79924 Grades K-5	434-6700 Fax 434-6705	Stephanie Santana-Lahrman	Edward Trujillo	Valerie Alcala
Parkland/113 6330 Deer Avenue 79924 Grades EC, K-5	434-6600 Fax 434-6695	Roxanne Merfa	Angela Mendoza	Rosa Castillo
Pasodale/122 8253 McElroy Ave. 79907 Grades PreK-5	434-8500 Fax 434-8505	David Medina	Adriana Alvarez	Elizabeth M. Quiz
Pebble Hills/131 11145 Edgemere Blvd 79936 Grades PreK-5	434-5600 Fax 434-5605	Irene Youngs	Maria Chavira	Donna Murray
Presa/123 128 Presa Place 79907 Grades K-5	434-8700 Fax 434-8705	Wendy Banegas	Veronica Jacquez	Debbie Herrera
Ramona/114 351 Nichols Rd. 79915 Grades EC, PreK-6	434-7700 Fax 434-7705	Irene Ahumada	Darlene Solis	Ana Medina
REL Washington Int'l/141 3505 Lee Trevino Dr. 79936 Grades K-6	434-5900 Fax 434-5905	Mauricio Cano	Haydee Duran	Belia Benitez
Sageland/116 7901 Santa Monica Ct 79915 Grades EC, PreK-6	434-2900 Fax 434-2905	Rachael Blair	Zeila Wittke	Beatrice Gutierrez
Scotsdale/117 2901 Mc Rae Blvd 79925 Grades EC, PreK-6	434-4800 Fax 434-4805	Juan Guzman	Martha Calderon Norma Lopez	Alma Orozco

Campus/Address/Area	Phone/FAX	Principal	Assistant Principal	Secretary
South Loop/118 520 Southside Rd. 79907 Grades K-5	434-8800 Fax 434-8805	Norma Myers (Interim)	Maritza Fernandez	Aida Molinar
Thomas Manor/146 7900 Jersey 79915 Grades K-6	434-7500 Fax 434-7505	Sandra Stresow	Javier Aguilera	Patricia Moreno Tercero
Tierra Del Sol/132 1832 Tommy Aaron Dr 79936 Grades PK-6	434-5800 Fax 434-5805	Michelle Romero	Rebeca Parada	Corina C. Olivas
Vista Hills/128 10801 La Subida Dr. 79935 Grades PreK-6	434-5700 Fax 434-5705	Laura Calderon	Marisa Holguin	Cleo Flores
Ysleta/119 8624 Dorbandt Cir. 79907 Grades K-5	434-8900 Fax 434-8995	Norma Osuna	Cecilia G. Perez	Yvette Campos

PRE-K SCHOOLS (2)

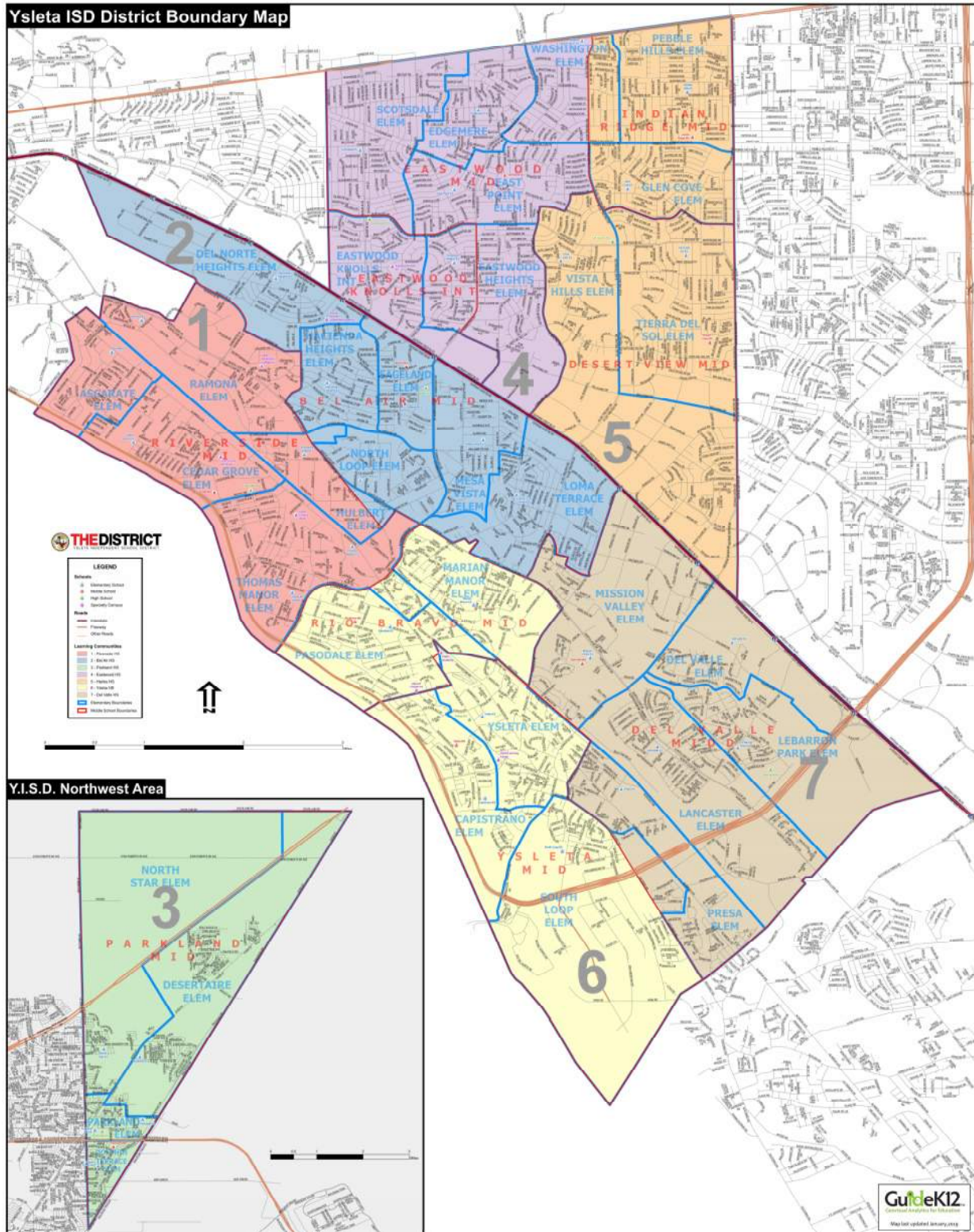
Campus/Address/Area	Phone/FAX	Principal	Assistant Principal	Secretary
Parkland Pre-K Center /147 10080 Chick-a-Dee 79924	435-7800 Fax 435-7896	Rita Lopez	Maria Gaytan	Elva Velasco
Ysleta Pre-K Center/134 7940 Craddock 79915	434-9500 Fax 434-9505	Heather Karns	Suizette Zubia	Kristin Pacheco

SPECIAL CAMPUSES (6)

Campus/Address/Area	Phone/FAX	Principal	Assistant Principal	Secretary
Cesar Chavez Academy/014 7814 Alameda Ave. 79915 Grades 7-12	434-9600 Fax 434-9605	Lionel Nava (interim)	Ohana DeLaRiva Walter Keys	Vivian D. Ortega
Plato Academy/033 8441 Alameda Ave. 79907 Grades 9-12	434-9000 Fax 434-9095	Gloria Spencer	Mae Read	Cynthia Jacobo
Tejas School of Choice/010 7500 Alpha Street 79915 Grades 9-12	434-9900 Fax 434-9905	Dr. Lucy Lozano-Lerma	Ruben Flores	Elizabeth Chavez
Valle Verde Early College High School/017 919 Hunter Drive 79915 Grades 9-12	434-1500 594-3900 Fax 434-1505	Paul Covey	Laura Widner	Julissa Elicerio
Young Women's Leadership Academy/018 8040 Yermoland Dr. 79915 Grades 6-9	434-1300 Fax 434-1399	Malinda Villalobos	Margarita Marrero Academic Dean	Margarita Chavez
Ysleta Community Learning Center/013 121 Padres Dr. 79907	434-9400 Fax 434-9498	Louis D. Martinez		Lidia De La Cruz Budget Specialist

Ysleta ISD District Map

For the most current version, go to <http://www.yisd.net/Page/6364>



YSLETA INDEPENDENT
SCHOOL DISTRICT

Ysleta ISD School Calendar– 2019/2020

Ysleta Independent School District

July						
S	M	T	W	Th	F	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

August						
S	M	T	W	Tr	F	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

September						
S	M	T	W	Tr	F	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

October						
S	M	T	W	Th	F	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

November						
S	M	T	W	Th	F	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

December						
S	M	T	W	Tr	F	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

2019-2020 DISTRICT CALENDAR	
July 1-5	District Holiday
August 12-16 19-23 26	Student Registration/New Teacher Induction Professional Development/Convocations/Teacher Prep Day First Instructional Day/First Day of the First Semester
September 2 23 24 25 26	Labor Day/District Holiday Parent Conference/Full Day Instruction (High School) Parent Conference/Full Day Instruction (Middle School) Early Release Campus PD/Students Half-Day (4 Hours)(Waiver) Parent Conference/Full Day Instruction (Elementary School)
October 25 31	End of 1st Nine Weeks Early Release Campus PD/Students Half-Day (4 Hours)(Waiver)
November 11 25-29	Veteran's Day/District Holiday Thanksgiving Break
December 10-13 20 23-27 30-31	EOC for Eng. I & II, Algebra I, Science, Social Studies Courses Early Release/Students Half-Day (4 Hours)(Waiver) End of First Semester/End of 2nd Nine Weeks Winter Break Winter Break
January 1-2 3 6 7 20 29	Winter Break Holiday Exchange Days/Professional Development Holiday Exchange Days/Professional Development (Waiver) First Day of Second Semester/Students Report Back to School Martin Luther King Jr. Day/District Holiday Early Release Campus PD/Students Half-Day (4 Hours)(Waiver)
February 18 19 20 26	Parent Conference/Full Day Instruction (Elementary School) Parent Conference/Full Day Instruction (High School) Parent Conference/Full Day Instruction (Middle School) Early Release TELPAS Calibration/ Students Half-Day (4 Hours)(Waiver)
March 6 16-20	End of 3rd Nine Weeks Spring Break
April 7-8 10	EOC for Eng. I & II; STAAR Grades 4 & 7 Writing; Grades 5 & 8 Reading & Math Good Friday/District Holiday/Inclement Weather Make-Up Day
May 5-8 12-15 25	EOC for Algebra I, Biology, and U.S. History Courses; STAAR Grade 8 Science & Social Studies STAAR Grades 3,4,6,7 Reading & Math; STAAR Grade 5 Science; EOC English III & Algebra II; Grades 5 & 8 Reading & Math Retest Memorial Day/District Holiday/Inclement Weather Make-Up Day
June 5 23-25 23-24	End of Second Semester/Last Instructional Day EOC Retest Grade 5 & 8 Reading & Math Retest
July 6-10	District Summer Holiday
Instructional Days	
Semester 1	Semester 2
78	102

January						
S	M	T	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

February						
S	M	T	W	Th	F	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

March						
S	M	T	W	Th	F	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April						
S	M	T	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May						
S	M	T	W	Tr	F	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June						
S	M	T	W	Th	F	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

July						
S	M	T	W	Th	F	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

This academic calendar is intended for use by YISD students, parents and guardians, district employees, and the community for planning. It is not intended for payroll purposes. Employees should confirm with Payroll/HR their actual days of employment per their assigned schedule. This calendar is compliant with Texas House Bill 2610 and verified to contain at least 75,600 minutes of instruction for the 2018-2019 school year.

Board Approved: February 6, 2019
Revised: August 7, 2019

Introduction

The Ysleta Independent School District (YISD) provides these standards presenting administrative and technical guidelines for those involved in the planning, design and construction of new school facilities and additions, expansions or renovations of existing schools.

This document comprises **Technical Design Standards (TDSs)** that state the general principles to be used in the design of schools with the objective of achieving design consistency, equity and quality, facilitating timely completion of buildings, and which can be effectively, efficiently and economically managed through their life cycle. The goal of these Standards is also to provide safe, functional and sustainable environments conducive to learning.

This document, in conjunction with other relevant design guidance, is intended both as a design tool-kit for the District and Design Team and as part of a set of reference documents for the evaluation of design submissions and contract compliance. All Architect/Engineering firms, and other consultants/ vendors, under contract with the District are required to abide by these guidelines. This document and all other guidance documents mentioned herein are available on the YISD web-site at www.YISD.net. These TDSs must be supplemented with the **Educational Specifications** developed for a specific project. When there is a discrepancy between the TDSs and the Educational Specifications, the latter shall have precedence. Any discrepancy must be brought to the attention of the District Architect.

Any revisions to the TDSs suggested by the owner or a design professional working on a specific project, must be approved by YISD via the Request for Waiver form included in of these TDSs See blank form on next page.

These TDSs are periodically reviewed and updated to address the inclusion of new products, construction methods, applicable building codes and reference standards. YISD welcomes comments and suggestions at any time on how to improve these standards. For comments and suggestions or further advice on these standards or any other matters relating to this document, please contact:

Frances Y. Yopez
Director of Facilities and Construction
Operations Department
Ysleta Independent School District
9600 Sims Drive
El Paso, TX 79925
fyepez@yisd.net

All comments and suggestions will be considered at the next review. All revisions will be properly dated and issued officially by the District. Always check the district's web site for the most up-to-date version.

TECHNICAL DESIGN STANDARDS

YSLETA INDEPENDENT
SCHOOL DISTRICT

Ysleta ISD 2019 Capital Improvement Program

Request for Waiver Form

WAIVER #:

Office use only

BP #:

DATE:

PROJECT NAME:

ORG #:



PROJECT STAGE:

SD

☐

DD

☐

CD

☐

BID

☐

CONST.

☐

SCHOOL TYPE:

ES

☐

MS

☐

HS

☐

PROJECT TYPE:

NEW

☐

ADD

☐

REN

☐

REQUESTED BY:

A/E

☐

VLK PM

☐

YISD

☐

WAIVER TYPE:

Ed Specs

☐

TDS

☐

Master

☐

Spec

DISCIPLINE:

ARCH

☐

CIV

☐

STRUC

☐

MECH

☐

ELECT

☐

OTHER

LOCATION OF ITEM IN NEED OF WAIVER:

DIVISION:

SECTION:

PARAGRAPH:

Briefly describe item that needs to be waived:

IMPACT ANALYSIS:

Saved Days

☐

Savings

☐

SCHEDULE Days

Extra Days

☐

FINANCIAL \$

Expenditure

☐

Reasons why the waiver is needed and how it is going to benefit the project:

REQUESTED BY:

A/E Firm:

Name / Firm

Signature

Date

RECOMMENDED BY:

VLK Program Manager:

Name

Signature

Date

YISD Program Manager:

Name

Signature

Date

AUTHORIZED BY:

☐

Requires TDS Update

(TDS Update Immediately)

☐

Requires TDS Update

(TDS Update Next Phase)

☐

Case Specific

(TDS Update Not Required)

☐

All Projects in Design

☐

All Projects in Design & Procurement

☐

All Projects in Design & Procurement & Construction

Chief Financial and
Operational Officer:

Name

Signature

Date

Director of Facilities
& Construction:

Name

Signature

Date

Director of Maintenance:

Name

Signature

Date

Methodology

The process followed for the creation/updating of the 2019 Technical Design Standards (TDSs) includes:

Preparatory to the 2019 Bond Election, the YISD Operations department and VLK Program Manager worked together to create a current set of standards for new construction and renovation of existing facilities. The Program Manager and its Technical Consultants organized and coordinated a series of eight (8) meetings with the District's Capital Improvement Office staff and Facility Trade Staff as appropriate. The purpose was to review the recommended revisions, reinforce the dialog and make sure that all parties had an opportunity to provide input and contribute. Meetings were held with the following agendas:

- A. General Information, District Information, Procedures, Geotech, Materials Testing and Documentation
- B. Building Interior: Wood and Plastics, Furnishings, Finishes, Specialties and Equipment
- C. Thermal and Moisture Protection, Openings, Special Construction, Conveying Systems
- D. Site, Building Exterior, Earthwork, Exterior Improvements, Utilities, Concrete, Metals and Masonry
- E. HVAC
- F. Plumbing, Fire Suppression, Electrical and Communications
- G. Electronic Safety and Security

A second draft review meeting followed.

The technical consultants were also given the opportunity to incorporate best practices and apply their technical expertise in the design and construction of educational facilities in Texas with the goal to improving the quality and content of the TDSs and its components, recommend new products and systems, etc.

Concurrently, the Program Manager coordinated the 2015 TDSs with the 2015 Educational Specifications. Once the review process concluded and the parties reached consensus, the project team produced the final draft of the 2015 TDSs for review by the Capital Improvement Office. These standards were reviewed and updated in preparation for the 2019 Bond Election by the YISD Operations Department.

The final document of the 2019 Technical Design Standards was issued officially on **February 28, 2020**.

Division 00 – Procurement and Contracting Requirements

0.01 Contracting Requirements

A. Owner / Architect Agreement

Ysleta ISD utilizes an Owner / Architect Agreement written by their attorney. Chief Financial and Operations Officer of Operations is responsible for facilitating the execution of this contract. Refer to Appendix A for example agreement. Contact Ysleta ISD for updates and latest revision to this document.

B. Agreement between Owner and Contractor

Ysleta ISD utilizes the AIA A101-2017 Standard Form Agreement between Owner and Contractor along with AIA A201-2017 General Conditions of the Contract for Construction, as amended by Ysleta ISD via their attorney.

Refer to Appendix B for example agreement. Contact Ysleta ISD for updates and latest revision to this document.

C. Supplementary Conditions

Any supplementary conditions required by the District are to be coordinated through the Chief Financial and Operations Officer. Contact Ysleta ISD for updates and latest revision to this document.

D. Prevailing Wage Rates

Ysleta ISD utilizes the Davis Bacon Wage Rate as its basis for wage rates. Contact Ysleta ISD for updates and latest revision.

E. Current Forms

The Architect / Engineer shall, prior to publishing or incorporating any of the above forms, confirm with the Project Manager that the forms to be published or incorporated are the latest revisions.

F. Rights Reserved

YISD reserves the right to make changes to any of these published documents and amendments prior to execution of any agreement.

0.02 PROCUREMENT REQUIREMENTS

Procurement Schedule

- A. Packages and schedule to be developed.
- B. Procurement should reference background check requirements.

Procurement Responsibility

YSLETA ISD - RESPONSIBILITY CHART					
FURNITURE, FIXTURES AND EQUIPMENT REQUIREMENTS					
	CATEGORY / ITEM	A	B	C	D
IN PROJECT		GENERAL CONTRACTOR (GC)	OWNER PROVIDED / GC INSTALLED	OWNER PROVIDED & INSTALLED	VENDOR PROVIDED & INSTALLED
	FURNITURE				
	Loose Furniture				X
	Fixed Furniture	X			
	AUDIO VISUAL				
	Projectors				X
	Fixed Lecterns	X			
	Movable Carts				X
	Computers				X
	Flat Screen TV				X
	LAB EQUIPMENT				
	Lab Goggles Cases	X			
	Loose Lab Equipment	X			
	Safety Eye Wash &/or Shower	X			
	Fume Hoods	X			
	Chemical Storage Cabinets	X			
	Fire Blanket	X			
	First Aid Kit	X			
	Lab Cart	X			
	Pegboard / drip trough	X			

TECHNICAL DESIGN STANDARDS

YSLETA INDEPENDENT
SCHOOL DISTRICT

IN PROJECT	CATEGORY / ITEM	A	B	C	D	COMMENTS
		GENERAL CONTRACTOR (GC)	OWNER PROVIDED / GC INSTALLED	OWNER PROVIDED & INSTALLED	VENDOR PROVIDED & INSTALLED	
	GENERAL					
	Projection Screens	X				
	White Boards/Chalk Boards	X				
	Storage Cabinets - Fixed	X				Built-ins
	Storage Cabinets - Freestanding				X	
	Lockers (non-furniture)	X				Built-ins
	Cubbies	X				Built-ins
	Moveable Carts			X		
	Waste Cans			X		
	Special Teaching Equipment			X		Identify needs for specific academic programs
	Display Cabinets	X				
	Trophy Cases	X				
	Soap & Paper Towel Dispensers, Roll toilet paper holders		X			
	Remaining Toilet Accessories	X				
	EQUIPMENT					
	Phones			X		GC provides wires and outlet
	Intercom System	X				
	Computers			X		GC to provide electrical and data
	Computer Printers			X		GC to provide electrical and data
	Copy/Fax/Scan Machines			X		GC to provide electrical and data
	Large Format Printers			X		GC to provide electrical and data
	Refrigerators (upright)			X		GC to provide water & electrical.
	Refrigerators (undercounter)	X				
	Microwaves	X				Non-fixed (countertop) provided by YISD
	Dishwashers	X				

IN PROJECT	CATEGORY / ITEM	A	B	C	D	COMMENTS
		GENERAL CONTRACTOR (GC)	OWNER PROVIDED / GC INSTALLED	OWNER PROVIDED & INSTALLED	VENDOR PROVIDED & INSTALLED	
	KITCHEN / FOOD SERVICE	X				
	Specialty Loose Kitchen Equipment		X			
	LIFE SAFETY					
	AED Units			X		
	Fire Extinguisher	X				
	Fire Extinguisher Cabinet	X				
	Emergency Communication Device	X				
	Speakers	X				
	ACCESSIBILITY AND OTHER					
	Wheelchairs			X		
	Motorized Scooters			X		
	Accessible Lifts	X				
	Emergency Stair Evacuation Chair	X				Recessed install is preferred. Surface mount if necessary.

0.03 Project Information Form

This form is to be filled out at the beginning of every project by YISD's Program Manager and distributed to the project team.

Project Name: _____

Address: _____

Project Budget: _____

Construction Budget: _____

Scope of the Project:

Substantial Completion Date: _____

Architect: _____

Contact: _____

Contract Status: Complete

Incomplete

Comments:

District Procured Consultants:

Contact: _____

Contact: _____

Contact: _____

Is property platted? Y N

Geotechnical Engineer: _____

Contact: _____

Agreement Status:

Complete

Incomplete

Did A/E Review?

Status of Soils Investigation Report: Complete

Incomplete

Issued to A/E?

Testing Lab (if different): _____

Contact: _____

Surveyor: _____

Contact: _____

Agreement Status:

Complete

Incomplete

Were Civil Engineers List of Needs Provided?

Status of Survey: Complete

Incomplete

Issued to A/E?

Asbestos Report: Y N N/A

Municipality: _____

Governing Jurisdiction(s): _____

Utility Providers:

Phone: _____

Water: _____

Gas: _____

Electricity: _____

Roadways: _____

TxDOT? Y N

Construction Procurement Method: _____

Construction Manager: _____

0.04 Geotechnical / Materials Testing

A. Ysleta ISD: Adrian K. Stresow, P.E.
 Program Director
 Bond Department
 Ysleta Independent School District
 9600 Sims Dr
 El Paso, TX 79925
 astresow@yisd.net

B. Procurement

1. Procurement of geotechnical and materials testing services shall be on the basis of qualifications and per Government Code, Chapter 2254, Professional and Consulting Services.
2. Geotechnical and materials testing services shall be selected on an as needed basis. A pool of qualified geotechnical and materials testing firms shall be selected by Request for Qualifications process in conjunction with a school bond.

C. Scope of Services

1. Geotechnical testing shall include verification of sub-surface conditions with respect to soil structure, bearing strata, seismic site class and coefficient and groundwater observations. The geotechnical engineer is responsible for making recommendations for construction on the basis of observed conditions. Recommendations shall include a range of options.
2. Materials testing services shall include inspection, sampling and testing necessary to confirm construction meets specified standards. Materials testing services shall ascertain compliance of materials and mixes with requirements of contract documents. Responsibilities include promptly notifying YISD, architect, appropriate consultants, and contractor and authority having jurisdiction of observed irregularities or non-conformance of work or products.

D. General

1. Testing and inspection services.
2. General requirements for Ysleta ISD testing laboratory services to perform quality control services and testing. Testing lab services to be performed by the following company:
 - a. Construction Material Testing
3. Lab to be selected by owner per project.
4. Employment of a testing laboratory by Ysleta ISD in no way relieves Contractor's obligation to perform work in accordance with Contract Documents.

E. Reference Standards

1. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2011c.
2. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2012.
3. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as used in Engineering Design and Construction; 2012a.
4. ASTM E329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2011.
5. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2009.
6. The latest adopted edition of all standards references in this section shall apply, unless note otherwise. In case of conflict between these Contract Documents and a referenced standard, the Contract Documents shall govern. In case of conflict between these Contract Documents and the Building Code; the more stringent shall govern.

F. General Requirements for Owners Quality Control Testing

1. Ysleta ISD may employ various testing laboratories and/or geotechnical engineering services to perform inspection services, testing of construction materials and verification testing services and to transmit copies of test reports to Contractor. Sampling and testing that Ysleta ISD may require is specified in this Section and in the various technical Sections requiring quality control or verification testing. Cooperate with Ysleta ISD's testing laboratory personnel, provide access to the work, to manufacturer's and fabricator's operations, furnish incidental labor and facilities, and samples for test and inspections, as specified.
 - a. Employment of testing laboratory to perform quality control tests is for benefit of Ysleta ISD in confirming that performance and quality of the Work is in conformance with the Contract Documents.
 - b. Ysleta ISD's testing laboratory shall not be the same as Contractor's testing laboratory used for design and certification testing unless otherwise acceptable to the A/E and Ysleta ISD.
 - c. Where the terms "Inspector" and "Laboratory" are used, they mean and refer to an officially designated and accredited inspector of the testing laboratory engaged by Ysleta ISD.
 - d. The inspecting agency shall make all inspections and perform all tests in accordance with the rules and regulations of the building code, local authorities, the Specifications of the ASTM and these Contract Documents.
 - e. Submittals
 - i. The Agency shall submit to Ysleta ISD's Representative:
 - ii. Detailed procedures
 - iii. Agenda
 - iv. Report forms
2. Commercial Testing Laboratories
 - a. In general, all Contracts awarded by Ysleta ISD will require that testing not performed by the Contractor (i.e., hydrostatic testing of piping) or by the A/E (i.e., spot checking of air flow by the Engineer) will be performed by a commercial testing laboratory selected by Ysleta ISD. The cost of such commercial testing will be paid directly by Ysleta ISD. Retesting of non-conforming work will also be paid by Ysleta ISD but will be re-invoiced at cost to the Contractor. The number of copies of test reports will be determined for each individual project but in general will include:
 - i. Two copies for Ysleta ISD, two copies for the General Contractor, two copies for the Architect, and one copy for the Structural Engineer.
 - b. Employment of the testing laboratory is for the benefit of Ysleta ISD in confirming that performance and quality of the Work is in conformance with the Contract documents.
 - c. The engagement of a testing laboratory by Ysleta ISD in no way relieves the Contractor of its responsibility. In full compliance of the Contract, the Contractor remains liable for the quality of the materials, products/equipment installed, and satisfactory work performance.

G. Quality Assurance

1. Laboratory Qualifications and Procedures:
 - a. Meet "Recommended Requirements for Independent Laboratory Qualification," latest edition published by American Council of Independent Laboratories. Testing agencies shall meet the requirements of ASTM E 329, "Recommended Practice for Inspection and Testing Agencies for Concrete, Steel and Bituminous Materials as Used in Construction" and ASTM E 543, "Determining the Qualification of Nondestructive Testing Agencies." Submit a copy accreditation certificate as received from a nationally recognized accreditation firm such as: AASHTO, CCRL, AMRL, A2LA, etc. validating as meeting these requirements.

- b. The inspection and testing services of the testing agency shall be under the direction of Registered Engineer licensed in the State of Texas, charged with engineering managerial responsibility, and having at least five years engineering experience in inspection and testing of construction materials.
 - c. Inspecting personnel monitoring concrete work shall be ACI certified inspectors.
 - d. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of National Bureau of Standards during most recent tour of inspection. Include memorandum of remedies of deficiencies reported by this inspection.
 - e. Testing Equipment: Calibrated at reasonable intervals by devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
 - f. Tests and inspections shall be conducted in accordance with specified requirements and if not specified, in accordance with applicable standards of the American Society for Testing and Materials and other recognized authorities as approved.
 - g. Primary inspectors performing structural steel inspection shall be currently certified AWS Certified Welding Inspectors (CWI), in accordance with the provisions of AWS QCI, "Standard and' Guide for Qualification and Certification of Welding Inspectors." The inspector may be supported by assistant inspectors who may perform specific inspection functions under the supervision of the inspector. Assistant inspectors shall be currently certified ASW Certified Associate Welding Inspectors (CAWI). The work of assistant inspectors shall be regularly monitored by the inspector, generally on a daily basis.
 - h. Contractor shall review scope of Ysleta ISD's testing and advise any additional testing to be provided by the construction team.
- 2. Laboratory Duties: Cooperate with Architect and Contractor. Upon notice, provide qualified personnel to perform required tests and inspections. In performing tests and inspections, Laboratory shall:
 - a. Comply with specified standards. Comply with building code requirements for "Special Inspection" whether or not such inspections are specified herein. Refer to the Table of Required Observations on the Structural Drawing sheets.
 - b. Ascertain compliance of materials with requirements of Contract Documents. If the material furnished and/or work performed fails to meet requirements of contract documents, laboratory inspector shall promptly notify both the Contractor and the A/E of such failure.
 - c. Promptly notify Ysleta ISD's Representative, Contractor and Architect of observed irregularities or deficiencies in the Work.
 - d. A representative of Ysleta ISD's testing laboratory, who has reviewed and is familiar with the project and specifications, shall participate in all preconstruction conferences. It shall coordinate material testing and inspection requirements with the Contractor and its subcontractors consistent with the planned construction schedule. The laboratory representative shall attend, throughout the course of the project, such conferences as may be required or requested to address quality control issues. The laboratory representative shall also attend any pre-construction meetings as required.
 - e. Laboratory personnel shall inspect and/or test materials, assemblies, specimens, and work performed, including design mixes, methods and techniques and report to the Architect the progress thereof.
- 3. Limits of Testing Laboratory Authority: Laboratory is not authorized to:
 - a. Release, revoke, alter, relax, or enlarge requirements of Contract Documents.
 - b. Approve or reject any portion of the work.
 - c. Perform any duties of the Contractor and subcontractors.
 - d. Laboratory technicians do not act as foremen or perform other duties for Contractor. Work will be checked as it progresses, but failure to detect any defective work or materials shall not, in any way, prevent later rejection when such defect is discovered.

- e. The laboratory inspector is not authorized to revoke, alter, relax, enlarge, or release any requirement of the Contract Documents or to approve or accept any portion of the work, except where such approval is specifically called for in the Specifications.
- 4. Contractor's Responsibilities: (For only the inspection and testing items noted within this CMET technical design standards section.)
 - a. Cooperate with laboratory personnel; provide access to work, to manufacturer's and fabricator's operations wherever work is in preparation or progress.
 - b. Secure and deliver to the laboratory without cost to Ysleta ISD adequate quantities of representative samples of materials proposed to be used and which require testing.
 - c. Furnish Incidental Labor and Facilities:
 - i. To provide access to work to be tested.
 - ii. To obtain and handle samples at the project site or at the source of the product to be tested.
 - iii. To facilitate inspections and tests. Furnish such labor as is required to assist laboratory personnel in obtaining and handling samples at the site.
 - iv. For safe storage and curing of concrete test cylinders at project site and other test samples as required for field curing by ASTM C31.
 - d. Costs of tests, samples, and mock-ups of substitute material, where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Architect to establish equality with specified items; shall be borne by the Contractor.
 - e. Costs of tests, samples, and mock-ups performed solely for the benefit or convenience of the Contractor.
 - f. Notify laboratory sufficiently in advance of construction operations to allow for laboratory to complete any required checks or tests and to make assignment of personnel and scheduling of tests.
 - g. Ysleta ISD's testing laboratory will conduct additional tests at Contractor's expense when initial quality control testing indicates work is defective or does not conform to requirements. Materials and workmanship not meeting the required standards or performance obligations are to be removed and replaced. Replacement and subsequent testing shall be at the expense of the Contractor.
 - h. Furnish concrete mix designs, in accordance with ACI 301, Section 3.9, made by an independent testing laboratory or qualified concrete supplier. Where mix designs by an independent testing laboratory are required, the laboratory shall be selected by the Contractor, approved by the Architect, and paid by the Contractor.
 - i. Obtain required inspections or approvals of the building official when required. All inspection requests and notifications required by the building code are the responsibility of the Contractor.
 - j. Provide current welder certifications for each welder to be employed.
 - k. Furnish fabrication/erection inspection and testing of all welds in accordance with AWS D1.1, Chapter 6.
 - l. Prequalification of all welding procedures to be used in executing the work.

H. Submittals

- 1. General: Testing laboratory shall promptly submit written report of each and every test and inspection; two (2) copies each to Architect and Contractor, two (2) copies each to Ysleta ISD and one copy to the Structural Engineer. Each report shall include:
 - a. Date issued.
 - b. Project title and number.
 - c. Testing laboratory name, address, and telephone number.
 - d. Name of laboratory inspector and signature of project manager.
 - e. Date and time of sampling or inspection.
 - f. Record of temperature and weather conditions.

- g. Date of test.
- h. Identification of product and specification section.
- i. Location of sample or test in the project.
- j. Type of inspection or test.
- k. Results of tests and observation regarding compliance with Contract Documents.
- l. Interpretation of test results, when requested by Architect.
- 2. State in report all details of each inspection and test. Indicate compliance or noncompliance with requirements of the Contract Documents. Also state in report any and all unsatisfactory conditions.
- 3. In addition to furnishing a written report, notify the Architect and the Contractor verbally of any uncorrected conditions or failures to comply with the requirements of the Contract Documents.
- 4. At completion of each trade or branch of work requiring inspecting and testing, submit a final certificate attesting to satisfactory completion of work and full compliance with requirements of Contract Documents.
- 5. Upon completion of building, testing laboratory shall furnish, to Ysleta ISD and Architect, statement (certified by Notary Public) that all required tests and inspections were made in accordance with requirements of Contract Documents.

0.05 Land Survey Services

A. Ysleta ISD: Adrian K. Stresow, P.E.
Program Director
Bond Department
Ysleta Independent School District
9600 Sims Dr
El Paso, TX 79925
astresow@yisd.net

B. Procurement:

- 6. Procurement of land surveying services shall be on the basis of qualifications and per Government Code, Chapter 2254, Professional and Consulting Services.
- 7. Land surveying shall be selected on an as needed basis.
A pool of qualified land surveyors shall be selected by Request for Qualifications process in conjunction with a school bond.

C. Scope of services:

- 1. Area to be surveyed shall be developed with YISD, architect, and civil engineer. The land survey shall commence immediately upon start of the project or as soon as scope of survey is determined. Draft copy of the land survey is required prior to start of Design Development phase.
 - a. Scale shall not be smaller than one-inch equals forty-feet and where practical shall be one-inch equals thirty-feet. Confirm scale requirements with Owner's architectural firm.
 - b. Terrain contours shall be shown at one-foot intervals.
 - c. Identify on the drawing the benchmark used to establish contour elevations. Relate benchmark to local jurisdictions benchmark as required.
 - d. Property lines shall be shown.
 - e. All existing easements, building set-back lines, required landscape "buffer" yards, and other statutory legal or technical restrictions shall be shown.
 - f. The location of all physical improvements to the property such as roads (gravel or paved), other paving, buildings, fences, wells, water tanks, drain fields, septic tanks, cisterns, signs, etc. shall be shown.

- g. All on-site overhead and underground utilities, lines and piping shall be accurately located on the survey in accordance with the surveyor's field inspection and examination of actual development construction documents on file with the municipality in which they are located. Note meters, boxes, clean-outs, etc.
- h. Identify any special flood hazard areas which occur on-site. Also note any contiguous, off-site special flood hazard areas. Identify location of 100-year flood plain, and official "floodway" based on the most recent FEMA map update, if applicable.
- i. Off-site utilities located adjacent to the property including water, sanitary sewer, storm sewer, natural gas, electrical, and telephone shall be shown. These utilities shall be accurately located on the survey in accordance with the surveyor's field inspection and examination of actual development construction documents on file with the municipality in which they are located. Note meters, boxes, clean-outs, etc.
- j. The existing location of those utilities listed above which do not lie adjacent to the property shall be documented separately with photocopy exhibits from City utilities plans, telephone company diagrams, etc.
- k. Spot elevations shall be provided at adjacent streets' centerlines, gutter and top of curb (where curb and gutter exist), slabs at existing entrances, and edge of paving and bottom of "borrow" ditch (where ditch exists) at intervals frequent enough to allow later detailing of matching on-site approaches and/or curb cuts.
- l. Provide invert elevations and flow-lines at all sanitary and storm sewer clean-outs, manholes, inlets, and culverts on-site and adjacent to site. (Provide same information on nearest piping if not located adjacent to site).
- m. Provide flow-line and invert elevations at any existing culverts or approach drain piping adjacent to site.
- n. Locate trees on site. Call out species and caliper in inches. Boundaries of dense tree clusters and other heavy brush shall be shown on the survey.
- o. Zoning of subject property and adjacent property shall be also noted on the survey.
- p. Provide Auto-Cad format disk to YISD, architect and civil engineer.
- q. Confer directly with Owner to obtain "Owner's record drawings", and other documents or knowledge which Owner may have, to establish all on-site "as-built" underground and overhead utility locations. This is of great importance on topographic surveys of sites that include existing buildings or other structures.
- r. Provide perimeter dimensions of all existing structures.
- s. Provide legal description of the property.

0.06 Environmental Services

- A. Ysleta ISD: Adrian K. Stresow
Program Director
Bond Department
Ysleta Independent School District
9600 Sims Dr
El Paso, TX 79925
astresow@yisd.net
- B. Procurement:
1. Procurement of environmental quality testing services shall be on the basis of qualifications and per Government Code, Chapter 2254, Professional and Consulting Services.
 2. Environmental quality testing services shall be selected on an as-needed basis.
A pool of qualified environmental testing laboratories shall be selected by Request for Qualifications process in conjunction with a school bond.
- C. Scope of services:
1. Investigation of hazardous materials shall include the following, but not limited to:
 2. Asbestos
 - a. Asbestos consulting activities--Consulting activities in public buildings include: the designing of asbestos abatement projects; the survey for asbestos-containing building materials; the evaluation and selection of appropriate asbestos abatement methods and project layout; the preparation of plans, specifications and contract documents; the review of environmental controls and abatement procedures for personal protection that are to be employed every day of the asbestos abatement activity, from the start through the completion dates of the project; the design of air monitoring of the project; any survey, management planning, air monitoring, or project management performed by or for the consultant or consulting agency; consultation regarding compliance with various regulations and standards; recommending abatement options; and representing the consultant agency or consultant in obtaining consulting work.
 3. Mold
 - a. Mold assessment - Activity that involves:
 - i. an inspection, investigation, or survey of a dwelling or other structure to provide the owner or occupant with information regarding the presence, identification, or evaluation of mold;
 - ii. the development of a mold management plan or mold remediation protocol; or
 - iii. the collection or analysis of a mold sample.
 4. Lead Paint
 - a. Any *lead-based paint inspection* conducted in target housing or child-occupied facilities must be conducted by a certified Lead Inspector or Risk Assessor in accordance with the TELRR. A lead-based paint inspection is a *surface-by-surface* investigation using approved documented methodologies to determine the presence of lead-based paint in these facilities. If only an *assumption* is made that lead-based paint may be present (*no testing or sampling conducted*), a certified Inspector or Risk Assessor is not required. Paint-chip collection and/or XRF (X-ray fluorescence) analysis are common ways to determine the presence of lead-based paint while chemical test wipe (*swab*) kits are *not* an approved method as they give inaccurate results for TELRR purposes. Paint-chip, soil, or dust samples must be sent to an *EPA-Recognized Laboratory (accredited through the National Lead Laboratory Accreditation Program - NLLAP)* for analysis to determine the

presence of any lead in the sample. To inquire about these EPA-recognized laboratories, call the National Lead Information Center toll-free at (800) 424-LEAD or view the current listing at the EPA website <http://www.epa.gov/lead/pubs/nllaplist.pdf>.

- b. A *written* lead inspection report must be developed by the certified Lead Inspector or Risk Assessor that includes the information specified in Section 295.212(a)(4) of the TELRR, such as, among other things, the date of inspection, address of building sampled, specific locations (building components) tested for lead-based paint, and copies of all lab analysis reports and downloaded XRF data.

0.07 Standards for District Systems

- A. All access controls are to be coordinated with Ysleta ISD approved access control vendor. Owner and Architect shall meet at the start of Construction Documents for the purpose of coordinating these requirements. Refer to Division 28 of the TDS for additional information.
- B. All energy management systems shall be coordinated with district standards and controls. Owner and Architect shall meet at the start of Construction Documents for the purpose of coordinating these requirements. Refer to Appendix C & D of the TDS for additional information.
- C. All surveillance systems shall be coordinated with Ysleta ISD approved access control vendor. Owner and Architect shall meet at the start of Construction Documents for the purpose of coordinating these requirements. Refer to Division 28 of the TDS for additional information.

0.08 Meetings

- A. **NOTICE TO PROCEED MEETINGS:** At the Notice to Proceed meeting the following shall be decided as a minimum:
 - 1. Process for providing construction documents to the public.
 - 2. Required deposits and return of checks and specifications.
 - 3. Communication at the pre-solicitation meeting (if applicable).
 - 4. Timeline for Addenda.
 - 5. Timeline for last day for questions.
 - 6. Communication throughout the CSP bond/construction solicitation.
- B. **REVIEW MEETINGS**
 - 1. Weekly or bi-weekly meetings with YISD and project team during schematic design & design development.
 - 2. Coordination meeting at the beginning of the construction document phase with YISD Access Controls and YISD Safety and Security representatives.
 - 3. Construction Document review at 50%, 90%, and 100%, with YISD Facilities Coordinator and YISD Construction Coordinator. YISD Security representative and YISD Access Control representatives to be included at 50%.
 - 4. Coordination meeting during design development with YISD Construction Coordinator to establish locations of all power and data.
- C. **DOCUMENT SETS FOR MEETINGS**
 - 1. At each CD' review point, provide E1 (30" x 42") size .pdf files of the drawing sets to the relevant parties four days in advance of the meeting. Architect is responsible for bringing appropriate printed material to the review meeting.
 - 2. 100% CD's need to be posted w/ ALL addendum and city review comments.
 - 3. Digital Copy of 100% CD's

0.09 Construction Document Standards

A. Drawing Standards:

1. Drawings shall be produced using a current CADD software program which can export and import to AutoCAD's current version at a minimum. BIM software is required for projects for new projects and additions over 25,000 s.f.
2. Drawings must include the following:
 - a. Full floor plan at minimum scale of $1/8" = 1'-0"$
 - b. Site plan at minimum scale of $1" = 40'-0"$ (projects with no sitework)
 - c. Site plan at minimum scale of $1/16" = 1'-0"$ (projects with sitework)
 - d. Enlarged partial plans at minimum scale of $1/4" = 1'-0"$ (renovated interior spaces)
 - e. Exterior elevations at a minimum scale of $1/8" = 1'-0"$
 - f. Interior elevations at a minimum scale of $1/8" = 1'-0"$
 - g. Details at a minimum scale of $1" = 1'-0"$
 - h. Door, Hardware, Window, Finish, and Signage Schedules

B. Specification Standards

1. Specifications should be produced in a word processing format that can export and import Microsoft Word's latest version.
2. Architects and Engineers must follow the Construction Specifications Institute (CSI) MasterFormat CSIMasterFormat 2004-2011. Division 0 and 1 "front-end" specification sections will be per the templates provided by the District during the Construction Documents phase. For more information, contact:

Adrian K. Stresow, P.E.
Program Director
Bond Department
Ysleta Independent School District,
9600 Sims Dr
El Paso TX 79925
astresow@yisd.net

C. Miscellaneous

1. Spreadsheets should be produced in a format that can export and import Microsoft Excel's latest version.
2. Electronic documents shall be transmitted in the latest version of Adobe, unless the original editable format is necessary.

0.10 Design Submittals

The following is an overview of the design submittals required of the A/E team at each design phase, subject to the requirements stipulated in the A/E's agreement with the District. Note that the District may choose to combine phases for certain projects, and the A/E should confirm the District's desired design process model, schedule, and deliverables at the initiation of each project. Each Architect shall provide a letter stating that these District Design Guidelines and Standards have been read and understood prior to starting the project. Written confirmation of submittal completion from the District is required before moving on to the next phase. See Appendix Design Submittals for more comprehensive and detailed requirements of each deliverable:

- A. Project Assessment: A bound, written and graphic document providing:
 - 1. The A/E's comprehensive evaluation of the existing site conditions, building envelope and infrastructure, including but not limited to structural, MEP, and fire/life safety systems; program, accessibility features, perceived deficiencies, and conceptual solutions and recommendations for improvements.
 - 2. Graphic information with photographs of existing conditions and drawings of proposed solutions, including concept site and building plans.
 - 3. Project assessment maybe combined with schematic design phase for some projects.
- B. Schematic Design:
 - 1. The Schematic Design Documents shall consist of drawings and other documents including a site plan, if appropriate, and preliminary building plans, sections and elevations; and may include some combination of study models, perspective sketches, or digital modeling. Preliminary selections of major building systems and construction materials shall be noted on the drawings or described in writing.
 - 2. Schematic cost estimate, that may include some items as square foot costs.
- C. Design Development:
 - 1. The Design Development Documents shall illustrate and describe the development of the approved Schematic Design Documents and shall consist of drawings and other documents including plans, sections, elevations, typical construction details, and diagrammatic layouts of building systems to fix and describe the size and character of the Project as to architectural, structural, mechanical and electrical systems, and such other elements as may be appropriate. Interior and exterior elevations, building sections; door, window, hardware, finish, and signage schedules; details.
 - 2. The Design Development Documents shall also include outline specifications that identify major materials and systems and establish in general their quality levels.
 - 3. The Design Development package shall be submitted in two components:
 - a. Sign off portion to include:
 - i. site plan
 - ii. plans
 - iii. elevations
 - iv. building sections
 - v. renderings
 - vi. preliminary color board
 - 4. Additional detailed information as outlined above.
- D. Interim Construction Documents (for example, 50% or 75% CD's, per the A/E's agreement with the District):
 - 1. Construction documents: site, floor, demolition, reflected ceiling, and roof plans for all disciplines.

2. Architectural interior and exterior elevations, building sections; door, window, hardware, finish, and signage schedules; details.
 3. Comprehensive 3-part technical specifications for all products and systems.
 4. Final color and materials board – sign off by YISD representative.
 5. When applicable, an updated cost estimate.
- E. 100% Construction Documents: Submit design drawings after incorporating District and any District consultant/peer review comments on the interim CD submittal. These drawings and specifications are for review, input, and approval from the District prior to the City of El Paso drawing submittal, back check, approval, and bidding. Documents submitted to the City of El Paso are required to meet the standard of being “buildable” and “biddable.”
1. Comprehensive and fully coordinated construction document site, floor, demolition, reflected ceiling, and roof plans for all disciplines.
 2. Fully annotated and coordinated interior and exterior elevations, building sections; door, window, hardware, finish, signage schedules, details and integration of colors and materials.
 3. Project manual with comprehensive, thoroughly complete 3-part technical specifications for all products and systems. Division 0 and 1 “front-end” specifications shall not be included in the project manual, including but not limited to the following sections:
 - a. 00001 Project Title and Signature Page
 - b. 00008 Deferred Approvals
 - c. 00009 Testing and Inspection Sheet
 - d. 00010 Table of Contents
 4. Copies of Drawings and Specifications Furnished to Requesting Offerors:
 5. (1) electronic copy of the Drawings and Specifications to Purchasing Department
 6. (1) electronic copy of the Drawings and Specifications to the Facilities & Construction Department
 7. (1) electronic copy of the drawings and specifications will be provided directly to a reprographic vendor of District choice to facilitate hard copy distribution to offerors upon request.
 8. (1) electronic copy of the Drawings and Specifications to each prospective General Contractor. Copies, including electronic files, will not be sent directly to subcontractors.
- F. Bid Set: City of El Paso Planning and Inspections Department approved set incorporating all back check comments and final District constructability review comments:
1. Comprehensive and fully coordinated construction document site, floor, demolition, reflected ceiling, and roof plans for all disciplines.
 2. Fully annotated and coordinated interior and exterior elevations, building sections; door, window, hardware, finish, and signage schedules; details.
 3. Approved project manual with the addition of Division 0 and 1 “front-end” specifications, including color construction phasing plans. Equipment cut sheets provided separately shall not be included in the bid set.
 4. Addendum may need to be issued during the bidding process. The addendum should be formatted on letter size or tabloid size paper whenever possible. All addendum items should be communicated to the Bond Office PM prior to formalizing. Once completed, the addendum will be transmitted to the District Purchasing Department thru Bond Office PM who will then issue it for distribution to the plan holders.
- G. For documents required during construction (Change Orders (CO), Requests For Information (RFI), material submittals, etc.), documents required after completion of the project (warranties, guarantees, training manuals, record documents, etc.), and the number of copies to be submitted at each phase, coordinate with the Bond Office.
- H. Written approval by the YISD Operations Department and VLK is needed to deviate from these standards.

0.11 Construction Cost Estimate

- A. The construction estimate shall be in CSIMasterFormat 2004-2011 format utilizing Microsoft Excel spreadsheet software. The estimate shall be itemized listing all materials, quantities, labor, equipment, and considerations for administrative costs such as bonds, insurance, contingencies, and escalation. Include a summary page that reflects the use of allowances and alternates (deductive or additive).
- B. Provide an estimate format that parallels and provides a level of detail equal to the CSI division format of the A/E specifications. Do not group the headings to reduce the length of the estimate unless it is appropriate to the scope of the Work.

0.12 Project Record Documents

1.1 SUMMARY

- A. Section Includes: Maintenance and submittal of record documents and samples.
- B. Related Requirements:
 - 1. General Conditions of the Contract for Construction: Documents at the site.
 - 2. Section 01 33 23 - Shop Drawings, Product Data, and Samples.
 - 3. Section 01 77 00 - Closeout Procedures.
 - 4. Section 01 78 23 - Operation and Maintenance Data.
 - 5. Individual Specifications Sections: Manufacturer's certificates and certificates of inspection.

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. In addition to requirements in General Conditions, maintain at the site for Owner one record copy of:
 - 1. Contract drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change orders and other modifications to the contract.
 - 5. Reviewed shop drawings, product data, and samples.
 - 6. Field test records.
 - 7. Inspection certificates.
 - 8. Manufacturer's certificates.
- B. Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.
- C. Label and file record documents and samples in accordance with section number listings in table of contents of this project manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- D. Maintain record documents in a clean, dry and legible condition. Do not use record documents for construction purposes.
- E. Keep record documents and samples available for inspection by Architect.

1.3 RECORDING

- A. Record information on a set of opaque drawings, and in a copy of a project manual. All changes made in these drawings in connection with the final construction and installation shall be neatly made in red ink on the prints.
- B. Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.
- C. Contractor shall include with the record documents, all changes and modifications made by addenda, change orders, supplementary instructions, or other forms of documentation, written or verbal, which alter the documents.
- D. Record information concurrently with construction progress. Do not conceal any work until required information is recorded.
- E. Contract drawings and shop drawings: Legibly mark each item on the drawings to record actual construction, including:
 - 1. Measured depths of elements of foundation in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
 - 4. Field changes of dimension and detail.
 - 5. Changes made by addenda and modifications.
 - 6. Details not on original contract drawings.
 - 7. References to related shop drawings and modifications.
- F. Specifications: Legibly mark each item in the specifications to record actual construction, including:
 - 1. Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.
 - 2. Changes made by addenda and modifications.
- G. Other Documents: Maintain manufacturer's certifications, inspection certifications, field test records, and other documents required by individual specifications sections.
- H. Maintain these documents to reflect the current conditions of the work. Changes shall be reviewed on a monthly basis with the Architect's representative. The Contractor's updating of the "installed condition drawings" shall be a prerequisite to the monthly review of the Contractor's payment request by the Architect's representative.

1.4 SUBMITTALS

- A. At contract closeout, deliver record documents and samples under provisions of SECTION 01 77 00 - CLOSEOUT PROCEDURES.
- B. Transmit with cover letter in duplicate, listing:
 - 1. Date.
 - 2. Project title and number.
 - 3. Contractor's name, address, and telephone number.
 - 4. Number and title of each record document.
 - 5. Signature of Contractor or authorized representative.

0.13 Spare Parts and Maintenance Manuals

- A. Coordinate with YISD Warehouse regarding instructions for delivery, inventory and sign off.
- B. Minimum spare items required:
 1. FINISH CARPENTRY – Provide 4 sheets of each millwork plastic laminate color(s).
 2. WATER REPELLENTS - Provide two gallons of coating.
 3. EXPANSION JOINT COVER ASSEMBLIES - Provide 25% overage of resilient joint filler, and special tools required for servicing components.
 4. CERAMIC TILING - Upon completion of work, deliver to the project site one box for each type, color, pattern, and size of ceramic tile installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.
 5. TILING - Upon completion of work, deliver to the project site one box for each type, color, pattern, and size of quarry tile [and quarry tile sill] installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.
 6. ACOUSTICAL CEILINGS - Upon completion of work, deliver maintenance materials to the project site, packaged with protective covering for storage and identified with appropriate labels. Furnish two boxes of full-size acoustical ceiling units of each type installed.
 7. STAGE FLOORING SYSTEM - Provide 5% spare 4'-0" x 8'-0" panels of tempered hardboard to the Owner for future replacement. Spare panels are to be painted and neatly stacked on a 2 x 4 frame supporting the pieces 24" o.c. both directions. Cover spare panels with a plastic drop cloth.
 8. RESILIENT FLOORING - Upon completion of work, deliver to the project site not less than one box for each 50 boxes or fraction thereof, for each type, color, pattern, and size installed. Furnish maintenance materials from same manufactured lot as materials installed and enclose in protective packaging with appropriate identifying labels.
 9. ATHLETIC RUBBER FLOORING – Provide additional amount of approximately 2% of the total floor surface of each type and color.
 10. CARPETING - Upon completion of work, deliver to the project site not less than 12 sq. yds. of each type, color, and pattern of carpet, exclusive of materials required to properly complete installation. Furnish maintenance materials from same production run as materials installed. Package maintenance materials with protective covering, identified with appropriate labels. Other remnants, usable scraps, and overage in carpeting shall be packaged in appropriate wrapping, labeled, and delivered to the Owner.
 11. VINYL-COATED FABRIC WALL COVERING - Upon completion of work, deliver to project site not less than 6 linear yards of each type, color, and pattern of vinyl wall covering installed. Furnish maintenance materials from same production run as materials installed. Other remnants, usable scraps, and overage in wall covering shall be packaged in appropriate wrapping, labeled, and delivered to the Owner.
 12. PAINTING - Upon completion of the work, deliver to project site 2 gallons of each type and color of paint applied to interior and exterior surfaces. Provide formula for custom match colors.
 13. MANUFACTURED PLASTIC-LAMINATE-CLAD CASEWORK – Provide the following:
 - a. sheets of each casework plastic laminate color(s).
 - b. 2 rolls of each edge banding color(s) provided on project.
 14. TELESCOPING AND FIXED BLEACHERS - Provide a 1% Attic Stock, or at least one unit of each style/type and size of seat.
 15. LIGHTING CONTROL DEVICES – Provide 10% spare sensors and switch packs of each type used on the project and deliver spares to Ysleta ISD at completion of project.
- C. Staff training on equipment operation and maintenance is required. Where possible, training to be provided by the manufacturer with written and video support.

Division 01 - General Requirements

1.01 Local Jurisdictions

City of El Paso

Planning Department	915-212-0104
Building Inspections and Plan Review	915-212-0104
Building Codes and Information	915-212-0104
Historic Overlay	915-212-1567
Fire	915-485-5611
Transportation	915-212-0118

County

Health	915-543-3640
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Utility

Electricity	El Paso Electric	915-543-5970	
Gas	Texas Gas	800-700-2443	
Water	El Paso Water Utilities	915-594-5500	
Phone	Time Warner	855-370-5884	
Waste	El Paso Disposal	915-772-7495	cust5110@wcnx.org
Recycling	Friedman	915-792-9300	
Underground Utility Locator		811	

State

TxDOT	915-849-5550	Richard Romero, East El Paso Engineer
TDLR	Note: all registration must be done through a Registered Accessibility Specialist	
Elevators	cs.elevators.escalators@tdlr.texas.org	
Boilers	800-722-7843	boilers@tdlr.texas.gov

1.02 Purpose and Codes

- A. The purpose of this document is to assist the Architect/Engineer in the planning, design, and administration of construction projects for which the Architect/Engineer has been commissioned by the Ysleta Independent School District (YISD).
- B. Unless noted otherwise herein or in the YISD-Architect/Engineer Agreement, the scope of each phase of the work and the recommended procedures and practices of the Architect/Engineer during performance of the work shall be provided as published in the latest edition of the following documents: The Architect's Handbook of Professional Practice, The American Institute of Architects Manual of Practice, The Construction Specifications Institute. Uniform Drawing System, The Construction Specifications Institute.
- C. These Design Standards are to be coordinated with and used in conjunction with all applicable codes and ordinances. All YISD projects shall be designed in compliance with the provisions as applicable:
 - 1. International Building Code, as amended by the City of El Paso
 - 2. International Plumbing Code, as amended by the City of El Paso
 - 3. International Mechanical Code, as amended by the City of El Paso
 - 4. International Fire Code, as amended by the City of El Paso
 - 5. International Energy Code, as amended by the City of El Paso
 - 6. National Electrical Code, as amended by the City of El Paso
 - 7. Texas Accessibility Standards (TAS)
 - 8. El Paso County Public Health Department Standards
 - 9. Texas Boiler Code
 - 10. ASHRAE 90A
 - 11. Texas Education Agency (TEA) - School Facility Standards for New Construction
 - 12. Universal Design
 - 13. Crime Prevention through Environmental Design (CPTED)
 - 14. Smart Growth for El Paso
 - 15. City of El Paso Zoning Ordinance
 - 16. City of El Paso Sign Ordinance

1.03 Schedule and Activities

- A. The Architect/Engineer shall schedule all activities to comply with the approved project schedule. Allow sufficient time to complete each task and submit to YISD for review. Schedule activities with consideration for review time and response time in acquiring approval for each project phase.
- B. Phasing of services shall be determined by the Architect/Engineer and YISD immediately after selection of the Architect/Engineer. Key events shall commence with program review and end with YISD's acceptance of the completed project. Due to the unique nature of predefined periods of occupancy of school facilities, it is mandatory that the Architect/Engineer cooperate with YISD in establishing a schedule of services and activities that minimize disruption to educational programs. As an example, it is not practical for extensive internal remodeling to occur in a facility during educational sessions without carefully planning for the attendant disruptions. Additionally, it is not desirable to complete a facility out of sequence with YISD semester periods and have the building remain vacant for an extended period of time.

*Program manager will provide a detailed schedule and deliverable information in Architect/Engineer contract.

1.04 Critical Site Information

- A. Determine if the property is properly platted and zoned. If platting or zoning is improper, notify YISD to allow for this work to occur in conjunction with the topographic survey. Architect / Engineer to be familiar with El Paso Stormwater Large Construction project standards and their requirements. Where possible, projects on larger campuses should explore whether the activities are or can be grandfathered.
- B. If no topographic survey exists, notify YISD in a timely manner to initiate acquisition. Specifically request any unusual site data required for the project.
- C. After new facilities have been “sited,” work in conjunction with the geotechnical engineer to provide a base site drawing locating all required test borings. Once complete, request that YISD procure geotechnical investigations.
- D. All site and geotechnical data will be provided to the Architect/Engineer by YISD. In order to assure that project schedules will be met, the Architect/Engineer shall initiate request for this data at outset of project. The Architect/Engineer shall cooperate with YISD and provide required documentation to facilitate contracting for these services at the earliest possible date and shall periodically review the status of required services with YISD to prevent potential delays.
- E. If required, an Environmental Survey Assessment (ESA) shall be furnished by YISD.

1.05 Architectural Considerations

- A. Program Review: The Architect/Engineer shall review the program prepared by YISD in relation to the following listed criteria. The Architect/Engineer shall report any discrepancies or incomplete data to YISD as soon as practicable and prior to commencing the Schematic Design Phase.
 - 1. Interrelationships/Adjacencies of all program components
 - 2. Coordination of new program components with existing to ensure a cohesive and effective design solution.
 - 3. New square foot efficiency of existing or planned facilities, i.e., compare recommended program area to actual area required.
 - 4. Analysis of existing/functional facility requirements by teachers and students during addition and renovation work to provide uninterrupted campus operation.
 - 5. Outline potential problem areas in existing buildings which need attention and list in order of priority. In addition to deficiencies identified by YISD, the Architect/Engineer shall identify deficiencies in existing buildings/sites and record to YISD a prioritized list of potential remedial work.
 - 6. Determine historical value of existing structure (if renovation/addition project) and assess the need for preservation.
- B. On projects where a great deal of renovation or addition to an existing project is part of the program, the Architect/Engineer is responsible for verifying the adequacy of existing building plans furnished by YISD. If plans are not adequate, notify YISD. Architect/Engineer to ‘field verify’ existing conditions.
- C. In general, allowances shall not be considered as part of the contract or estimate. If there is a special case, the Architect/Engineer shall submit, on a per project basis, any inclusion of allowances that it recommends be introduced into the Contract Documents.

- D. It is expected that the architect will engage a commercial kitchen consultant to be included in the Architect's fee as part of the consultant group except where specifically relieved by Owner's written direction.

*Program manager will provide a detailed schedule and deliverable information in Architect/Engineer contract. Division 01

1.06 Structural Considerations

- A. The structural design should consider simplicity, economy of construction and buildability. Innovative structural designs or methods of construction may be considered only when the end product is suitable for use in schools and the cost is comparable to traditional structural systems.
- B. The building structure should allow for flexibility e.g. future change of function of rooms.

1.07 Mechanical Considerations

- A. The Mechanical engineering installation comprises heating, ventilation, water, soils and wastes, and fire protection services. Among other considerations, the mechanical design must take into account the site microclimate, the building form and orientation of spaces, the thermal performance characteristics of the building, the occupancy trends and restrictions on pollutant emissions.
- B. Thermal insulation standards shall meet or exceed the applicable codes but shall also be considered in the context of the balance of heat loss and gain so as to minimize operational costs while maintaining comfort conditions.
- C. The use of passive energy measures to achieve a comfortable internal environment should be employed where possible. Coordinate the form of the building with the Architect to minimize energy consumption, e.g. maximize use of natural ventilation and day-light and minimize heat losses.
- D. In determining the way in which a room is ventilated, consider performance and comfort levels, acoustic factors, safety, ease of operation, conformance with current codes and maintenance factors.
- E. Airtightness is a major factor in controlling heat loss due to unwanted air infiltration into buildings. Attention to construction detail and proper supervision of the work are necessary in achieving this goal.
- F. Verify that toilets are ventilated by natural permanent ventilation means. In addition, changing areas and toilets shall be mechanically ventilated. A permanent natural vent to the exterior, either directly or ducted should be provided.
- G. Provide for afterhours operation of certain areas as identified by Owner.

1.08 Electrical Considerations

- A. The Electrical engineering installation comprises electrical supply, electricity main distribution, power distribution services, lighting services, communication services, transport services and protective services.
- B. An integrated design approach should provide opportunities for energy efficiency. The design team should be aware that energy efficiency strategies can support each other or can conflict, and thus individual measures should not be considered in isolation.

- C. In order to provide natural lighting, review the site, plan form, orientation, passive ventilation and passive solar strategies, and day lighting opportunities.
- D. Verify that all teaching spaces and habitable rooms have natural daylight as the principal source of light. Artificial lighting shall be used to supplement the available daylight in accordance with standards.
- E. Coordinate the geometry and distribution of glazed areas with the goal to provide a high level of natural light while avoiding glare and ensuring a good quality day-lighting distribution in the room.
- F. If provided, windows in Computer rooms shall be designed as “wide and low” rather than “narrow and high” to minimize the area of bright, visible sky. For security reasons, they must be placed higher on the wall.

1.09 Acoustical Considerations

- A. A good acoustic performance improves the quality of the learning environment. Noise producing and noise sensitive spaces shall be located, designed and detailed so as to minimize noise interference between them.
 - 1. Sound Quality Considerations
 - a. Control excessive reverberation
 - b. Eliminate or minimize echoes
 - c. Shape rooms to create uniform sound field in audience areas
 - 2. Sound Isolation Considerations
 - a. Separate noisy and quiet spaces
 - b. Control noise transfer from noisy spaces
 - c. Provide adequate speech privacy
 - d. Isolate from exterior noise
 - e. Isolate impact noise
 - 3. Equipment Noise and Vibration Considerations
 - a. Locate mechanical equipment with acoustical considerations
 - b. Specify noise emissions of equipment
 - c. Provide adequate vibration isolation. All equipment with moving parts will need to be isolated from the building structure to avoid vibration transfer.

1.10 Miscellaneous Design Considerations

- A. All solicitations and contracting for testing laboratory services shall be furnished by YISD. Carefully review specified Contractor testing procedures with YISD to prevent duplication of services.
- B. The Architect/Engineer shall establish additive or deductive alternates as a means of bringing the proposed project budget at least 5% under its estimated construction cost. These alternates shall be reviewed and approved by YISD.

1.11 Site Design Requirements

- A. The Architect/Engineer shall visit the site with a YISD representative and review and document existing conditions. The following listed items are to be considered in both new and existing construction conditions. Existing facilities may limit or prohibit full implementation of these items.

1. Consider traffic patterns, staging areas, student drop-off and pick-up from cars and buses, parking areas, safety of children while crossing streets or drives, and convenient access to office entry.
2. Preserve existing trees and shrubs (consider City of El Paso Landscape Ordinance requirements).
3. Provide adequate service and staff parking.
4. Consider topography and existing drainage structures, creeks, swells, etc.
5. Consider existing easements, building lines, parking encroachments, communications, and electrical, utility, or gas/oil transmission lines.
6. Locate Contractor's site access points, work area, and staging area.
7. Locate existing structures, their size, and if they are portable or permanent.

1.12 Sustainability

Ysleta ISD strives to provide the best atmosphere for learning and growth. We also have an integral partnership with the community, which not only charges us to be good stewards of taxpayers' money, but to also work in concert with others for a better world. Green, sustainable, high performance, and energy efficient are all terms used to express an environmentally friendly approach to design and construction. This is a general overview of how the district is looking towards making our buildings more sustainable, hence reducing overall operating costs and providing a positive, healthier working and learning environment.

The district's goal is as follows:

To provide a positive impact on the health and environment of all Ysleta ISD students and employees; to reduce operating costs, enhance building and organizational atmospheres, potentially increase occupant productivity and help to provide a healthier and more effective learning environment.

1.13 Safety and Security

- A. The criteria set forth in this section are to be taken merely as considerations during the design process and shall not override local building codes or Texas Administration Code Title 19, Chapter 61, Subchapter CC.
- B. The design team must stay abreast of the latest development in the area of safety and security of school buildings and work in coordination with the District and local law enforcement to incorporate features intended to improve the health, safety and security of all occupants.
- C. The design team must include in the design all current regulations relating to safety, health and welfare. In particular, the team members must both individually and collectively identify, at all stages of the design process, any hazards that the design or the facility may present during construction and subsequent use and maintenance. Where possible, the hazards should be eliminated, or the risk reduced. Any outstanding risks, together with any design assumptions, must be provided to the District so that they can be dealt with in the School's Safety and Health Plan.
- D. The Design Team should anticipate any potential danger to the school occupants and visitors as a result of work taking place near to, or within areas where educational activities are conducted, and seek to eliminate those hazards or reduce the risk through design, choice of location, phasing, programming of works, etc. In particular the arrangements for safe entry and egress of building construction traffic during construction and the staging area should be considered. The approved phasing plan must be submitted with the construction documents for final validation by the Contractor.

E. Resources

1. Web Links
 - a. Texas School Safety Center
 - b. National School Safety Center
 - c. Crime Prevention Through Environmental Design (CPTED)
 - d. National Institute of Crime Prevention (NICP)
 - e. American Crime Prevention Institute (ACPI)
 - f. National Alliance for Safe Schools
 - g. Keep School Safe
2. In Print
 - a. AIA Guide - Security and Design
 - b. Building Security - Barbara A. Nadel, FAIA
 - c. Let None Learn in Fear - Michael Dorn
 - d. Texas Senate Bill 11
 - e. Security Design Considerations for Instructional Facilities

F. Site Design

1. The designer shall consider the three layers of defense for the building.
 - a. First layer – location and understanding behaviors of physical context. Buildings & businesses located outside of site perimeter are of particular concern.
 - b. Second layer – Pertains to the space between site perimeter and building. Considers location of building on site and natural resources that provide protection. Design of access points, parking, roadways, pedestrian walks, lighting and signage are of importance.
 - c. Third layer – Pertains to protection of building itself. Consider design and location of utilities, mechanical systems, and surveillance equipment.
2. Proper site perimeter sets a pleasant first impression, is welcoming but controlled. Provide a buffer between the perimeter and building. Fences and gates should be considered. Provide site restriction during school hours. Access points should be minimized.
3. Overall campus should have maximum visibility from within the building. Provide shallow porches appropriate landscaping and open canopies to eliminate hiding places. At vehicular circulation points provide concrete barriers, benches, bollards or landscaping as a barrier.
4. Site entrances should be limited and controlled. Parent and bus drop-off should be separate, distinct, and well-marked with clearly defined areas of pedestrian circulation. Special needs drop-off areas should be protected from traffic flow to allow for prolonged loading. On-site queuing allows students ease of access to parents.
5. Site lighting should be provided at parking and pedestrian routes to reinforce after-hour visibility. Sidewalks are designed to support peak loads and reduce congestion.
6. Design playgrounds to allow visual surveillance by neighbors and police patrols. Provide transparent separation with fences. Site signage should mark the intended purpose of each entrance and post rules governing access.

G. Building Design - Exterior Considerations

1. Provide good illumination at the exterior of the building. Lighting should be continuous from dusk to dawn.
2. Building should be raised on site to improve visibility. Maximize windows for exterior surveillance. Control access to crawl space by installing grates.
3. Consider signage at access points designating main entry, cafeteria, gymnasium and auditorium. Number each building entrance to assist emergency responders. At entry points provide multiple points of visibility. Entrances should be designed so they are easy to recognize.
4. Consideration should be given to conduits and gas pipes that lead to the roof. Provide sheet metal cover to deter climbing. Refrain from low walls that can allow access to the roof.

5. Design to accommodate appropriate coverage of surveillance cameras, including, at a minimum, one at each egress.
- H. Building Design - Interior Considerations
1. Provide visibility to visitor parking and main entry from reception area. Consider the use of video surveillance for parent drop-off and bus drop-off.
 2. Provide a secure vestibule at the main entrance in which visitors must enter administration area prior to admission to school.
 3. Provide wide corridors that allow for increased visibility. Open stairs with see-through rails allow for ease of control. Avoid enclosed stairwells when possible.
 4. Design to accommodate appropriate coverage of surveillance cameras, including, at a minimum, full coverage of corridors, cross corridors and interior side egress doors.
- I. Construction Security
1. All employees of the general contractor and his subcontractors shall be badged. Temporary badges shall be issued by the general contractor for deliveries and other visitors.
 2. There shall be no interaction between students and faculty, and construction workers. Contractor shall take such reasonable means necessary, including construction fencing and interior dust partitions to separate the work and workers from the school.
 3. Architect / Engineer, General Contractor and Subcontractors must be compliant with Texas Senate Bill 9 which requires school district contractors (those who provide services to school districts) to obtain state and national criminal history background searches on their employees who will be on school district properties for any purpose whatsoever, and to receive those results through the Department of Public Safety criminal history clearinghouse FACT (Fingerprint-based Applicant Clearinghouse of Texas).

1.14 Space Numbering

- A. From the 50% Construction Document forward, drawings shall display the Construction Room Number and the Permanent Room Number for rooms. Do not assign Permanent Room Numbers to Restrooms, Mechanical Rooms, Electrical Closets or Custodial Closets. They should be labeled by function
- B. Rooms should be numbered according to the floor in which they are located.
 1. 1st floor rooms -100s, 2nd floor - 200s and so on. Basement level preceded by a B, such as B01.
 2. The first floor should be the level of the main entrance.
- C. The main administration office in each facility should be the start, and then a logical sequence proceeding down the corridors preferably in a clockwise fashion should follow.
 1. Even numbers on one side of a corridor and odd numbers on the other is good for organizing but may be hard to achieve.
- D. Numbered rooms opening from the corridor shall be considered main rooms. E.g.: Room 100. Small rooms contained within larger rooms can be considered a sub part of that room. They should be numbered 100A, 100B, 100C and so on corresponding to the room they are in.
- E. Additions should respect the numbering systems of the existing system.
- F. Room numbers should not change once established by the architect; all systems (fire alarm, public address, mechanical, electrical, plumbing, etc.) must use the same numbers and names.
- G. Number exterior exits prominently and sequentially to enable easy identification.

- H. Display street address number in conformance with El Paso Fire Department requirements, at a minimum.

1.15 Commissioning

Section to be developed by commissioning consultant.

1.16 TEA Certification of Compliance Form

The certifications specified in sections (A) – (E) of section (c) - (3) shall be gathered on the certification compliance form developed by the Texas Education Agency and submitted to the Program Manager.

1.17 Dedication Plaque

Provisions for the inclusion of a dedication plaque shall be included in the construction documents for each project. Plaque will be based on a template design and specification furnished by the YISD Project Liaison. A sufficient allowance may be used as a means of making provision for the plaque and shall be in compliance with YISD Policy.

END OF DIVISION 01

Division 02 - Existing Conditions

2.01 Project Conditions

- A. The design team shall field verify existing conditions to confirm the accuracy of any as-builts provided by YISD. This is to include verification of property lines and easements in accordance with the most recent survey and or plat. If an applicable survey or plat is not available or in the design team's opinion is out of date, the design team shall advise YISD of the need for a new topographic survey and or legal plat. YISD can require that updated drawings of existing conditions be submitted for YISD records and use.
- B. YISD will be continuously occupying portions of the existing building. A phasing plan should be developed in order for work to be carried out carefully and in an orderly manner to minimize interference with the daily operations and with adjacent portions of the structures to remain.
- C. It is essential that there be minimal interruptions of existing mechanical and electrical systems in addition to the normal operation of YISD's facilities. Phase existing utilities indicated to stay in service and protect against damage during demolition operations. Except when authorized in writing by YISD, existing utilities serving occupied or used facilities are not to be interrupted. Architect/Engineer shall note for Contractor to locate, disconnect, remove and cap designated utility lines within demolition areas or any locations where adjacent work is to be performed.
- D. Architect/Engineer shall consider location of existing trees on the site if an addition is planned. Design building to minimize the number of existing trees to be disturbed or removed.
- E. Architect/Engineer shall phase demolition operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities. Streets, walks, or other occupied or used facilities shall not be closed or obstructed without YISD's permission.
- F. Phase operations to prevent damage to adjacent buildings, structures, and other facilities.
- G. Architect/Engineer shall review existing drawings and survey (provided by YISD) for underground utilities where additions are being located. If utilities are located beneath the new addition, design of the building should include the relocation of existing utilities.
- H. The design team shall identify all items required to be temporarily removed, stored and reinstalled and or relocated as part of the project.

2.02 Design Phases

- A. Additions and Renovations
 - 1. YISD shall furnish an asbestos report to the Architect/Engineer.
 - 2. If electronic files of the existing building are available, YISD shall furnish them to the Architect/Engineer.
 - 3. Architect/Engineer shall perform a field investigation of the existing building.
 - 4. Architect/Engineer shall coordinate an ADA/TAS review of the existing building based on the proposed scope of the project.

2.03 Assessment

- A. Site Documentation: The Architect/Engineer shall document the site with photographs prior to construction. Photos are especially important for additions and renovation projects as they will allow before and after assessment at various stages of demolition and construction.
 - 1. Documentation should include overall assessment, evaluations, calculations, and photographs of the existing conditions, prior to commencement of the work.
 - 2. It is recommended that all disciplines participate in the site visit/survey(s) and documentation.
- B. Site analysis of surrounding site considerations that may impact design and cost of project development, including but not limited to: surrounding land uses, mass transit routes, and utilities, zoning ordinances, easements, aircraft flight patterns, flood hazards, wetlands, topography, and biological and other environmental considerations.
- C. Site analysis of on-site considerations that may impact design and cost of project development including but not limited to: Site access/circulation, ingress/egress by pedestrians (including persons with disabilities), passenger vehicles, delivery vehicles, emergency vehicles, and mass transit, if applicable as well as building access for fire apparatus, site security requirements, etc.
- D. Evaluate existing and proposed number of parking spaces, accessible parking spaces, and handicapped van parking spaces for surface and structured parking allotment as per City and State accessibility standards.
- E. Documentation of the local flooding potential and all other soil conditions.
- F. Investigation of the conditions and capacities of the existing storm water management system. Review of local, state, and federal storm water regulations, and third-party sustainability storm water design requirements, when required. Perform a preliminary drainage analysis of existing and proposed site conditions to assess potential options for storm water management strategies. Generally, locate areas where storm water storage facilities shall be, if needed.
- G. Identify all conditions that will influence project schedule, including:
 - 1. Site conditions that require mitigation
 - 2. Availability of utilities, roadways, etc.
 - 3. Approvals from regulatory agencies (historic, environmental, etc.)
 - 4. Platting of both developed and undeveloped property.
- H. The District's budget includes all onsite and off-site development costs incurred, including parking, curb cuts, drives, paved play areas, walks and sidewalks at the street, unloading zone, landscaping, and exterior furniture and equipment.
- I. The Architect/Engineer shall show concern for neighborhood scale, visual impact, aesthetics of proportion and color, good drainage, and the safety and comfort of the students.

2.04 Surveys

- A. Architect/Engineer shall consult the YISD for existing survey information regarding the project. If any additional boundary topographical survey work should be promptly requested by the Architect/Engineer. Refer to Survey procurement form.

2.05 Subsurface Investigations/Geotechnical

- A. If a building addition is planned, the Architect/Engineer shall promptly request a soil engineering investigation report and shall assist in suggested boring locations/quantities.
- B. Architect/Engineer site plans shall note YISD policy regarding underground utility locations.
- C. Engineer shall include the boring logs from the geotechnical report in the bidding and construction documents (as a section) of the specifications.
- D. The geotechnical design values and parameters used to design the foundations shall be enumerated on the structural drawings.
- E. Additional Geotechnical Considerations:
 - 1. Architect/Engineer shall take into consideration the effects of local soils.
 - 2. Architect/Engineer shall consider Geotechnical Engineer's Report when designing foundation.
 - 3. Regarding a building addition, the Architect/Engineer shall consider differential settlement between new construction and existing construction.

2.06 Hazardous Material and Abatement

- A. The design team shall specify that no asbestos containing material (ACM) is to be utilized on any YISD new construction.
- B. The design team shall specify that the General Contractor shall agree contractually to not utilize materials containing ACM and a letter of certification that no ACM was used shall be provided by the General Contractor at the end of the project.
- C. If during construction, any suspect ACM or other hazardous materials are encountered during field verification, demolition or construction, the Design Team and the General Contractor agree to contact YISD immediately and to not disturb those materials.

END OF DIVISION 02

Division 03 – Concrete

3.01 General Considerations

- A. All structures shall have their structural components designed by a structural engineer, licensed to practice in the State of Texas, and all structural drawings shall have the structural engineer's seal and signature affixed.
- B. It is not the intent of these guidelines to limit the ability of the design skills or of the design professional's expertise; however, structural designs other than conventional foundation and frame designs must be reviewed and approved by YISD. The use of proprietary or patented structural systems should be avoided.
- C. All concrete members shall be designed in accordance with the Building Code Requirements for Structural Concrete and Commentary ACI 318 – current edition adopted by the City of El Paso.
- D. If ACI Specifications conflict with local code, the local code shall govern.
- E. The preferred ground floor construction is slab-on-grade with continuous footings for walls, and spot footings for columns, in accordance with the geotechnical engineer investigation.
- F. Structural engineer, Architect, and Mechanical engineer should coordinate any special requirements to assure adequate support is provided for special conditions, and equipment loads shall be designed to resist impact or dynamic load characteristics.
- G. Test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- H. All concrete Work shall be performed in accordance with ACI 301 – Specifications for Structural Concrete Buildings.
 - 1. Comply with ACI 304 – Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - 2. Comply with ACI 305 - Specifications for Hot Weather Concreting.
 - 3. Comply with ACI 306 – Standard Specification for Cold Weather Concreting.
- I. Provide logs of geotechnical test borings in project specifications.

3.02 Geotechnical Investigations for Foundations

- A. The primary purpose of a sub-surface investigation for foundation design is to accomplish an engineering use of the in-place materials for the support of imposed structural loads (and to provide the contractor a guide on how achieve the required soil capacity).
- B. Sub-surface exploration for foundation design shall delineate the horizontal and vertical limits of the investigation and establish the engineering properties that will affect the foundation design.
- C. The spacing of borings, the establishment of boring depth, and the selection of engineering tests are the responsibility of the geotechnical engineer with consultation of the Architect/Engineer. These services must be provided by a geotechnical engineer licensed to practice in the State of Texas, and the report will have his or her seal.

3.03 Testing - By Owner

- A. All construction materials engineering services will be provided by a firm registered by the State of Texas to provide construction materials engineering services. The firm must comply with the requirements of ASTM E329 "Agencies Engaged in Construction Inspection and/or Testing." Services are to be provided under the direct supervision of a professional engineer as required by the State of Texas Engineering Practices Act.
- B. All concrete, soils, masonry, asphaltic concrete, structural steel, and other required services should be provided in accordance with the applicable ASTM and ACI standards as referenced in the project specifications.
- C. Structural and compliance testing required as Special Inspections under the latest IBC Code as amended by the City of El Paso shall be provided.

3.04 Structural Design Criteria Tabulation

- A. The following data shall be shown on the first sheet of the Structural Drawings:
 - 1. Note bearing strata for footings and/or piers, and allowable bearing capacities used for foundation design by engineer.
 - 2. If concrete frame, indicate design was prepared in accordance with the latest edition of ACI - 318.
 - 3. Indicate required 28-day concrete strength, in PSI, for each concrete member classification and any Special Inspection or Special Testing requirements.
 - 4. Indicate ASTM specification and grade of reinforcing used for design.
 - 5. Indicate ASTM specification and type of cement to be used in concrete mix designs. Also note type and maximum amount of fly ash allowed in concrete mixes.

3.05 Concrete Forming and Accessories

- A. Note all concrete beam and wall faces shall be formed full height each side. Earth forms shall not be permitted except at interior, unexposed faces of beams at slab-on-grade construction.
- B. Note to construct and maintain concrete formwork tolerances as required by ACI 347 – Recommended Practice for Concrete Formwork.
- C. Note corrugated fiberboard void forms shall be of a square shape and design. Trapezoidal shaped void forms shall not be used. These are only required if a suspended structural slab is designed.
- D. Note: for Slab-on-Grade, provide an approved Vapor Barrier System minimum 15 mil. thick. Install the vapor barrier per geotechnical requirements.

3.06 Concrete Reinforcing

- A. Reinforcing bars shall meet ASTM A615, Grade 60 deformed billet steel.
- B. Reinforcing fabric shall meet ASTM A185, Grade 65 welded steel wire fabric. Supply welded wire fabric in flat sheets, not in rolls.
- C. At slab-on-grade construction, provide reinforcing bolsters or chairs with sand plates where base material will not support chair legs.

3.07 Concrete Materials

- A. Portland Cement shall meet ASTM C150, Type I and Type II, unless job conditions or Work to be completed require alternate cement type.
- B. Chemical admixtures used in concrete mixes shall be selected per job conditions or Work requirements. Concrete mix designs shall be reviewed by the Engineer of Record.
- C. Fly ash shall be in accordance with ASTM C618, Type C or F. Fly ash may be substituted for up to a maximum of 25% by weight of cementitious material.
- D. Calcium chloride shall not be used.

3.08 Tilt-Up Concrete

- A. Provide Sandwich panels with a minimum thickness of 5 ½". Reinforcing bars shall meet ASTM A615, grade 60 deformed billet steel and Reinforcing fabric shall meet ASTM A185, grade 65 welded steel wire fabric provided in flat sheets, not rolls. Refer to "Concrete Work" for requirements. Minimum concrete strength for panels shall be 4000 psi.
- B. Erectors and construction firms should have a minimum of 5 years of experience in tilt-up panels similar in size and scope for the project. Interior & Exterior surface should receive a smooth troweled finish. Contractor shall provide a 4' x 6' mock-up showing the exterior smooth finish, reveals, joint configuration, interior troweled smooth finish, reinforcement, anchorage, lifting inserts and other accessories.

END OF DIVISION 03

Division 04 – Masonry

4.01 Architectural Considerations

- A. Face Brick: Select a minimum of two face brick samples for the project and submit samples with preferred selection to YISD for approval. Endeavor to select brick that is readily available from multiple sources to prevent delays and future color matching problems. Selection for renovation and addition projects shall match existing brick as closely as possible or provide compatible integration with existing materials. Specify face brick by manufacturer's name and number. Do not use an allowance.
 - 1. Face brick shall be grade SW, modular size. If addition / renovation, A/E shall match existing brick size.
 - 2. Provide brick dimensions that minimize brick cuts and waste. Dimensions shall allow brick to be cut in half so both pieces are used in the design. Small and irregular brick cuts are discouraged.
 - 3. EFFLORESCENCE Particular care must be taken in the selection of materials and in design and detailing of exterior walls to prevent efflorescence in brickwork. Certification shall be provided that brick and any masonry trim material have passed the "wick" test (ASTM C67).
 - 4. Mortar at face brick above grade to be Type N, and below grade to be Type M.
- B. Split face CMU, burnished block, cultured stone, and any other masonry exterior veneer shall be only be used upon written approved by YISD.
- C. Consider the use of sound absorbing CMU in Gymnasiums and Activity Rooms.
- D. Rock shall be native stone, fieldstone or quarried, free of loose or friable incisions.
- E. Exterior stucco is to be integrally colored and finished similar in color to paint finish coat with an appropriate elastomeric paint coat.
- F. Cast stone units are to be manufactured by a current producer in good standing of the Cast Stone Institute. Manufacturer shall be required to design and provide reinforcement and anchorage systems.
- G. Adhered masonry without cavity wall construction is not acceptable.
- H. For masonry veneer, provide adjustable anchors to allow for movement. Provide joints for expansion and contraction typically at inside and outside corners (within 5'-0"), offsets, and other changes in the wall plane, and at regular spacing (typically 20 to 30 feet on center, maximum). Refer to guidelines for expansion joint design/layout from the Brick Industry Association (BIA).
- I. Design veneer walls with a "drainage plane" to allow water that penetrates the wall to flow freely and drain through weep holes to the exterior. Provide cellular plastic weeps made from UV-resistant material and mortar net or equivalent cavity drainage material. The recommended cavity width behind the masonry veneer is 2 inches.
- J. Architect shall specify for full masonry mock-up, including all masonry at exterior veneer, mortar, sealant, and window assembly.
- K. Provide colored mortar for new facilities and additions. When patching, masonry mortar shall match existing.
- L. At brick veneer retaining walls and dumpster enclosures, or metal coping at top of wall.

- M. Apply anti-graffiti coatings on surface areas up to 8'-0" in height
- N. Dissimilar Masonry Veneer Materials
 - 1. A bond break material shall be provided between dissimilar masonry veneer materials, such as between clay brick, stone, cast stone and CMU courses.
- O. CMU single wythe exterior construction is not permitted.
- P. Detail the return of masonry veneer at all door and window jambs. Due to increase in wall thickness from continuous insulation requirements, standard 4 1/2" aluminum storefront does not span from back-up wall system to masonry veneer without returning the veneer.
- Q. Cavity Drainage Material
 - 1. Mortar dropping collection product made of recycled polyester or high-density polyethylene, with 90% open mesh weave, such as Mortar Net.
- R. Blended mortars such as SpecMix shall be acceptable alternatives.

4.02 Structural Considerations

- A. Structural masonry design shall be in accordance with Building Code Requirements and Specifications for Masonry Structures with Commentaries – latest edition.
- B. All cells containing reinforcing, bolts or other metal anchors shall be grouted solid.
- C. All cells at or below grade shall be grouted solid whether reinforced or not.
- D. Reinforcing bars shall meet ASTM A615, Grade 60 deformed billet steel.
- E. Masonry cement shall not be used in mortars.
- F. Provide Type 'S' mortar in accordance with ASTM C-270 for all exterior and interior load-bearing masonry construction.
- G. Reinforced masonry grout shall be in accordance with ASTM C-476.
- H. Where horizontal joint reinforcement is used, reinforcement shall be prefabricated and conform to ASTM A951, minimum 9 gage wire, galvanized.

END OF DIVISION 04

Division 05 – Metals

5.01 Structural Design Criteria Tabulation

- A. The following data shall be shown on the first sheet of the Structural Drawings:
 - 1. If steel frame, design was prepared in accordance with the latest edition of AISC Steel Construction Manual.
 - 2. All structural steel shall meet appropriate ASTM standard for strength and grade.
 - 3. Include yield strength for each steel member type used in design.
 - 4. All Structural Steel Inspection and Testing Requirements

5.02 General Considerations

- A. Structural steel design shall be in accordance with the AISC Steel Construction Manual – current edition adopted by the City of El Paso.
- B. Open-web steel joists and joist girders shall be designed and fabricated in accordance with the latest edition of the Steel Joist Institute.
- C. Bolted connections shall conform to the RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts – latest edition.
- D. All welded steel construction shall be noted to be in accordance with the latest edition of the ANSI/AWS D1.1 Structural Welding Code.
- E. Metal decking design shall in accordance with the Specifications of the Steel Deck Institute.
- F. Cold-formed metal framing shall conform to the latest edition of the AISI Specification for The Design of Cold-Formed Steel Structural Members.
- G. Design requirements for steel stair assemblies shall conform to the latest adopted building code by the City of El Paso.

5.03 Structural Steel

- A. Provide headed anchor rods, threaded at one end for nut attachment, for column anchor bolts. J-shaped anchor bolts shall not be used.
- B. Exterior steel members exposed to weather, including lintels, shall be Hot-dip galvanized and field painted.
- C. Note to provide a minimum of 2 bolts at bolted steel connections.

5.04 Metal Deck

- A. Provide galvanized metal deck at all steel roof and floor decking units. Galvanizing shall maintain a minimum coating class of G60.
- B. Note metal deck welding shall be in accordance with ANSI/AWS D1.3 Structural Welding Code – Sheet Steel. Use E60XX electrodes.
- C. Consider use of acoustical deck at Activity Rooms and Gymnasiums.

5.05 Cold-Formed Metal Framing

- A. Design of Cold-Formed Metal Framing shall be delegated design (responsibility of Contractor). Design criteria shall be specified by Architect's Structural Engineer to comply with applicable codes and project requirements.
- B. Exterior cold-formed metal stud framing shall be a minimum of 18 gage material thickness.
- C. Metal stud framing used as a back-up for brick veneer and Stucco shall be sized to limit lateral deflections to a maximum of $L/600$ at exterior conditions. Deflections shall be based on steel stud properties only.

5.06 Metal Stairs

- A. Design of metal stairs shall be delegated design (responsibility of Contractor). Design criteria shall be specified by Architect's Structural Engineer to comply with applicable codes and project requirements.
- B. Hot-dip galvanize after fabrication at exterior locations.

5.07 Metal Railings

- A. Design of all railings shall be delegated design (responsibility of Contractor). Design criteria shall be specified by Architect's Structural Engineer to comply with applicable codes and project requirements.
- B. Hot-dip galvanize after fabrication at exterior locations.

5.08 Metal Fabrications

- A. Hot-dip galvanize after fabrication where exposed to weather, in a wall cavity, or touching exterior masonry.

END OF DIVISION 05

Division 06 - Wood and Plastics

6.01 Rough Carpentry

- A. All composite wood products (particleboard, MDF, and hardwood plywood) must comply with current regulations on formaldehyde emissions.
- B. Pressure-preservatives are to be used on all wood in contact with concrete or masonry, exposed to the weather, or prone to insect attack, in conjunction with roofing, under parapet caps, vapor barriers and waterproofing – sills, sleepers, furring, blocking, and stripping).
- C. No wood products treated with (a) pentachlorophenol, (b) arsenic compounds, and/or (c) creosote shall be used in either interior occupied spaces or for exterior applications where there is a possibility of student contact. Borates are the preferred product if available.
- D. For exterior applications where students contact is not possible, wood treated with (a) pentachlorophenol, (b) arsenic and/or (c) creosote may be used; however, Borates are preferred product if available.
- E. Must be water-borne, inorganic type and comply with the limit on volatile organic compounds (VOCs) for wood preservatives of 350 grams/liter using EPA Test Method 24.
- F. Provide fire retardant treated wood as required by code. Provide Exterior Type fire retardant treatment complying with ASTM D 2898 for exterior locations. In addition, comply with ASTM D 5664 at exterior, high-temperature locations (such as enclosed roof framing, framing in attic spaces, etc.)

6.02 Finish Carpentry

- A. General:
 - 1. Millwork shall be designed as maintenance-free as possible. Countertops shall be plastic laminate over plywood substrate and stabilizing backing sheet. At wet areas and areas prone to moisture, use solid surface countertops. Cultured marble is not acceptable. All shelves shall be plywood with hardwood edges. For typical casework construction, utilize AWI Custom Grade fabrications, plastic laminate clad. Particleboard is prohibited in casework.
 - 2. Specialty woodwork is to be stain-finished and in accordance with AWI Premium Grade. Wood species as selected by the Architect.
 - 3. Fabricate casework stiles and rails of solid lumber, firmly secured to cabinet ends, partitions, and bottom. Partitions, vertical dividers, and shelves shall be solid plywood. All exposed surfaces shall be plastic laminate clad. Semi-exposed surfaces may be thermoplastic-faced plywood.
 - 4. Cabinet doors shall be lumber core plywood with solid edge bands, clad in plastic laminate. Thermo plastic facing is not acceptable on the interior side of cabinet doors. Door thickness shall be based on door size, but not less than 3/4". Door design and species shall match existing construction in renovation/addition projects. Drawer fronts shall be 3/4" lumber core plywood with solid edge bands, clad in plastic laminate. Side and backs shall be 1/2"-thick solid lumber, slightly rounded on top edge, dove-tailed or dado glued, and nailed in the drawer fronts. Allow for nominal 1/2" clearance between doors and drawer fronts for overlay construction.
 - 5. Shelves shall be a minimum of 3/4" thick lumber core plywood with thermoplastic faces and solid edge band. Shelves of 36" in length up to 48" should be 1-1/8" thick lumber core plywood

- with thermoplastic faces and solid edge band. Lower shelves should be the full depth of the cabinet. Upper shelf and open bookshelves shall be no less than 14" deep.
6. Typical hardware for casework shall include adjustable shelf standards routed into cabinet end walls, 75# capacity drawer slides, 4"-long wire door pulls, and heavy-concealed hinges or match existing hinges on renovations. Locks within anyone room shall match, except that teacher's cabinet shall be keyed differently. Elbow latches should be used on offset doors.
 7. Plastic laminate to be NEMA LD3, PF42 post forming, GP50, color and texture as selected.
 8. Locks shall be provided at teacher cabinets, clinics, special needs classrooms, collaboration areas, and offices.
 9. Fabricate wall-hung cabinets with nailing cleat built into back of wall-hung cabinets. In new construction, provide solid wood blocking (fire resistant where required) in walls to which cleat shall be attached. In existing construction, provide wood cleats on surface of wall to which cabinet shall be attached. Fabricate wall cabinets to allow for a minimum depth of 12" clear inside.
 10. Adjustable Shelf Supports: Shall be designed with metal pin anti tip-up shelf restraints for both 3/4" and 1-1/8" shelves. Design to include keel to retard shelf slide-off, and slot for ability to mechanically attach shelf to clip. Load rating to be minimum 300 lbs. each support without failure.
 11. Architect shall designate on the drawings for the contractor to provide a mock-up of the casework. The mock-up should represent a typical installation of casework with both base and upper cabinets. If acceptable to the architect, the mock-up may be installed as part of the project.
 12. Architect shall specify that the work be performed by a company licensed by the AWI Quality Certification Program. Certification shall be evidenced through the application of AWI Quality Certification labels and/or the issuance of an AWI letter of licensing for the project.
 13. Wood Base and Handrails: Shall be Maple solid lumber. Joints shall be accurately cut to provide a close, flush fit with no visible end grain.
 14. Tall cabinets and tall open shelf units shall either have a fixed intermediate shelf or shall have 1-1/2" thick side panels.
 15. Millwork shall be used only for custom furniture such as the reception desk. Casework shall be used for everything else.

END OF DIVISION 06

Division 07 - Thermal & Moisture Protection

7.01 Damp proofing

- A. Bituminous Damp proofing: At CMU backup and Tilt-wall backup with veneer, provide semi-mastic asphaltic emulsion reinforced with non-asbestos fibers. Products shall comply with ASTM D 1227, Type II.

7.02 Vapor Permeable Air/Moisture Barriers

- A. Acceptable System: Provide a sheet air retarder with air leakage of 0.06cfm/s.f. at 25 mph per ASTM E1677 Type I. Water Vapor Transmission of greater than 20 perms. Vapor Barriers should be avoided. It should have a minimum water penetration resistance of 200 cm in accordance with AATCC-127. Provide flashings, tapes, fasteners, etc. from same manufacturer as required for a complete system.
- B. Acceptable alternative: Fluid-applied vapor permeable membrane air barrier should be specified for use in cavity wall systems based on the type of rain screen material being provided. Such products should have certified air leakage and vapor permeance rates that exceed the requirements of ASTM E2178. All ancillary products for the system should come from a single manufacturer. If thru-wall flashings are specified in Division 4, it should be noted that they need to be supplied by the selected manufacturer of the vapor permeable membrane air barrier.
- C. On larger projects a mockup should be specified to include typical flashing associated with the vapor permeable membrane.

7.03 Self-adhering Sheet Waterproofing

- A. It is Ysleta ISD's preference that buildings should be designed with no soil placed above finished floor (basement condition). If it is determined by the Architect that the best design solution is to provide finished grade above finished floor, the design professional shall seek written approval from Ysleta ISD. If approval is granted, provide self-adhering membrane of rubber asphalt integrally bonded to polyethylene sheeting, formed into uniform flexible sheets not less than 56 mils thick. Provide drainage mat for a protection board over the membrane. Perforated pipe surrounded by gravel should be installed at base of membrane and tied into the storm sewer to collect ground water. The installation and extent of installation shall be in conformance with the geotechnical investigation recommendations.
- B. Provide termination bar with anchors at 6 inches on center along top edge of all waterproofing which should terminate below finished grades. Allow for some soil subsidence since below grade waterproofing membranes should not be exposed to sunlight.
- C. Prior to installing the drainage mat and prior to backfilling against the below grade waterproofing system, have the installed membrane inspected by the waterproofing membrane's technical representative and provide a written report.

7.04 Mechanical Room Floor Coating

- A. Provide an interior urethane elastomeric pedestrian traffic coating with silica sand evenly broadcasted. Architect should also consider the addition of concrete curbs and floor drains.

7.05 Water Repellents

- A. Water repellent coatings are required to achieve water resistance on brickwork subjected to normal exposures where proper material selection, detailing, construction and maintenance have been executed. Any application of repellents that also serve as a graffiti guard shall be approved in writing by the Ysleta ISD.
- B. Cast stone shall have a silane or siloxane water repellent applied in accordance with the Cast Stone Institute and the respective manufacturer's requirements.

7.06 Building Insulation

- A. Typical Learning Spaces: At all gypsum board dividing walls that extend to floor or roof deck above, provide minimum 3-1/2" batt acoustical insulation between studs and acoustical sealant at all joints on one side of wall to reduce sound transmission.
- B. Administration: Where gypsum board partitions are utilized, extend walls to floor or roof deck above and provide minimum 3-1/2" batt acoustical insulation between the studs and acoustical sealant at all joints on one side of wall to reduce sound transmission.
- C. Insulation for Exterior Walls: Insulation for exterior walls shall meet the requirements of the governing International Energy Conservation Code. Batt insulation shall fill entire depth of wall cavity, regardless of required R-value.

7.07 Metal Panels

- A. Metal panels shall be installed a minimum of 9'-0" above finish grade and shall be installed with a continuous drainage plane.

7.08 Roofing Considerations

A. Products - All materials shall be certified as totally asbestos-free.

1. Roof System: 1-ply 80 mil SBS Modified base ply plus a smooth surfaced white polyester reinforced fleece backed adhered Elvaloy® membrane cap, complying with UL Class A and ASCE-7 wind uplift criteria.
 - a. Finish Membrane: The white polyester reinforced fleece backed Elvaloy® membrane shall be minimum 80 mil nominal thickness (excluding fleece backing) and shall meet the following physical properties: Elongation 45% x 42%, ASTM D 751; Breaking Strength 632 x 511 lbs, ASTM D 751; Heat Aging 90% of Original, ASTM D 3045; Cold Resistance -40° F, ASTM D 2136; Water Vapor Permeability 3.5g/m2/day, ASTM E 96; Seam Strength 80% of sheet, ASTM D 751.
 - b. Base Flashing: Shall be same material as the white polyester reinforced fleece backed adhered Elvaloy® membrane and be installed using the design principles set forth in the National Roofing Contractors Association Manual and details included in Specifications.
 - c. Approved manufacturer's:
 - i. Johns-Manville
 - ii. Carlisle SynTec
 - iii. Versico
 - iv. Mule-Hide
 - v. Flex Membrane International
 - vi. US Ply
2. Felts: Shall be 80 mil SBS base sheet, tested in accordance with ASTM D 5147, as approved by field membrane manufacturer.
3. Fasteners: Fasteners and fastening plates or bars shall be listed in the FM Global Approval Guide and be as recommended by the fastener manufacturer for the specific application.
4. Bitumen: ASTM D-312, Type IV extra steep asphalt or cold applied adhesive as approved by manufacturer.
5. Insulation: Shall meet IEC requirements.
 - a. First layer: Rigid closed cell polyisocyanurate; long term thermal resistant R-value, FM Class I fire hazard classification, UL classified for installation with Class A roof covering.
 - b. Top layer: Non-structural glass mat faced, non-combustible, moisture resistant silicone treated gypsum core panel, manufactured to conform to ASTM C 1177. Thickness shall be 1/2" = R of .56 with nominal board size of 4' x 8', UL classified for installation with Class A roof covering. Provide additional factory-tapered boards (minimum 1/2" per foot slope) for crickets as shown on roof plan.
6. Expansion Joints and Divider Joints: Shall be as recommended by NRCA.
7. Equipment Supports: As recommended by both the roof system manufacturer and the equipment manufacturer.
8. Pipe Supports: Non-ferrous, non-corrosive type as recommended by roof manufacturer for proper pipe support and weight distribution on roof; supports shall provide unbinding thermal expansion/contraction movement of piping without jeopardizing warrant ability of roof system. Set supports on additional wearing surface of cap sheet layer or walk-pad material.

B. Execution

1. Pre-Roofing Conference: Must be held after approval of submittal data, and at least seven (7) calendar days prior to start of roofing work.
2. General Installation
 - a. Maintain end-of-workday watertight building conditions on all re-roofing projects on existing facilities. Contractor shall be solely responsible for all damage occurring due to failure to properly seal building.
 - b. Install only as much roofing insulation as can be covered with roofing during the same work period.

- c. Clean completed roof of all construction debris.
 - d. At roofing projects for existing buildings, all debris shall be removed from the grounds at the end of the day.
 - e. Test cuts should be performed only where there is reason to suspect that less than proper installation procedures have been used or materials have been shorted.
 - f. Copper and aluminum flashings and gravel stops are discouraged due to excessively high cost and possible problems related to vandalism.
 - g. IBC requirement of a minimum slope of 1/4" per foot in new construction shall be achieved by sloping the deck and not through tapered insulation. Tapered crickets are, however, encouraged to move water to drains.
 - h. In reroofing projects, the design standard of 1/4" slope is not required, and drainage of roofs shall be accomplished where needed, with appropriately placed drains and overflow scuppers or gutters and downspouts rather than merely sheet flow to scuppers or over-the-side onto walls.
 - i. No drainage onto walls from adjacent roof areas shall be permitted except under emergency overflow conditions.
 - j. All multi-level roofs shall have permanently attached ladders between levels with height differentials of 48 inches or greater. Ladder shall be made of iron or steel and at a minimum 3 feet wide to allow staff to go up and down with tools. Steps must be non-slip surface.
 - k. Do not change the design standard and system selected without prior approval from the Ysleta Independent School District.
 - l. Comply with governing local, state, and federal regulations, safety standards, and codes.
3. General Roofing Standards:
- a. Roof design shall be in compliance with applicable building codes, manufacturer recommendations, and industry standards.
 - b. Design simple roof planes avoiding complex and varying roof levels or changes. Consider impact of structural expansion joint on roofing related details. On new low slope roofs provide a minimum 1/4 inch slope per foot in structural deck. Provide positive drainage for all canopies. Provide positive drainage on existing dead level roof decks in accordance with code requirements for existing buildings. Design roof slopes to minimize parapet heights where possible. Utilize roof drains with overflow scuppers for roof drainage in accordance with applicable codes. Coordinate locations of overflow scuppers on exterior elevations. Use overflow roof drains where the use of overflow scuppers is not desired aesthetically. Provide crickets as required to direct water to drains.
 - c. Primary roof drains shall sump 24" around drains (48" distance around drains less than 1/8" slope in reroofing). Provide cast iron drains and caps that are slotted or screened to minimize foreign object entry. All drains shall receive lead flashing and installed per the local plumbing code.
 - d. Provide shop fabricated sheet metal expansion joints. Roof expansion joints shall be installed according to NRCA guidelines. All sight exposed sheet metal shall be prefinished galvanized sheet metal. All other sheet metal not exposed to normal views shall be galvanized sheet metal. Form thru-wall scupper sleeves out of Zincgrip Paintgrip sheet metal to allow for all joints to be soldered. Prime and paint to match adjacent prefinished sheet metal face trim.
 - e. Counterflashing shall be installed at a minimum of 12" above roof surface for all rooftop items and equipment
 - f. Provide Stainless Steel downspout boots (minimum 24 inches above finished grade) at all downspouts that discharge storm water at grade or where downspouts are piped into storm drainage system. Where feasible, downspouts shall connect into the storm drainage system. Downspouts discharged at grade shall have a concrete splash block.

Install precast concrete splash blocks installed over an additional ply of adhered cap sheet where downspouts discharge storm water onto roofing unless such roofing is metal.

- g. Counterflashing shall be installed at a minimum of 12" above roof surface for all rooftop items and equipment.
- h. Provide Stainless Steel downspout boots (minimum 24 inches above finished grade) at all downspouts that discharge storm water at grade or where downspouts are piped into storm drainage system. Where feasible, downspouts shall connect into the storm drainage system. Downspouts discharged at grade shall have a concrete splash block. Install precast concrete splash blocks installed over an additional ply of adhered cap sheet where downspouts discharge storm water onto roofing unless such roofing is metal.
- i. Provide minimum 3' x 3' roof hatch with ladder safety posts for each roof area through lockable maintenance areas such as custodian closets and mechanical rooms. Roof or crawlspace access shall not be allowed in classrooms or other areas accessible to the students. When not possible, provide roof access ladders to allow for access to all roof areas from roof areas having a roof hatch at all elevation changes of 48 inches or greater. Legs of such roof access ladders shall not require flashings to be installed in the field of the roof. Provide permanently installed steel access ladder for all roof hatches. Ladders and roof hatches shall be no closer than 10'-0" from edge of roof.
- j. Replacement of Existing Roofs:
 - i. Repair and replacement of existing roof systems and associated assemblies should only be performed after discussion with Ysleta ISD. Items to be evaluated include, as a minimum, the existing condition of roofing cap-sheet & membranes, insulation and roof deck or substrate assembly, flashing components, expansion joints, roof drainage and slope. Architect shall perform a roof survey with Ysleta ISD maintenance staff when evaluating an existing roof system and shall secure a history of the roof installation, roof maintenance and leak history. No mopped overlay roof systems will be considered. Single ply overlay systems can be considered if maintenance traffic warrants such a system and after infrared moisture survey, moisture probes and possible roof cores have been completed to confirm any areas containing suspected wet insulation. All wet insulation shall be replaced prior to any overlay system being installed. Architect shall confirm that existing structural system can support the additional load of any overlay system.
 - ii. All traffic upon and work associated with existing roof systems shall be done in methods, manners and by personnel endorsed by the manufacturer of the existing roof. The in-effect warranties and integrity of the existing roof systems shall be fully maintained.
 - iii. Standing/Ponding Water: Design of new roof systems shall include measures to ensure that positive drainage is present for all roof areas to eliminate the presence of ponding water 48 hours after rainfall occurs.
- k. Tile Roofs:
 - i. Tile Roofs are not preferred but will be considered as an accent design element through a design variance request. Where tile roof is used, provide a high temperature self-adhering rubberized asphalt underlayment beneath the tile.
- l. Metal Roofs:
 - i. Metal roofs are not preferred but will be considered as an accent design element through a design variance request. Metal roofs should not be used as the primary roofing material. Any metal roof should have a slope of 3:12 minimum. Avoid roof penetrations in metal roofs. Provide a high temperature self-adhering rubberized asphalt underlayment beneath the metal roof. The

metal should be prefinished with a fluorocarbon polymeric coating containing 70% PVDF Hylar 5000 or Kynar 500 finish. The finish shall have a Solar Reflective Index of 29 or greater.

- m. Support roof level piping with pre-manufactured pipe supports installed at a maximum of 8 feet on center and within 2 feet of each change in direction. Install each pipe support over an additional layer of membrane as required by roofing manufacturer. No wood blocking shall be used for pipe supports. Specify pipe supports with rollers under all gas piping to allow for expansion and contraction. Pipe supports should be at a height that maintains roof warranty and complies with MEP requirements.
- n. Locate roof penetrations a minimum of 36 inches away from vertical roof system flashing or other vertical roof penetrations.
- o. Install rooftop condensing units level on pre-manufactured roof curbs with built-in slope (i.e. ThyCurb by Thybar) and galvanized sheet metal caps installed over plywood sheathing. Shim such curbs to provide a level surface for condensing unit. Secure condensing units to metal caps with galvanized sheet straps anchored to the unit and through the vertical face of the sheet metal caps. Anchor the required electrical disconnects for the condensing units to the condensing unit.
- p. Eliminate roof penetrations of any kind through the roof system base flashings.
- q. Install roofing manufacturer approved and warranted roof walk pads on all sides of all roof hatches, at the high and low base of all roof access ladders, on walkways from hatches to roof top condensing units and around rooftop equipment that will require periodic servicing.
- r. Install continuous termination bars, with fasteners at 6 inches on center along the leading edge of all roof system base flashings and a minimum of 12" above finished roof height.
- s. All vertical flashing seams shall be hot air welded and become part of manufacturer's twenty (20) year warranty.
- t. Roofing system shall be watertight without depending on any metal flashing or coping.
- u. Install a minimum of two fasteners per side to anchor all exhaust fans to rooftop curbs. Such fasteners shall be installed in the vertical face of the exhaust fan base.
- v. Install sheet metal counter flashing at all vertical flashings. Utilize 2-piece counter flashing with reusable receiver where possible. Exception: Counter flashings are not needed below sheet metal copings.
- w. Install prefinished sheet metal wall panels at all parapet walls that are in excess of 36 inches high while providing minimum 12-inch-high roof system base flashings.
- x. Only edge gutters are permitted.
- y. Provide butt type expansion joints at 50 feet on center at all guttering. Install downspouts with expansion joints taken into account.
- z. At single pipe penetrations, provide prefabricated boot with stainless steel pipe bands. Where multiple pipe penetrations occur in close proximity provide at least 1 inch of separation between each pipe, each to be properly flashed. Include removable flashing hood at pipe penetrations flashed with pourable sealer installed in galvanized metal penetration dams with soldered joints to allow for the pourable sealer to be serviced. Pitch pans are not allowed unless they are protected by sheet metal hood or boot. Where resin flashings are to be installed provide a minimum of 6 inches between penetrations to allow for resin flashings to be installed.
- aa. Typical at pipe penetrations, brace high and low to structure to prevent movement. Insulate from underside of deck, along laterals, then minimum 6" vertical below next elbow joint (or tangent) to reduce potential condensate drippage.
- bb. When rooftop equipment screening is required, the use of parapets is preferred over roof-top equipment screens. If rooftop equipment screens are required, limit the

- number of roof penetrations. Install a prefabricated boot with stainless steel pipe bands or sheet metal flashing hoods over all screen support flashings.
- cc. Provide non-freeze roof hydrants at 150'-0" O.C. to enable routine cleaning of the roof membrane.
- dd. Install tapered insulation crickets, sloped at a rate of 1/2 inch per foot on the high side of all roof curbs in excess of 30 inches wide when the field of the roof is sloped at 1/4 inch per foot.
- ee. Install thru-wall flashings with weeps at 24 inches on center above roof system counter flashings when new or existing cavity wall construction is present.
- ff. Review changes in metal deck direction with roofing manufacturer to confirm if roof expansion joint or separation curb will be required.
- gg. At locations where gas piping must extend up and over the face of a structure in an exposed condition install prefinished sheet metal cover to discourage individuals from climbing gas piping to gain roof access.
- hh. Insulation: Minimum 2-layer application with all joints staggered minimum 12"; show material types and thicknesses in the specifications.
 - ii. Provide underlayment under all roof level copings. Copings shall be fabricated in accordance with ANSI/SPRI ES-1 requirements and SMACNA. Slope towards roof minimum 1" across width for drainage. Only standing seam profile for joints is permitted.
 - jj. Provide minimum 12" high roof system base flashings with such height being measured from the field of the roof to the top edge of the roof system flashings.
- kk. No angle supports through roof plane, use round pipe supports that can be easily flashed and sealed.
- ll. Gas Equipment heights should be designed to achieve minimum 3" vertical clearance between roof surface and bottom of drip leg piping cap. All gas pipe shall be painted yellow.
- mm. For safety, ease of maintenance, and to minimize damage to roof system components, no equipment locations within 5' of roof expansion joints and / or roof divider joints, vertical parapets; no equipment within 10' of roof edges.
- nn. Hose bibbs shall be installed every 100 feet and protected from freeze in areas where HVAC are located. Consult with Owner.
- oo. Areas shall not harbor and provide protected areas for pigeons and other birds.

4. Warranties

- a. Roofing - Manufacturer: Project shall be installed in such a manner that the roofing material manufacturer will furnish a written twenty (20) year NDL type warranty with no exclusions for damage up to two (2) inch diameter hail and coverage of wind speeds up to 72 mph.
- b. Roofing - Contractor: The contractor, jointly with any subcontractors employed by him, shall guarantee the work required and performed under this contract will be free from defects in workmanship and materials, and that the building will be and remain waterproof for a two (2) year warranty period, after the Owner accepts the work as substantially complete. The warranty shall be in approved notarized written form, to obligate the contractor and his subcontractors, if any, to make good the requirements of the warranty.
- c. Warranty repairs shall be performed by a certified installer. The repairs shall be performed in accordance with the manufacturer's written instructions and recommended procedures so as to not void the warranty. Repair of the system, including materials and labor, shall be done at no cost to the Owner.

7.09 Flashing and Sheet Metal

A. General Installation

1. Reference Standards: Applicable portions of SMACNA, ASTM and NAAMM publications.
2. Design Criteria
 - a. Flashing details, materials, and systems shall be endorsed by the specified roofing system manufacturers. Identify appropriate National Roofing Contractors Association (NRCA) and/or SMACNA detail criteria for all conditions. Include legible cut sheet copies of all referenced SMACNA and NRCA details in the Specifications or Drawings.
 - b. Coordinate heights, systems, details with related construction; special attention to parapets and mechanical items.
 - c. Draw all "special" conditions.
 - d. Make sure front of gravel stop metal sufficiently laps back of gutters; consider gutter slopes, downspout locations, and gutter expansion joints.
 - e. Gutter and downspout sizes designed for not less than the 10-year rainfall criteria.
 - f. Draw large-scale details of coping/membrane/blocking assemblies.
 - g. Copings: Flashing membrane shall extend under the coping and up and over the top of the wall to one inch below the outside edge of the nailer. Do not penetrate top of membrane with fasteners. Set copings with concealed front and rear cleats; do not mechanically fasten. Neatly trim away exposed-to-view excess membrane material.
 - h. Building shall be detailed to be watertight prior to flashing installation.
 - i. Prefinished galvanized sheet metal shall be used where visible from the ground.
 - j. Metal edge gravel stops: Finish ply field membrane shall extend under the metal edge gravel stop to one inch below the outside edge of the nailer prior to installation of primed metal edge gravel stop and continuous clip.
3. Submittals: Secure roof system manufacturer's written endorsement of all submitted proposed flashing details. Designer approval of flashing submittals is mandatory prior to pre-roofing conference.
4. Warranties:
 - a. Flashing membrane and seams shall be part of twenty (20) year manufacturer's warranty. Sheet metal shall be part of contractor's two (2) year warranty. Pre-finished metal shall have a twenty (20) year finish warranty.

B. Products

1. All non-metallic materials shall be certified as totally asbestos-free.
2. Sheet Metal Material:
 - a. Hot-dipped Galvanized Steel for use as counter flashings (where visible from the ground), pitch pans and expansion joints: Minimum 24-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.
 - b. Hot-dipped Galvanized Steel for use as continuous clips: Minimum 22-gauge, G-90, hot-dipped galvanized metal, commercial quality, ASTM A 525.
 - c. Elvaloy® Cladded Metal: Shall be G-90 galvanized steel with 24 mil Elvaloy® membrane lamination; width shall be four feet; length shall be eight or ten feet.
 - d. Prefinished Galvanized Sheet Steel (where visible from the ground): Shall be 24-gauge flat stock, prefinished with Kynar finish meeting ASTM A 446, forty-five and one-half inches to forty-eight inches width by one hundred twenty inches in length (45-1/2" - 48" x 120") for use as new metal edge gravel guard, cover plates, downspouts, gutters, coping and miscellaneous metal. Standard color to be selected by Designer.
 - e. Sheet Lead: QQ-L-201, Grade B.
 - f. All existing sheet metal on reroofing projects shall be replaced with new metal of like gauge and type, or as specified on drawings.

3. Fasteners
 - a. Continuous Clip: Concealed hold-down clip type; of the same materials as coping, gravel guard, sized to suit application. Use a continuous clip, minimum 22-gauge G-90 galvanized.
4. Sealant
 - a. One-component polyurethane, conforming to the requirements of FS TT-S-230C, non-staining and non-bleeding.
5. Expansion Joint Detail at Wall:
 - a. Shall be as outlined by SMACNA details and be in full compliance with all provisions of SMACNA and FM Global requirements for attachment, installation and recommendations.
6. Copings:
 - a. All coping shall be manufactured with low profile standing seam metal.
 - b. Shall be minimum 24-gauge prefinished Kynar installed in ten-foot (10') sections maximum.
 - c. Vertical fascia shall extend minimum of two and one-half inches (2-1/2") or be minimum one and one-half inches (1-1/2") below bottom of nailer, whichever is greater.
 - d. Shall be fabricated in accordance with all SMACNA provisions.
7. Splash blocks:
 - a. Minimum 3000 p.s.i. precast concrete, smooth formed, approximate 12" width by 18" length.
8. Gutters, Downspouts, and Conductor Heads:
 - a. Fabricate according to SMACNA guidelines. Basic rectangular shape, lapped in direction of water flow and sealed, seams oriented against building to greatest extent possible. Gutter anchors at max. 3'-0" OC with gutter expansion joints every 50 feet and downspout anchors maximum at 6'-0" OC. Bottom 18" of downspout above grade or paving sleeved in cast downspout boot secured to building wall. In specific cases where downspouts are not tied into storm water system, terminate downspouts 1" above splash block on concrete mow strip.
9. Gravel Guard / Fascia:
 - a. Shall be installed with expansion joints, ten feet (10') on center, one-fourth inch (1/4") expansion leeway, with a cover plate.
 - b. Shall be fabricated in accordance with all SMACNA provisions.
10. Bonnets / Hoods:
 - a. Fabricate and install metal bonnets over all pitch pans, NO EXCEPTIONS.
 - b. Bonnets/Hoods shall be manufactured with metal compatible with metal to which bonnet is to be attached.
 - c. On beams and other steel, weld in place bonnets fabricated from one-fourth inch (1/4") steel plate.
 - d. Draw band bonnets fabricated from 22-gauge galvanized steel may be used on circular projections.

C. Execution

1. Require the Contractor to install flashing and sheet metal in the following manner:
 - a. Isolate dissimilar materials to prevent electrolysis.
 - b. Use factory-fabricated corners at reglet changes in direction.
 - c. Equipment curb counter flashing shall be discontinuous 12" from each corner; use "L-shape" corner counter flashing pieces with 12" leg lengths.
 - d. Install materials to provide watertight fit, allowing for expansion & contraction without deformation.

- e. Test all flashing, gutters, conductors, and downspouts for water tightness after completing installations; make repairs to deficient items as required attaining water tightness.

7.10 Through-Wall Flashing

A. Design Criteria

1. Required at heads and sills of exterior doors, windows, louvers, soffit lintels, etc.
2. Required at elevated slab lines and just above exterior finish grades and/or pavement; external bottom just below and in same course as masonry weeps. To the greatest extent possible, weeps located at least 2" lower than inside slab elevation (except at "basement" conditions); locate weeps above exterior finish grade or pavement.
3. Draw large-scale details for all project conditions; draw upturned end dam condition details.
4. Draw details at conditions traversing structural columns and other framing.

B. Warranty

1. Two (2) years full material and labor against failures in material workmanship.

C. Products

1. Flashing Membrane:
 - a. Standard type (Hyload Self-Adhered Membrane), elastomeric and thermal plastic polymers combined with DuPont Elvaloy, reinforced with synthetic fibers and calendared into 40-mil thick sheets, with the following physical properties:
 - b. Color as selected by Designer from manufacturer's range of black, grey, buff, or white.
 - c. Compatible with urethane and silicon sealant.
 - d. UV stable, secure with stainless steel or aluminum termination bar.
2. Adhesive
 - a. Totally asbestos free as recommended by flashing manufacturer.
3. Mortar Break
 - a. Continuous nylon mesh

D. Execution

1. Incorporate mock-up of conditions into masonry panel mock-up for Designer approval.
2. Set flashing projected 1/2" beyond outside face of exterior wythe, extend through cavity, rising no less than 8", and terminate at depth of 4" into bed joint of interior wythe. Neatly trim excess from exterior wythe joint after Designer approval of installation.
3. Provide standard or customized three-dimensional shapes (cloaks) to form a complete flashing system with preformed corners, end dams, other special shapes, and seaming materials; all provided by flashing sheet manufacturer.
4. Shop drawings: provide from manufacturer a review of the flashing design for the project and location of cloaks on reduced floor plan.
5. Pre-roofing meeting: Review flashing for the project and how the flashing will be sequenced with the following: Below grade waterproofing, window installation, sealant installation and roofing. Representatives from all above trades should attend.
6. Accessory Flashing Materials: Flashing manufacturer's standard adhesive, primer and mastic products for bonding flashing sheets to each other, to cloaks and to substrates. A four inch (4") minimum lap is required.
7. Install mortar break diagonally on top of flashing to ensure that the mortar droppings are broken up and deflected away from the weep holes.

7.11 Fireproofing

- A. Architect should design building in order to eliminate the need for fireproofing. If due to the building size or other considerations fireproofing is required by code, provide cementitious fireproofing in lieu of mineral fiber fireproofing. All fireproofing shall be designed per UL requirements and shall be detailed and specified. All facilities shall be of Type I or Type II construction.
- B. All smoke and fire-rated walls shall be identified in a concealed location with 3" high lettering with 3/8" stroke stenciled at no more than 10'-0" O.C. identifying the wall as indicated on the code review sheet. "2-HR FIRE RATED WALL PROTECT ALL OPENINGS" or comparable.

7.12 Firestopping

- A. Detail and or specify the installation of fire stopping at all penetrations through all fire-rated construction where required by code.

7.13 Expansion Joint Cover Assemblies

- A. Wall and Floor Locations: Provide all metal joint covers, aluminum frame construction, free of gaskets and fillers and designed to permit 50% joint movement at all interior conditions. Gaskets and fillers shall be allowed at exterior conditions.
- B. Ceiling Locations: Provide flexible multi-layered rubber extrusions with continuous internal baffles to fit in an extruded aluminum frame.
- C. Exterior Locations: Provide preformed foam joint seals, pre-compressed, self-expanding sealant system with silicone pre-coated surface.
 - 1. Acceptable products: Emseal Colorseal

7.14 Exterior Insulation & Finish System (EIFS)

- A. EIFS is not allowed.

7.15 Joint Sealants

- A. Modified Polyurethane (Type 1 Sealant):
 - 1. Two or three-part conforming to ASTM C 920, Type M, Grade NS, Class 25.
 - 2. Color: Custom colors as selected by Architect.
 - 3. Acceptable products:
 - a. MasterSeal NP2, BASF the Chemical Company
 - b. Dymeric 240FC, Tremco.
- B. Pourable Urethane (Type 2 Sealant):
 - 1. Multicomponent conforming to ASTM C 920, Type M, Grade P (pourable), Class 25, Use T (traffic).
 - 2. Color: Custom color as selected by Architect.
 - 3. Acceptable products:
 - a. Urexpand NR-200, Pecora Corp.
 - b. MasterSeal SL 2 Sealant; BASF the Chemical Company
 - c. THC 900 (Self leveling) or 901 (low sag), Tremco.

- C. Pourable Urethane Sealant (Type 3 Sealant):
 - 1. Single-component conforming to ASTM C 920, Type S, Grade P (pourable), Class 25, Use T (traffic).
 - 2. Color: Gray or limestone as selected by Architect.
 - 3. Acceptable products:
 - a. Sikaflex - 1CSL; Sika Corporation, Inc.
 - b. MasterSeal SL 1; BASF the Chemical Company
 - c. Vulkem 45; Tremco
- D. Silicone, General Purpose (Type 4 Sealant)
 - 1. One-part rubber based silicone conforming to ASTM C 920, Type S, Grade NS, Class 100/50.
 - 2. Color: As selected by Architect.
 - 3. Acceptable products
 - a. 790 Building Sealant, Dow Corning.
 - b. SCS2700 Silpruf LM, GE Silicones.
 - c. Spectrem 1, Tremco.
- E. Polyurethane Hybrid, Paintable (Type 5 Sealant):
 - 1. One-part, moisture-cure, polyurethane hybrid sealant for interior use, conforming to ASTM C 920, Type S, Grade NS, Class 35 and Fed. Spec TT-S-00230C, Class A, Type II.
 - 2. Acceptable product:
 - a. Dymonic FC, Tremco
- F. Silicone, Sanitary (Type 6 Sealant):
 - 1. One-part conforming to ASTM C 920, Type S, Grade NS, Class 25, F.D.A. Regulation 21 CFR177.2600, and FDA Food Additive Regulation 121.2514.
 - 2. Color: Clear.
 - 3. Acceptable products:
 - a. 786 Silicone Sealant - M, Dow Corning.
 - b. SCS1700 Sanitary, GE Silicones.
- G. Acrylic Latex (Type 7 Sealant):
 - 1. One-part, non-sag acrylic latex, siliconized, conforming to ASTM C 834, Type OP, Grade NF or - 18° C.
 - 2. Acceptable products:
 - a. AC-20+, Pecora Corp.
 - b. MasterSeal NP 520; BASF the Chemical Company
 - c. Tremflex 834; Tremco.
- H. Acoustical Sealant (Type 8 Sealant):
 - 1. Butyl rubber for concealed locations.
 - 2. Acceptable products:
 - a. AC-20 FTR Acoustical and Insulation Sealant, Pecora Corp.
 - b. Acoustical Sealant, Tremco
 - c. Sheetrock Acoustical Sealant; USG Co.
- I. Sealant (Type 9 Sealant): Reference SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES
- J. Silicone Sealant (Type 10 Sealant):
 - 1. ASTM C 1184, One-part, neutral-cure, silicone sealant.
 - 2. Color: Clear.
 - 3. Product/manufacturer:
 - a. Dow Corning® 995 Silicone Structural Glazing Sealant.

7.16 Sealant Schedule

- A. Locations specified below for sealants and caulking required under this section are general and shall not be considered as affecting the required use of sealing compounds specified under other sections of the specifications.

<u>SEALANT TYPE</u>	<u>APPLICATION</u>
1	<p>A. Vertical control and expansion joints in exterior and unpainted interior masonry surfaces. At joint width 1" or more, reference SECTION 07 95 00 - EXPANSION CONTROL.</p> <p>B. Vertical joints at perimeter of window, door, and storefront elements where adjacent to stone, masonry, or concrete surfaces.</p> <p>C. Reglets: The top groove along the surface-mounted flashing reglets.</p> <p>D. Sealing joints in sheet metal fabrications.</p> <p>E. Unless noted otherwise, any other exterior vertical joints.</p>
2	<p>A. Interior horizontal control and expansion joints in flooring, stone, masonry and tile flooring and at junctures between these materials and other adjacent materials.</p>
3	<p>A. Exterior horizontal control and expansion joints in concrete paving.</p> <p>B. Filing of roof penetration pockets (pitch pans).</p>
4	<p>A. Sealing of joints between plumbing fixtures and substrates and between plastic laminate splashes and adjacent tops and walls.</p> <p>B. Threshold and windowsills set in full bed of sealant.</p>
5	<p>A. General caulking as part of interior painting in joints subject to movement.</p> <p>B. Sealing of joints between tilt-wall panels.</p>
6	<p>A. Sealing joints between countertops and substrates in concession areas and elsewhere which may be in contact with food.</p>
7	<p>A. General caulking as part of interior painting.</p>
8	<p>A. Setting sill track, head track, and end studs to substrates on acoustically rated partitions. Refer to SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES for application requirements.</p>
9	<p>A. Sealing of joints in exterior glass-mat gypsum sheathing</p>
10	<p>A. Sealing of joints in butt glazing.</p>

END OF DIVISION 07

Division 08 – Openings

8.01 Hollow Metal Doors & Frames

- A. Provide steel doors and frames to comply with all the requirements of the Steel Institute SDI A250.8. Interior Doors: Heavy Duty (18 ga.); SDI A250.8 Level 2; SDI A250.4 Performance Level B; Edge Construction Model 2 Seamless. Exterior Doors: Extra Heavy Duty (16 ga.); SDI A250.8 Level 3; SDI A250.4 Performance Level A; Edge Construction Model 2 Seamless.
 1. Interior Steel Doors should be provided at the cafeteria/kitchens, locker rooms, gymnasium, athletics and other areas which are subject to high abuse. Interior hollow metal doors shall be 18 gage.
 2. Exterior Steel Doors & Frames should be provided at all Exterior Entrances, except where Main Entry doors should be, in keeping with the architectural style of building. Exterior hollow metal doors shall be 16 gage insulated with R-8 foamed-in-place polyurethane.
 - a. Card readers shall be installed at locations as coordinated and determined by Ysleta ISD.
 - b. Exterior doors should be recessed or protected by an awning or canopy to prevent sun and water issues, etc.
 3. Fire-Rated Door Construction should conform to NRPA 252 or UL 10C. Single fire rated doors for area separations at egress corridors shall be as large as allowed by code pair 4'-0" x 8'-0" with Maglocks wired into the fire alarm system. Double doors shall include removable center mullion (keyed) with interchangeable cores and provided with Maglocks wired into the fire alarm system.
 4. Door heights shall be 7' unless specifically stated otherwise within the YISD TDSs and Ed Specifications. Minimum door widths shall be 3' with 3'-6" maximum for single-leaf door (4'-0" wide door is permitted at kitchen loading dock, laundry rooms, MEP rooms, or at fire-rated door which will primarily be held in the open position). Vertical rods are prohibited at double doors. Provide removable mullions (keyed) at these locations.
 5. Hollow metal frames shall be continuously welded. Interior hollow metal frames shall be 16 gage steel (0.053"). Exterior hollow metal frames shall be 14 gage steel (0.067"). The use of knock-down frames is not allowed. (Use 2" frames at head of doors. Do not use 4" head for door frames unless to match existing construction). Use CMU 5" starter course if needed for door frame to course out.
 6. In historic renovation projects, Ysleta ISD reserves the preference for steel window frames to be salvaged and re-glazed.
 7. Loose glazing stops in HM frames shall be 16 gage steel (0.053").
 8. Vision Panel moldings in doors shall be 20 gage steel (0.032").

8.02 Wood Doors

- A. Typical Interior Doors should be flush solid core doors premium grade, 1-3/4" thick, clear pre-finished 5-ply stain grade, plain sliced white birch. Door finish shall be stained hardwood veneer at all campuses. Door finish shall be plastic laminate inside the kitchen and nurses' areas. Frames should be 16-gage welded steel. Vision Panel moldings in doors shall be 20 gage steel (0.032"). All glass shall be tempered unless wire glass is required by Building Code. Fire-Rated Door Construction should conform to NFPA 252 and NFPA 80. No wood doors shall be used at exterior.

8.03 Sound Control Door Assemblies

- A. At Auditorium Band, Choir, Ensemble, adjacent offices, practice rooms, adjacent vestibules and other Fine Arts areas in need of sound control, provide door and frame fabricated as a sound-retardant unit. The assembly should be tested according to ASTM E90 and Certified with an STC rating minimum of 48. At Middle and High School levels, an acoustical consultant should be part of the design team to determine sound control door locations.

8.04 Aluminum-Framed Entrances and Storefront

- A. Aluminum Entrances: For exterior installations, use 2" x 4 1/2" profile, flush glazed (inside glazed at elevated floors). Door frames should have 3/16" thick "heavy-wall" construction and aluminum doors shall be 2" thick, "heavy wall" 3/16" thick wide-style type with 5" stiles, 6 1/2" top rail, 5" intermediate (centered on panic device) and 10-1/4" bottom rail beveled. Preferred finish is Architectural Class 1 Clear Anodic Coating. Where exterior pairs of doors are required, use a removable mullion (keyed). The maximum size of glass panel shall be 4'-0" x 4'-0". Deflection of glass framing members under exterior design loads shall not exceed L/175 or 3/4", whichever is less. If allowed by building code requirements, aluminum storefront is acceptable to be used at interior areas such as Library, Administration, and Cafeteria entrances, but 1-3/4" x 4" profile, normal weight shall be used.
 - 1. Hardware Preparation: Prepare and reinforce doors and door frames for hardware.
 - a. Mortising, reinforcing, drilling, and tapping for mortised hardware shall be done at the factory.
 - b. Wherever possible, concealed steel reinforcement for surface-applied hardware shall be installed at the factory. The drilling and tapping for surface-applied hardware shall be done in the field.
 - 2. Reinforced Mullion: Same profile as non-reinforced frames, of extruded aluminum cladding with internal reinforcement of steel shaped structural section.
 - 3. Reinforcement: Concealed reinforcements for hardware in doors and frames and mullions shall be plated or galvanized steel and shall be secured in place.
 - a. Fabricate doors and frames allowing for minimum clearances and shim spacing around perimeter of assembly yet enabling installation.
 - 4. Rigidly fit and secure joints and corners with internal reinforcement, except that door corners will be welded. Make joints and connections flush, hairline, and weatherproof.
 - 5. Prepare components to receive anchor devices. Fabricate anchorage items.
 - 6. Arrange fasteners, attachments, and jointing to ensure concealment from view.
 - 7. Prepare components with internal reinforcement for door hardware.
 - 8. Reinforce framing members for imposed loads.
 - 9. Preparation for Card Reader Access shall be coordinated with the District.
- B. Aluminum Storefront Windows for exterior installation shall use 2" x 4 1/2" profile at additions and new buildings, Preferred finish is Architectural Class 1 Clear Anodic Coating. Deflection of glass framing member under exterior design loads shall not exceed L/175 or 3/4", whichever is less. Exterior storefront windows shall be thermally broken. Aluminum sub-sills with preformed watertight end dams shall be provided.

8.05 Glazed Aluminum Curtain Wall

- A. Limit the use of glazed aluminum curtain wall systems. If system is required for structural requirements, restrict its use to the main entrance. System should be designed for permanent resistance to air and water leakage. Preferred finish is Architectural Class 1 Clear Anodic Coating. Deflection of framing members, perpendicular to the plane wall shall not exceed $L/175$ of its clear span or $3/4"$, whichever is less. System shall be thermally broken.
- B. Glass: Refer to the Aluminum Framed Entrances and Storefront for requirements.

8.06 Translucent Fiberglass Sandwich Panel Assemblies

- A. At Middle School and High School gymnasiums, the use of translucent fiberglass sandwich panels (Kalwall or equal) for window openings is preferred. Translucent fiberglass faces shall be manufactured from glass fiber reinforced thermoset resins. The exterior face shall have permanent glass erosion barrier.
- B. Skylights are not preferred. If skylights are required by energy code or allowed through a design variance, they shall be translucent fiberglass sandwich panels. (Kalwall or equal) Translucent fiberglass faces shall be manufactured from glass fiber reinforced thermoset resins. The exterior face shall have permanent glass erosion barrier.

8.07 Door Hardware

- A. General
 - 1. All exterior doors, toilet room doors, custodial closets and other doors required by codes shall receive closers with top plate reinforcement. All doors shall be furnished with stops (floor mounted preferred). All exterior doors shall have rubber silencers and/or weather stripping. The preferred hardware finish at new facilities shall be BHMA-626 Satin Chrome (US26D).
 - 2. All exterior doors shall be provided with electronic hardware and door position switch as identified in Section 28.07 Security System Provisioning – Security System Requirements Chart.
 - 3. All exterior doors shall receive Security System Provisioning as identified in Section 28.07. All single exterior doors and one exterior door within a group of two or more doors shall receive Credential Access Controlled Door Infrastructure as identified in Section 28.07(A).
 - 4. Include Ysleta ISD in the Door Hardware and Security System Provisioning specifying and submittal review process for approval.
- B. Preferred Hardware:
 - 1. Cylindrical locks are preferred. Mortise locks shall not be used.
 - 2. Finish shall be BHMA-626 Satin Chrome (US26D).
 - 3. Door Locks: Schlage Interchangeable Cores (I.C.)
 - a. The specified door hardware for all Classrooms is to be Schlage ND70 classroom function lever handle. Outside lever locked and unlocked by key. Inside lever is always unlocked.
 - b. Provide Schlage Storage Room function cylindrical locks with indicator lock at Storage Rooms and Single User toilets with occupied indicator.
 - c. Provide E. & C. keyways
 - 4. Include Ysleta ISD in the Door Hardware specifying and submittal review process.

5. Closers: LCN
 - a. Exterior: Provide LCN 4041XP with holder where permitted by code with BHMA-626 Satin Chrome (US26D).
 - b. Interior: Provide LCN 4041H with BHMA-626 Satin Chrome (US26D). Do not install manual hold-opens on fire-rated doors. Utilize Maglocks wired into fire alarm system.
 - c. Opening Setting: 100 degrees minimum and 120 degrees maximum (depending on the application)
6. Panic Devices: Provide (Von Duprin) 99L X 996 with
 - a. I.C. Schlage Primus cylinders,
 - b. E & C keyway. Include rim I.C. cylinder housing
7. Exterior Metal Doors
 - a. Continuous hinges and vertical rods are not allowed.
 - b. 6 x 34 vision lite kits with clear glass (tempered / laminate per Fire Code). Vision lite kit shall be located on the opposite side of the doorknob (hinge side).
 - c. 4.5 X 4.5 Ball Bearing Hinges (INTERIOR)
 - d. 4.5 x 4.5 NRP Ball Bearing Hinges (EXTERIOR)
 - e. All Pivot Hinge shall have reinforcement
 - f. 160 FATT weather-strip
 - g. 198 na Door Sweeps
 - h. Kick Plates - Entry/ exit doors, café / kitchen doors, gym, storage rooms, fine arts, custodial closet and athletics
 - i. 425 EV Threshold
8. Exterior Metal Frames
 - a. Use a 2" frame
 - b. Keyed removable mullion with interchangeable cores
9. Provide ball bearing butt hinges on all doors with closers. Provide continuous geared hinges on high frequency usage aluminum doors.
10. Provide intumescent smoke seals at all fire-rated doors.
11. Key cabinets shall be furnished with each building and shall have the capacity to store all keys plus 25" additional stock. Each school shall be primus keyed, sub master keyed, master keyed, and/or grand master keyed as directed by Ysleta ISD. Provide bitting list with all locks. Provide three keys for each number and additional.

8.08 Louvers

- A. At new buildings, provide aluminum louvers with Architectural Class 1 Clear Anodic Coating. Architect should coordinate with Engineer to determine free area requirements for mechanical equipment.
- B. For additions/renovations, alternate material and finishes to match existing building may be considered with approval by Ysleta ISD.
- C. Provide disposable air filters on the intake side of the louver. Coordinate air intake requirements with MEP Engineer. Make sure the filters are located in an easily accessible filter box and provide access panels if required.

8.09 Glass

- A. Entrance Doors: Tempered 1" thick, insulated (double glazed) with tinting to either match existing construction or on new construction, as approved by YISD.
- B. Storefront and Exterior Windows: Tempered, double-glazed, 1" thick minimum, with tinting to either match existing construction or on new construction, as approved by YISD. Unless noted otherwise,

provide with hard-fired, low-emissivity coating. For security considerations, all glass shall be inside glazed. Provide YISD approved shading for west and south facing glass.

- C. Interior Doors and Borrowed Lights: In vision panels or borrowed lights, provide ¼" tempered. Wire safety glass is acceptable if required by code. Provide a 6" x 34" long narrow lite or a 4"x24" long narrow lite located on the opposite side of the doorknob (hinge side) at rated doors where allowed by code. Install at 43" AFF maximum to bottom of glass per Texas Accessibility Standards.
- D. Laminated glass shall be used in high impact areas (interior and exterior) such as gymnasiums, cafeteriums, and activity rooms.

8.10 Access Doors

A. General

- 1. Flush metal panel access doors.
- 2. Size: As required for ease of access, but not less than 12" x 12".

B. Access Units – Walls

- 1. Non-Fire-Rated Door and Frame Unit:
 - a. In Cast-in-Place Concrete: Model M3202 (painted) manufactured by Milcor.
 - b. In Masonry: Model M3202 (painted) manufactured by Milcor.
 - c. In Ceramic Tile on Gypsum Board on Steel Studs: Model MS3202 (stainless steel) manufactured by Milcor.
 - d. In Gypsum Board on Steel Studs: Model DW3203 (painted) manufactured by Milcor.
 - e. In Plaster on Metal Furring: Model K3200 (painted) manufactured by Milcor.
- 2. Fire-Rated Door and Frame Unit: 1-1/2 hour UL B label fire rating
 - a. In Cast-in-Place Concrete: Model 3218 (painted) manufactured by Milcor.
 - b. In Masonry: Model 3218 (painted) manufactured by Milcor.
 - c. In Ceramic Tile on Gypsum Board on Steel Studs: Model 3218 (stainless steel) manufactured by Milcor.
 - d. In Gypsum Board on Steel Studs: Model 3218 (painted) manufactured by Milcor.
 - e. In Plaster on Metal Furring: Model 3218 manufactured by Milcor.

C. Access Units – Ceilings

- 1. Non-Fire-Rated Door and Frame Unit:
 - a. In Gypsum Board on Metal Furring: Model DW 3203 manufactured by Milcor.
 - b. In Plaster on Metal Furring: Model K3200 manufactured by Milcor.
 - c. In Metal T-Bar Ceiling: Model ATR 3204 manufactured by Milcor.
- 2. Fire-Rated Door and Frame Unit: 1-1/2 hour UL B label fire rating
 - a. In Gypsum Board on Metal Furring: Model 3218 manufactured by Milcor.
 - b. In Plaster on Metal Furring: Model 3218 manufactured by Milcor.

D. Access Units – Exterior Wall

- 1. Provide Model BXT as manufactured by Babcock Davis, 24 Gage Galvanneal Steel door with .080 inch 6063-T5extruded aluminum frame, size shall be 32" x 48", stainless steel continuous piano hinge, tested for air and water penetration. Provide latch with mortised lock keyed to building.

E. Access Units – Floors

- 1. Floor Access Door:

- a. Provide single-leaf door, 2'-6" x 3'-0". Type K-3 by The Bilco Company.
- b. Construction: Provide door of ¼" aluminum diamond pattern plate reinforced with aluminum stiffeners as required to withstand a live load of 150 lbs. per sq. ft. Provide cast steel hinges that pivot on torsion bars that counter-balance the door for easy operation. The door shall open 90° and lock in the open position. Provide under side release handle and removable key wrench on top side. Aluminum shall be mill finished with bituminous coating to be applied to exterior of frame by manufacturer. Hardware shall be zinc-plated and chromate sealed.
- c. Ladder Extension: "LadderUP" safety post, 42" high; telescoping steel, automatically locking when extended (as manufactured by The Bilco Company).

END OF DIVISION 08

Division 09 - Finishes

9.01 Finishes Matrix

SPACE	FLOOR	BASE	WALL	CEILING	REMARKS
Early Childhood Classroom	VCT	Rubber	Painted Gypsum Board and Painted CMU	Acoustical Ceiling Tile	
Elementary School Classroom	VCT	Rubber	Painted Gypsum Board and Painted CMU	Acoustical Ceiling Tile	Glass to Corridors, operable partitions for flex space.
Middle/High School Classroom	VCT	Rubber	Painted Gypsum Board and Painted CMU	Acoustical Ceiling Tile	Glass to Corridors, operable partitions for flex space.
Special Education Classrooms	VCT	Rubber	Painted Gypsum Board (demising walls) and Painted CMU	Acoustical Ceiling Tile	
Computer Lab	VCT	Rubber	Painted Gypsum Board	Acoustical Ceiling Tile	
Art Studio / Kiln	Sealed or polished concrete or VCT	Rubber	Painted Gypsum Board	Acoustical Ceiling Tile	Tack boards and bulletin board cases as coordinated and approved by YISD
Cafetorium	VCT	Rubber	Ceramic Tile Wainscot on Painted Gypsum Board Wall or Painted Concrete	Acoustic Ceiling Tile and Painted Gypsum Board	Resilient wood stage flooring
Cafeteria	VCT	Rubber	Ceramic Tile Wainscot on Painted Gypsum Board Wall	Acoustic Ceiling Tile and Painted Gypsum Board	Tack boards and bulletin board cases as coordinated and approved by YISD
Kitchen	Quarry Tile (Thickset)	Quarry Tile	Ceramic Tile	Vinyl-coated Ceiling Tile	-3" recess in slab -Inside cooler/freezer also

TECHNICAL DESIGN STANDARDS

YSLETA INDEPENDENT
SCHOOL DISTRICT

Auditorium (Middle/High School)	Carpet (aisle) and Sealed Concrete (under seats)	Rubber	Painted Gypsum Board and Acoustic Wall Panels	Painted Gypsum Board and Acoustic Panels	Resilient wood stage flooring
Elementary School Gymnasium	VCT	Rubber	Painted and Acoustical CMU	Painted Exposed Structure with Acoustical Roof Deck	Flooring shall include integrated game striping as approved by YISD. Tack boards coordinated and approved by YISD
Middle/High School Gymnasium	Resilient Wood	Vented Rubber	Painted and Acoustical CMU	Painted Exposed Structure with Acoustical Roof Deck	Flooring shall include integrated game striping as approved by YISD. Tack boards coordinated and approved by YISD
Dance Studio	Resilient Wood	Molded Rubber	Painted Gypsum Boards or Painted CMU / Mirrored Walls	Painted Exposed Structure	Tack boards, bulletin board cases and trophy shelves as coordinated and approved by YISD
Weight Room	Resilient Athletic Flooring	Rubber	Concrete or Painted CMU	Painted Exposed Structure	Tack boards and bulletin board case as coordinated and approved by YISD
Locker Room	Sealed or polished Concrete	Porcelain Tile or Glazed CMU	Concrete or Painted CMU	Painted Gypsum Board	*Recommend sound consultant for design and use of materials. Tack boards and white boards as coordinated and approved by YISD
Shower	Porcelain Tile	Porcelain Tile	Ceramic Tile (full height)	Painted Plaster	Tile backer board at showers
Band/Ensemble	VCT	Rubber	Concrete or Painted CMU	Acoustic Ceiling Tiles and Diffuser Panels	Wenger Sound Doors required
Choir	VCT	Rubber	Concrete or Painted CMU	Acoustic Ceiling Tiles and Diffuser Panels	Wenger Sound Doors required
Elementary Music Room	VCT	Rubber	Painted Gypsum Board or CMU	Acoustic Ceiling Tiles and Diffuser Panels	Wenger Sound Doors required

TECHNICAL DESIGN STANDARDS

YSLETA INDEPENDENT
SCHOOL DISTRICT

Activity Room	Indoor Resilient Athletic Flooring	Rubber	Concrete or Painted CMU	Painted Exposed Structure	Flooring shall include integrated game striping as approved by YISD. Tack boards coordinated and approved by YISD
Library	Modular Carpet, LVT / VCT at computer rooms	Rubber	Painted Gypsum Board	Acoustic Ceiling Tile and Painted Gypsum Board	
Office/Administration	Modular Carpet or LVT	Rubber	Painted Gypsum Board	Acoustic Ceiling Tile and Painted Gypsum Board	
Workroom/Lounge/Admin Storage	VCT	Rubber	Painted Gypsum Board	Acoustic Ceiling Tile	
Vestibules	VCT	Ceramic Tile, Rubber or Glazed CMU	Ceramic Tile or Exterior Material	Acoustic Ceiling with hold downs and Gypsum Board	Subject to YISD Emergency Operations and Preparedness Dept requirements
Receptionist / Counselors Area	Modular Carpet or LVT	Rubber	Ceramic Tile or Painted Gypsum Board	Acoustic Ceiling Tile	Subject to YISD Emergency Operations and Preparedness Dept requirements
Main Corridor	VCT	Rubber	Ceramic Tile Wainscot with Schluter trim, painted gypsum board	Acoustic Ceiling Tile, Painted Gypsum Board	
Monumental Stairs	Resilient Wood	Continuous Painted Metal Stringer	Ceramic Tile Wainscot with Schluter trim, painted gypsum board	Acoustic Ceiling Tile, Gypsum Board	Must include handrail as approved by YISD
Secondary Stairs (open areas)	VCT	Continuous Painted Metal Stringer	Ceramic Tile Wainscot with Schluter trim, painted gypsum board	Acoustic Ceiling Tile, Gypsum Board	
Stairwells	Sealed or Polished Concrete with nosing	Continuous Painted Metal Stringer	Concrete or Painted CMU	Painted Exposed Structure	Non-slip stair treads to be approved by YISD

MDF / IDF	Sealed Concrete	Rubber	CMU or Gypsum Board with 3/4" fire rated plywood	Acoustical ceiling tiles or painted exposed structure	Refer to Division 27 for additional requirements
Academic Corridor	VCT	Rubber	Ceramic Tile Wainscot with Schluter trim, painted gypsum board	Acoustical ceiling tiles	Tack boards and bulletin board cases as specified and approved by YISD
Custodial Office	VCT	Rubber	Concrete or Painted CMU or painted gypsum board	Acoustical ceiling tiles	Minimum four quad receptacles on two separate circuits; millwork as coordinated and approved by YISD
Custodial Closet	Polished or sealed concrete	Rubber	Concrete or Painted CMU or painted gypsum board	Acoustical ceiling tiles	Millwork and mop sink as coordinated and approved by YISD
MEP Rooms	Polished or sealed concrete	Rubber	Concrete or Painted CMU or painted gypsum board	Acoustical ceiling tiles	
A/V Rooms	Polished or sealed concrete	Rubber	Concrete or Painted CMU or painted gypsum board	Acoustical ceiling tiles	Electrical requirements as coordinated and approved by YISD
Single-user Restroom	Porcelain Tile	Porcelain Tile	Ceramic Tile Wainscot with Schluter trim, painted gypsum board	Painted Water-resistant Gypsum Board	
Group Toilet	Porcelain Tile	Porcelain Tile	Ceramic Tile Wainscot with Schluter trim, painted gypsum board	Painted Water-resistant Gypsum Board	Access Panels to be coordinated with YISD

* Prior to installing any floor covering using moisture-sensitive adhesives, Contractor shall perform moisture testing on concrete slab. If moisture is elevated, apply appropriate sealing application to prevent moisture penetration.

** Mold resistant gypsum board to be used in areas with high levels of moisture, damp areas and areas near a water source.

9.02 Interior Material Applications

- A. Finish materials require written approval by YISD. In general, materials shall be selected for durability, minimum maintenance and ease of repair/replacement with the YISD's maintenance personnel.
- B. Minimum ceiling heights shall be 9'-0", unless otherwise required to match existing construction.
- C. Acoustical Control: Minimize sound transmission between classrooms and other spaces, and to maximize the privacy of offices, walls around these spaces shall extend and seal the deck above.
 - 1. Do not locate mechanical rooms or restrooms adjacent to classrooms, offices or library.
 - 2. Minimum 55 NRC ceiling tiles.
 - 3. The sound insulation should be either located within the wall cavity, or be achieved by wall mass, such as solid masonry.
 - 4. All other partitions shall extend a minimum of 8" above the finished ceiling.
 - 5. In special instructional spaces requiring specific acoustical control, such as band and choir rooms, isolate these areas acoustically from adjacent rooms, with special acoustical treatment, vestibules, isolation walls extending and sealed deck above, sound traps/liners in mechanical systems, high NRC ceiling tiles and acoustical seals on all doors. Utilize Acoustical Consultant for design.
 - 6. Humidity Resistant Ceiling Tiles shall be required.

9.03 Plaster Assemblies

- A. Provide cement plaster soffits at building entrances and cement plaster ceilings at locker room shower areas. Plaster should be installed on metal lath with scratch, brown and finish coats.
- B. Apply plaster in accordance with ASTM C 926, PCA Plaster Manual and Manufacturer's instructions. Utilize the most stringent if conflicts exist.
- C. Exterior Insulation & Finish Systems (EIFS) shall not be used for either new or renovation projects.

9.04 Gypsum Board Assemblies

- A. Install as recommended by U.S. Gypsum Co., "Gypsum Construction Handbook".
- B. Use Type X or better at all interior conditions.
- C. Use 25 ga. min. cold form metal framing at all interior partitions, 20 ga. min. at large format tile, plaster, etc, and 18 ga. min. where x-bracing is required. Maximum stud spacing 16" on center.
- D. Gypsum wall board shall be 48 inches wide by 5/8" thick by maximum permissible length, with tapered edges.
- E. Exposed gypsum board surfaces shall be orange peel texture. Finish shall be approved by YISD.
- F. Utilize 5/8" thick water-resistant gypsum board in wet areas, meeting ASTM C1396.
- G. Gypsum sheathing shall be 4' x 8' x 1/2" thick water-resistant treated core with glass mats front and back. Seal joints with manufacturer's joint tape and sealant.
- H. At shower locations provide a tile backer board per ASTM C 1178.

9.05 Acoustical Ceilings

- A. Acoustical Tile Lay-in Panels
 - 1. USG Donn Ceiling Grid with Standard USG 2 X 4 directional fissured tiles; regular 5/8" flat edge lay in with 1" grid
 - 2. NRC range of 0.50 – 0.60.
 - 3. Acoustic panels shall be Class 25 (non-combustible).
- B. Where required by code, provide fire-rated ceilings per UL assemblies. Architect shall coordinate with local jurisdiction for building code compliance.
- C. Vinyl Covered Lay-in Panels shall be installed at all food preparation areas and when required by building or health code.
 - 1. 1" thick, fine-textured, white vinyl-faced.
- D. Pyramid Acoustic Panels, for sound performance in Fine Arts as recommended by acoustician.
 - 1. 4' x 4', off set inverted pyramid.
 - 2. Class A PVC plastic 0.125".
 - 3. Minimum weight 1/2 pound per square foot of surface area.
- E. Fiberglass Acoustic Lay-in Panels, when a high level of sound control is required and as approved by YISD.
 - 1. NRC range of 0.90 – 1.00.
- F. Suspension Assemblies
 - 1. Intermediate duty structural classification per ASTM C 635.
 - 2. 1" wide white enamel finish.
 - 3. Suspended ceiling systems should be of the type that allows the ceiling materials to be removed from its supporting framework, or otherwise removable, and replaceable, without refinishing.
 - 4. Provide design to prevent uplift at vestibules.
 - 5. At Vinyl Covered lay-in panels, suspension system shall be 15/16" hot dipped galvanized steel with aluminum cap grid, 6063 T-5 aluminum alloy with white finish.
 - 6. All IT conduits need to extend past the edge of the "cloud"
- G. Warranty
 - 1. Minimum 30-year warranty against visible sag and resistance to mold/mildew and bacteria.

9.06 Ceramic Tile

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. Corridor wall tile shall be minimum 12" in one direction. Maximum tile size is 12" x 24".
- C. Tile for floor applications should have a Dynamic Coefficient of Friction that exceeds 0.42 when wet.
- D. Tiles shall have a minimum hardness of 7 on the MOH's scale.
- E. Grout shall be sealed at the following locations:
 - 1. Wall tiles in wet areas
 - 2. Floor tile

- F. Install metal trim at outside corners, exposed edges and floor transitions to other materials, as manufactured by Schluter or approved equal.
 - 1. Anodized Aluminum, minimum 8' lengths, with profile dimensions to match tile thickness.
 - 2. Trapezoid-perforated anchoring leg and integrated grout joint spacer.
 - 3. Include matching end caps and transition trim for thin-set mortar installation.
 - 4. Refer to Section 10.06 for stainless steel corner guards at kitchens and concession areas.
- G. For all shower pans install Composeal Gold 40-mil Waterproof Membrane as manufactured by Compotite Corp.; Chloraloy 240 Shower Pan Liner as manufactured by Noble Co.; or approved equal. Provide 40-mil thickness crack isolation waterproofing sheet membrane.
 - 1. Crack Isolation Membrane:
 - a. Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated.
 - b. Contractor's Option: Provide either tile manufacturer's standard product as stated above, or the following product:
 - i. Chlorinated Polyethylene Sheet: Non-plasticized elastomer with non-woven polyester laminated to both sides, nominal 0.030" thickness.
Product/manufacturer; NobleSeal CIS; Noble Co.
 - 2. Provide at Slab on Grade and 2nd Floor installations in compliance with ANSI A108.17.
- H. For all upper level restrooms install the following Adhesive/Waterproof Membrane:
 - 1. Urethane Waterproofing and Tile-setting Adhesive: One-part liquid-applied urethane in a consistency suitable for trowel application and intended for use as both waterproofing and tile-setting adhesive in a two-step process. Product/manufacturer; one of the following:
 - a. Hydroment Ultra-Set; Bostik
 - b. Deck-Seal 1000; Southern Grouts & Mortars, Inc.
 - 2. Reinforcing: Woven glass fiber scrim, 2" wide roll.
 - 3. Large Format and Heavy Tile Waterproofing/Crack Isolation Membrane:
 - a. Provide Mapelastic Aquadefense as manufactured by MAPEI or approved equivalent.
 - b. Include Reinforcing fabric at change of planes and at drain areas.
- I. Install 5/8" Type X Tile Backer board behind ceramic tile walls at shower location. Georgia-Pacific DensShield, or equal.
- J. Toilet Rooms
 - 1. Tile size to be approved by YISD.
 - 2. Latex-modified cement grout in all tile.
- K. Floor Tile shall be thru body porcelain.
- L. Provide coved trim tile at wall base.
- M. Damp cure Portland Cement grout for a minimum of 72 hours.

9.07 Quarry Tile

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. Seal with slip resistant, low luster, non-buffing type sealer.

- C. Install on thick-set Portland cement mortar bed in conformance with ANSI A108.1.
- D. Damp cure grout minimum of 48 hours.
- E. Provide coved quarry wall base at Quarry tile flooring.
- F. Provide epoxy grout at all food prep areas.

9.08 Resilient Wood Flooring

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. At stages and gymnasiums in Middle and High School and Dance Floors, provide resilient wood flooring with vented base. Minimum thickness shall be 25/32".
- C. Seconds or better grade Maple flooring is preferred. Product should comply with sports-floor assembly manufacturer's written recommendations of MFMA applicable to flooring type indicated.
 - 1. Provide perimeter gap for ventilation and expansion.
 - 2. Vapor Barrier: 6-mil polyethylene per ASTM D4397.
 - 3. Shock Absorbing Pad: Minimum 7/16".
 - 4. Subfloor: 2 layers 15/32" APA rated sheathing, Exposure 1.
- D. DIN Certification: At High School Gymnasiums, provide systems tested by a qualified testing agency according to DIN 18032, Part 2 and shown to meet the following requirements.
 - 1. Shock Absorption: Minimum 53 percent.
 - 2. Vertical Deflection: Minimum 0.09 inch.
 - 3. Area of Deflection: Maximum 15 percent.
 - 4. Ball Bounce: Minimum 90 percent.
 - 5. Surface Friction: Not less than 0.5 or more than 0.7.
 - 6. Rolling Loads: No damage when subjected to 337 lbf applied through a single wheel.
- E. Design extra support at full footprint of telescoping bleachers.
- F. Game line and custom graphic designs to be approved by YISD.
- G. Dance Room Floors shall extend the entire floor surface from wall to wall.
- H. Warranty wood flooring system against cupping, buckling, and defects in material or workmanship for 2 years from final acceptance of building, at no cost to Owner.

9.09 Tempered Hardboard Flooring System

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. At High School stages (located behind curtain), provide tempered hardboard floor underlayment. Integral Color selection shall be black.

9.10 Resilient Flooring

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. Rubber Base and Accessories
 - 1. Type TS (rubber, vulcanized thermoset) rubber base, 1/8" thick x 4" high.
 - 2. Manufacture in continuous rolls.
 - 3. Outside corners shall be matching, factory formed, pre-molded units.
- C. Vinyl Composition Tile
 - 1. 12 x 12 x 1/8-inch-thick size.
 - 2. ASTM F1066, Class 2 (through pattern construction.)
 - 3. Minimum 5-year warranty.
 - 4. Provide slip-retardant, textured vinyl composition tile on sloped surfaces.
- D. Luxury Vinyl Tile – Requires district approval.
 - 1. Minimum 5.0mm thick
 - 2. Minimum 0.55mm wear layer.
 - 3. Minimum 5-year wear warranty.
- E. Rubber Flooring – Requires district approval.
 - 1. Homogeneous construction with non-porous texture.
 - 2. Sheet or tile, minimum 3mm thick.
 - 3. Rated for heavy traffic.
 - 4. Minimum 10-year warranty.

9.11 Indoor Resilient Athletic Flooring

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. At elementary level activity rooms, provide indoor athletic flooring "Taraflex Sport M Plus" by Gerflor, "Omnisports" by Tarkett, or YISD approved equal. The preferred design/finish is a wood look with slightly grained texture.
- C. At weight room, provide Spartus as manufactured by Tuflex Rubber Flooring, Div. of Rubber Products, Inc, 27" x 27" x 3/8" thick tiles, or equal.

9.12 Sand Cushion Terrazzo Flooring

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. Product and Installation shall be in strict accordance with the National Terrazzo and Mosaic Association (NTMA) instructions for Sand Cushion Terrazzo.
- C. Quartz or Marble Chips:
 - 1. All chips size 0-2 as per NTMA grading standards.

2. Abrasion and impact resistance when testing in accordance with ASTM C 131 shall not exceed 40% loss.
 3. 24-hour absorption rate not to exceed 0.75%.
 4. Chips shall contain no deleterious or foreign matter.
 5. Dust content less than 1% by weight.
- D. Portland Cement: ASTM C 150, Type 1, white color.
- E. Coloring agents: Alkali-resistant, color-stable pigments.
- F. Divider strips: 1/4" x 1 1/4" white alloy zinc, flat bar.
- G. Sand: ASTM C 33, Clean, washed, and locally available.
- H. Reinforcement: ASTM A 185, 2 by 2 by 16 gauge galvanized welded wire mesh.
- I. Isolation Membrane: ASTM D 2103, Type 13300, 4 mil. Polyethylene sheeting or ASTM D 226, 15-pound unperforated roofing felt.
- J. Curing Materials: Water or polyethylene sheeting.
- K. Mixes
1. Proportions:
 - a. Underbed: One-part Portland cement to four parts sand and sufficient water to provide workability at as low a slump as possible.
 - b. Terrazzo Topping: One 94-pound bag of Portland cement per 150 pounds of marble chips, color pigment if required and sufficient potable water to produce a workable mix.
 2. Mixing:
 - a. Underbed:
 - i. Charge and mix sand and Portland cement.
 - ii. Add water and mix.
 3. Terrazzo Topping:
 - a. Charge and mix marble chips, Portland cement and color pigment if required.
 - b. Add water and mix to a uniform workable consistency.
- L. Divider strips, and/or control joints shall not exceed 4'-0" in either direction for any pattern. Finish thickness of terrazzo shall be minimum 5/8", and total installation to rough slab shall be 3".
- M. Coordinate terrazzo control joint design with concrete slab control joints to align where possible.
- N. Finishing: Finished installation shall be uniform in color, free of pits, voids, or cracks. Upon completion, terrazzo shall show a minimum of 70% marble chips.

9.13 Precast Terrazzo Stairs

- A. Provide epoxy treads/risers for installation over concrete or steel substrate. Materials shall consist of white Portland cement (ASTM C 150), aggregates that meet ASTM C33, and marble chips that conform with NTMA gradation standards.
- B. Reinforce precast with deformed rods or wire mesh as recommended by manufacturer.
- C. Provide five lines of abrasive inserts at each tread.

9.14 Modular Tile Carpeting

- A. Prior to flooring installation, test slabs for moisture and alkaline content and include remediation procedures within specifications to prevent finish-flooring failures. Follow manufacturer's guidelines for recommended practices for preparation of subfloor for finish materials.
- B. No broadloom carpet is acceptable.
- C. Textured or level loop, tufted or woven, pile height shall be between 0.107 and 0.187, with maximum pile height variation of 1/32 inch.
- D. Pile Density of minimum 7000 oz per cubic yard, for moderate to heavy traffic, as defined in HUD/FHA publication UM-44d:
 - 1. Pile density = $[36 \times \text{pile yard weight (ounces per square yard)}] / \text{pile thickness}$.
- E. Class 1 flammability rating.
- F. Flooring Radiant Panel Test, NFPA-253, ASTM E 648.
- G. Smoke Density, NBS Smoke Density Chamber NFPA-258, 450 or less.
- H. Static Test, AATCC Test Method 134-1979, 2.5KV or below under standard test conditions 70°F, 20% R.H.
- I. Appearance Retention Characteristics:
 - 1. Appearance Retention Rating (ARR): Carpet and Rug Institute (CRI) test TMI101 graded in accordance with ASTM D-5252 (hexapod). Rating shall be a minimum of 3.0 after 12k revolutions.
 - 2. Colorfastness to Light: Test Method AATCC-16E with a rating of 3 minimum, 4 for heavy light exposure locations, after 40 AATCC fading units using AATCC gray scale for color change.
 - 3. Soiling Resistance: AATCC 171 (HWE) for 2 washings to simulate removal of topical treatments by hot water extraction, followed by AATCC 175. Minimum rating of 7 using AATCC Red 40 Stain Scale.
- J. Durability Characteristics: Provide carpet meeting or exceeding the following:
 - 1. Tuft Bind / Edge Ravel: ASTM D1335, minimum of 8 lbs-force or higher, wet.
 - 2. Delamination Strength of Secondary Backing: ASTM D 3936 minimum 2.5 lbs per inch width.
- K. Dye method: minimum 80% solution dyed, 100% preferred.
- L. Backing:
 - 1. Primary Backing: woven polypropylene or approved equal.
 - 2. Secondary Backing: vinyl or urethane backing system.
 - 3. Hard-Backed or Modular Carpet Backing: Primary Backing: Reinforced synthetic. Secondary Backing: vinyl or urethane backing system.
 - 4. Cushion Backed allowed where acoustical dampening is desired. Pre-approval of use required by YISD. Secondary backing: PVC Free polyurethane cushion.
- M. Lifetime warranty, with a minimum 10-year, non-prorated warranty against delaminating, edge ravel, zippering, moisture penetration and maximum 10% wear.

9.15 Painting

- A. Provide paint as manufactured by one of the following:
 - 1. Glidden Professional
 - 2. Kelly-Moore Paints
 - 3. PPG Pittsburgh Paints
 - 4. Sherwin-Williams Co.
- B. Paint and finish the following materials, fittings, and equipment items which are exposed-to-view.
 - 1. Iron, steel, and galvanized metal.
 - 2. Unstained Wood.
 - 3. Concrete masonry units.
 - 4. Interior concrete ceiling and beam surfaces.
 - 5. Gypsum board.
 - 6. Interior caulked joints.
 - 7. Portland cement plaster.
- C. Paint and finish bare and insulation covered piping and ductwork, conduit, hangers, grilles and registers, and primed metal surfaces and factory-finished surfaces of mechanical and electrical equipment.
- D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels, including the following:
 - 1. Factory-finished metal lockers and finished light fixtures.
 - 2. Architectural aluminum and stainless steel.
 - 3. Interior concrete floors and steps and all exterior concrete.
 - 4. Acoustic panel ceilings, unless noted on drawings.
 - 5. Pre-finished cabinets.
 - 6. Operating parts: Moving parts of operating mechanical and electrical equipment, such as: valve and damper operators, linkages, sensing devices, motor and fan shafts.
 - 7. Labels: UL, FM, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
 - 8. All IT data cabling, J hooks, cable trays, or other data associated items.
- E. V.O.C. (Volatile Organic Compound) Compliance: Products listed in the schedules and/or substitutes proposed for use by Contractor must be formulated to meet all applicable ordinances and regulations regarding maximum V.O.C. content. Utilize products which have been specially formulated to meet such requirements.
- F. Painting: All wall surfaces shall be water based unless no suitable water-based coating is available for the particular substrate. Hollow metal frames shall be oil based.
 - 1. Interior coatings that are required to be highly scrubbable shall be in a gloss sheen.
 - 2. Oil-based paint is preferred for exterior metals.
 - 3. Block Filler: Utilize block filler only of type and quality approved by primer and topcoat manufacturer.
 - 4. Curbs and fire lanes shall be painted using oil-based paint.
- G. Wood Doors: Doors shall be factory finished with a clear finish with two coats of sealer and two coats of stain.

9.16 Staining

- A. Clear wood finishes, floor coatings, stains, primers and shellacs applied to interior elements must not exceed the VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on January 1, 2004.
- B. Doors shall have a clear finish with two coats of sealer and two coats of stain.

9.17 High Impact Wall Coating

- A. Apply only with prior approval from YISD.
- B. High performance coating as manufactured as PolyShield Plus by Colortex Coating or approved equal.
 - 1. Two step water-based system.
 - 2. ASTM scrub rating of a minimum of 11,000 rubs.

END OF DIVISION 09

Division 10 – Specialties

10.01 Markerboards & Tackboards

- A. Markerboards: Shall be of porcelain enamel steel liquid chalk writing system, 4'-0" high by length indicated in the Educational Specifications. Face sheet shall be 24 gage, leveled enameling steel with porcelain enamel writing surface. Core material of nominal 1/2" thick fiberboard or double-ply hardboard. Panel backing of 0.015" sheet aluminum or 26 gage sheet steel. Manufacturer shall factory assemble and bond together the face sheet, core and backing sheet. Color shall be white and panel shall be up to 16' in length without joints. Mounting heights from finished floor to bottom of chalk rail shall be:

1. Pre-K	24"
2. Kindergarten	24"
3. Elementary	30"
4. Middle School	36"
5. High School	36"
6. Adult	36"
- B. Markerwalls: Shall only be on operable partitions in flex spaces. Provide porcelain enamel steel liquid chalk writing system, 4'-0" high by length indicated in the Educational Specifications. Face sheet shall be 24 gage, leveled enameling steel with porcelain enamel writing surface. Dry-erase surface shall be installed directly to wall as recommended by manufacturer. Color shall be white, and panel shall be up to 16' in length without joints.
- C. Tackboards: Provide vinyl covered tackboards in the configuration shown in Educational Specifications. Vinyl shall be heavy duty, self-healing laminated under high pressure to 1/4" thick cork. Rigid backing panel of 1/4" hardboard and cork shall be factory assembled and bonded together. Colors shall be approved by YISD. Tackboards shall be up to 16' in length without joints.
- D. Tackwalls: Provide tackwalls at corridors shown in Educational Specifications. Tackwall shall consist of flame-resistant 1/4" thick un-mounted fine grain natural cork in 4-foot width and shall meet the following fire-retardant ratings when tested in accordance with ASTM E 84: Flame spread - 30, Fuel contributed - 5, and Smoke developed - 80. Cork shall be vinyl covered. Refer to Division 9.1 for additional information.
- E. Frames & Trim: Marker and tack boards should have extruded aluminum frames and trim. Finish shall be Architectural Class II natural anodic coating. Provide 1" wide map rail made of aluminum with cork insert. Provide one map hook for each linear foot of map rail and two flag holders for each room. Marker troughs should be of tubular extruded aluminum with cast aluminum end caps.
- F. Provide permanent stenciled horizontal lines or horizontal/vertical grid lines on marker boards as shown in Educational Specifications.
- G. Markerboard/Chalkboard resurfacing is not allowed. At existing buildings, in cases where asbestos is located behind chalkboards, abatement will be coordinated with YISD.

10.02 Display/Trophy Cases

- A. Provide manufacturer's standard recessed display case, consisting of the display housing with extruded aluminum perimeter frame, sides and back, tackable surface, tempered glass shelves and sliding doors with lock and hardware, fully recessed fluorescent light fixtures, and operable transparent covers with hardware. Key all locks alike and provide tempered glass at doors.
- B. Provide display cases in locations as follows and/or as described in the Educational Specifications:
 - 1. Elementary Schools: One display case near the administrative offices.
 - 2. Middle & High School: A minimum of one display shall be located in the corridor near the main entrance, administrative offices, the main entrance to the cafeteria, near art classrooms, gym lobby, dance studio, near band hall, ROTC, in areas of the library/resource center, and other academic/CTE spaces as necessary.
 - 3. STEM/CTE Displays: Refer to Educational Specifications for detailed examples of display cases and display areas to be provided.

10.03 Bulletin Board Cases

- A. Provide 3" deep display cases with clear, tempered safety glass. YISD to approve height and width. Finish shall be Architectural Class II natural anodic coating. Tackboard shall be seamless sheet 1/4" thick cork with a resinous binder and washable vinyl surface. Color and texture should be recommended by Architect and approved by YISD. Furnish each cover with the manufacturer's standard lock, keying all locks alike.
- B. Location: In Corridor adjacent to teacher sign-in area, workroom area, cafeteria and in administrative office. Reference Division 9.1

10.04 Identifying Devices

- A. Interior Room Signage
 - 1. Interior Graphics: All rooms and areas within a building shall be identified with a number or name per section 1.14 Space Numbering in this document. All rooms shall receive a sign. For renovation work, DO NOT change the room numbers which are already in place. Room numbering for additions and renovations should match existing room numbers. All signs shall comply with the ADA/ Texas Accessibility Standards (TAS) and all other laws, ordinances, and authorities having jurisdiction. Braille shall be Grade II, having dimensions as required to meet TAS. Provide engraved or pre-molded lettering. Signs shall be fastened according to manufacturer. Back blank plates shall be provided for signs mounted to glass. Final interior room signage shall be approved by YISD.
 - 2. Provide occupant load signs in all rooms where the occupant load exceeds 50 or as required by IBC. Sign shall be located in a conspicuous location and identify the maximum occupant load of the space.
 - 3. At required exits, a sign with braille shall be located near the exit door.
 - 4. Signage above FDC and FDC directional as required, Fire Extinguishers, AED, and other life safety systems within the building shall be installed per requirements of the IBC and local AHJ.
- B. Exterior Building Signage:
 - 1. Cast Aluminum Letters: Cast aluminum alloy, smooth flat faces, sharp corners, true lines and accurate profiles. Provide at least two points of attachment for each letter. Finish shall be anodized or baked-on enamel, bonderized to aluminum, as selected by Architect and approved by YISD. Letters shall be fully fabricated before enameling. School name and address to be located at front of building. At MS and HS level, identify Gymnasium and Auditorium. Final exterior building signage layout and locations shall be approved by YISD.

10.05 Toilet Compartments

- A. Provide floor-mounted, overhead braced 1" thick, solid HDPE (high density polyethylene) with rounded corners. Panels shall be scratch resistant. Hardware shall be vandal-resistant satin stainless steel hardware. Provide ADA compliant sliding door latches, twisting catch operation is not acceptable. Integral pivot type hinge system should be installed on doors. Coat hooks should be installed on faculty restroom doors only. Panels that extend to the floor shall be outfitted with a shoe in the same material as the panel.
- B. Provide backing within walls and ceilings and use continuous mounting brackets for panels and urinal screens to withstand partition loading.
- C. Finish: Gray is the preferred color, although YISD will consider other color selections for approval. Panels shall be textured with an orange peel texture.
- D. Overhead braces with sloped and contoured profile that makes them difficult to grip.
- E. Door lock shall have occupancy indicator.
- F. Global partitions are used as the basis of design.

10.06 Corner Guards

- A. Metal Protector, Schluter or equal, at all outside corners in corridors.
- B. At outside corners in Kitchens provide cement-on Guards 4'-0" long Type 430, 18 gage stainless steel corner guards, 90°, 1/8" radius. Mount as recommended by manufacturer.

10.07 Cubicle Curtains

- A. Located at Clinic and where required by academic program and special education areas, provide cubicle curtain, track and hanger system. Track shall be extruded anodized aluminum. Carriers shall be an assembly with body and wheels that are self-lubricating. The eye and hook assembly shall have a 2" drop from the bottom of the track. Curtains shall be the length on track plus 10% and height of ceiling to 15" above the floor. Light shall be placed inside curtain area and individually switched. Fabric shall be flame resistant, polyester reinforced, anti-bacterial vinyl fabric. Color to be approved by YISD.

10.08 Toilet Accessories

- A. A/E shall indicate all accessories on both floor plans and interior elevations. All accessories shall be mounted in compliance with applicable IBC and ADA/TAS requirements. When the code-required mounting dimension is a minimum or maximum, the A/E should locate the accessory and indicate a dimension so as to provide for appropriate construction tolerance.
 - 1. The following accessories will be owner furnished/contractor installed:
 - a. Soap dispenser: Symmetry 1250 ML Foam "Free" Dispenser. Quantities must be verified with warehouse for new construction 2-4 months prior. Provide one at every two lavatories and at classroom sinks.
 - b. Paper towel dispenser: Soft Push Mechanical Hardwound Roll Towel Dispenser PART #404623. Provide in the following locations: group restrooms, employee restrooms, nurses' office, principal's office, locker rooms, and classroom sinks.

- c. Roll toilet paper holder: Jumbo Bath Tissue Dispenser 12 in capacity PART #404625. Provided in all toilet stalls and single user toilets.
- d. Wall-mounted Stainless-Steel trash cans under paper towel dispensers.
- 2. The following accessories will be contractor furnished/contractor installed:
 - a. Heavy-duty, vandal-resistant accessories shall be selected, including but not limited to the following listed items:
 - i. Doorstop for each toilet stall.
 - ii. Sanitary napkin receptacle shall be installed at women's restroom in secondary schools and faculty facilities. One per stall.
 - iii. Framed mirror over each sink. 18 gage Type 430 stainless steel mirror with bright polished finish and frame at middle and high schools. Mirrored glass surface with satin stainless-steel frame at administrator's and teacher's restrooms and elementary schools.
 - iv. Stainless steel grab bars in accessible stalls installed per ADA/TAS requirements. Provide wood blocking in walls at mounting locations.
 - v. Reversible Folding Shower Seat shall be water resistant, 1/2" thick solid phenolic with stainless steel frame, mounting brackets and self-locking mechanism.
 - vi. Shower Curtain Rods shall be heavy duty with stainless steel finish. Shower curtain shall be heavy duty, opaque, matte white vinyl containing antibacterial and flame-retardant agents.
 - vii. Provide mop/broom holder with shelf adjacent to all mop sink locations.
 - viii. Coat hooks shall be located in all Staff restrooms.

10.09 Fire Protection Specialties

- A. Provide as required by the City of El Paso Fire Marshal in public spaces. Coordinate with YISD as required to achieve a vandal-resistant installation.
- B. Fire Extinguisher Cabinets: Preferred style: Semi-recessed (less than 4" projection from wall for ADA compliance). Provide stainless steel trim and door and continuous piano hinge.
- C. Fire Extinguishers: Provide 10 lb. extinguisher that conforms to NFPA-10.
- D. Provide Class K Fire Extinguisher for cafeteria as required by code.
- E. All pull stations shall have a protective cover.
- F. Fire Hose Cabinets: 22 gage steel cabinet with no glass in door. Stainless steel to match Fire Extinguisher Cabinets.

10.10 Lockers

- A. Secondary Student Personal Lockers: Pre-finished metal, 18" x 18" x 36" mounted two tiers high with a four-digit standard numbering system. Each locker shall have handle-hasps to receive a student-provided lock. Provide with coat hooks and bookshelf. Lockers shall have a sloping top to prevent dust accumulation or shall be built in a wall recess. When existing lockers are to be replaced, consideration shall be given for locker size and quantity in a given footprint. Architect shall coordinate locker layout with YISD.
- B. PE Areas: Basis of design to be DeBourgh All American PE lockers; or owner approved equal.
 - 1. Provide all-welded and ventilated construction; min. 16 gage steel construction.

2. All lockers shall be expanded mesh construction with min. 73% ventilation.
 3. Each locker shall have non-recessed turn-handle latch to receive a student provided lock.
 4. Provide solid finished end panels at lockers with a minimum of 16 gage steel.
 5. Lockers shall have a sloping top to prevent dust accumulation or shall be built in a wall recess. Refer to Educational Specifications for size and quantity of PE lockers.
 6. Locker door hinge shall be full length piano hinge type.
 7. PE lockers shall be 4 tiered at 18" high each; approx. size 18"H x 18"W x 72"D; total height of PE lockers should match the height of the athletic lockers.
 8. Finish shall be baked-on enamel; Owner shall be able to select from the manufacturer's full range of colors.
 9. Provide numbering plates on all lockers
 10. Lockers shall be anchored to the floor
- C. Athletic Lockers: Basis of design to be DeBourgh All American Team lockers; or owner approved equal. Provide all-welded and ventilated construction. Each locker shall have steel 3-point turn handle-hasps to receive a student-provided lock. Finished end panels at lockers should be a minimum of 18 gage. Lockers shall have a sloping top to prevent dust accumulation or shall be built in a wall recess. Refer to Educational Specifications for size and quantity of athletic lockers.
- D. Kitchen Lockers: Provide 18" x 18" x 54" lockers in an appropriate area near the kitchen restroom. Lockers shall have a sloping top to prevent dust accumulation or shall be built in a wall recess. Lockers shall be heavy-gage steel with a baked-on enamel finish. Each locker shall have a handle hasp to receive a padlock. Provide a minimum of six lockers or as directed by YISD. Basis of design to be DeBourgh All American Team lockers; or owner approved equal.
- E. Custodial Lockers: Provide 18" x 18" x 54" lockers in an appropriate Custodial Room. Lockers shall have a sloping top to prevent dust accumulation or shall be built in a wall recess. Lockers shall be heavy-gage steel with a baked-on enamel finish. Each locker shall have a handle hasp to receive a padlock. Provide a minimum of six lockers or as directed by YISD. Basis of design to be DeBourgh All American Team lockers; or owner approved equal.

10.11 Exterior Sun Control Devices/Prefabricated Walkway Covers

- A. Where storefront openings occur on the east, west, and south building face, provide shading to protect glazing from direct sunlight. The preferred method for shading of openings is to recess under building soffit. If this option is not able to be utilized, consider the use of exterior sun control devices or prefabricated walkway covers.
1. Exterior Sun Control Devices shall be aluminum with preferred finish of Architectural Class I Clear Anodic Coating. Architect/Engineer shall design connections for attachment of sun control device.
 2. Prefabricated Walkway Covers shall be aluminum with preferred finish of Architectural Class I Clear Anodic Coating. Consider use at front of buildings for cover at parent and bus drop-off. Walkway covers should be engineered for design requirements including wind loads.
 3. Glass canopies will not be allowed.
 4. Ensure conditions do not support bird/pigeon roosting and/or nesting.

10.12 Flagpoles

- A. External halyard style only (do not use internal halyard style) 30' tall, aluminum construction. All provision shall be made to ensure minimum noise level while flag(s) are displayed. YISD will provide flags.

- B. Provide 1 flagpole at Elementary and Middle School campuses which shall have the capability to display two (2) flags. Provide 3 flag poles at High School campuses.
- C. Flagpole(s) should be located near and assist in identifying the main entrance to the building. A tapered, ground set, pole is preferred (manual operation). Flagpole should be furnished with one rope, with two sets of clips at ES/MS and one set of clips per pole at HS.

END OF DIVISION 10

Division 11 - Equipment

11.01 Energy Efficiency Requirements

- A. All equipment shall comply with the highest Consortium for Energy Efficiency (www.cee1.org) tier available for that product category. Where no CEE rating is available, equipment should meet Energy Star criteria. All equipment should be cross-referenced with available rebates and the Project Manager should be alerted to their existence where applicable.

11.02 Auditoriums

- A. To be reviewed by Theatrical Consultant.
- B. Coordinated with the District's Director of Fine Arts, through the Department of Facilities & Construction, to discuss equipment selections and additional requirements for each project:
 Scott Thoreson
 YISD Director of Fine Arts
 [T] 915-434-9714
 [E] sthoreson@yisd.net

11.03 Food Service Considerations

- A. To be reviewed by Food Service Consultant.
- B. Coordinate with the District's Director of Nutrition Service, through the Department of Facilities & Construction to discuss equipment selections and additional requirements for each project:
 Alan Crawford
 YISD Director of Nutrition Services
 [T] 915-434-0125
 [E] acrawford@yisd.net
- C. Dishwashers located at some EESs shall be high-temperature type capable of sanitizing dishes without the use of chemicals. Ysleta ISD will supply and install the EcoLab system.
- D. The District typically provides point-of-sale equipment at food service locations at school sites. Review the requirements for each individual project with the District Director of Nutrition Service, through the Department of Facilities & Construction and see the Telecommunications section in Division 27 of these Standards for related power and data scope to be included in the contract documents.
- E. Ysleta ISD shall approve a food service kitchen consultant who will coordinate all food service equipment with the Architect/Engineer. All specifications, equipment layout and rough-in data will be furnished to the Architect/Engineer and updated as the design progresses and is approved by YISD. GC to provide and install equipment.
- F. Coordination: The Architect/Engineer shall avoid all notes on the drawings such as "by others", or "by plumbing Contractor", or "by electrical Contractor", or refer to "Architects" when describing items that will be installed in the kitchen. The kitchen equipment shall be a separate list and layout by the Kitchen consultant and will need approval from YISD.
- G. Fire dampers shall be installed in exhaust hood ducts as required by code.

- H. The Architect/Engineer shall closely coordinate all plumbing, electrical, HVAC, floor finishes, recesses, and drains with Kitchen consultant and receive approval by YISD.
- I. Floor drains to have slope to drain. Minimized to allow for rolling of carts without tipping. Refer to Division 22.
- J. Grease traps/interceptors to be provided per code. Refer to Division 22.
- K. Minimum / maximum square footage requirements:
 - 1. Elementary School: 2700 - 2900 sq. feet
 - a. Population estimate 600 - 700 students
 - 2. Middle School: 3200 - 4200 sq. feet.
 - a. Population estimate 700 students
 - 3. High School 5200 - 9000 sq. feet.
 - a. Population estimate 1500 - 2000 students
- L. Design Criteria for Foodservice loading and Receiving Area (refer to appropriate sections):
 - 1. Receiving area for the delivery of all foodservice and related products, supplies and materials. This area will also be used for foodservice employees' entry and exit. Receiving Area shall be well lit and weather protected. Provide floor drains or floor sinks with hot and cold-water freeze proof hose bibb on exterior. Provide dumpsters, recycling and waste storage containers. Trash/recycling areas are to be screened from the public view.
 - 2. The receiving area should include:
 - a. One (1) 48" receiving door, lights, fly fan, doorbell audible throughout the kitchen and peep hole in door located at 48" above the finished floor.
 - b. A time clock is required at the interior of the receiving door area. Card reader (connected to locking mechanism) required at exterior of door.
 - c. The width of the receiving corridor is to be 6'-0" minimal.
 - d. Loading/unloading area will be via curbside access.
- M. Design Criteria for Storage Areas:
 - 1. Storage area for all incoming product will consist of dairy, produce, meat, and frozen. All food items to be stored on shelving with 6" floor clearance. Paper Goods, Chemicals, and Operating Supplies are stored separately from food supplies on Storage Shelving or Dunnage Racks 6" above floor.
 - 2. Baked goods are delivered directly to ambient storage. Dry storage shall be totally enclosed with doors and locks for security. All Dry Food storage areas shall be ventilated to maintain a 70-degree ambient air temperature with minimal humidity.
 - 3. Equipment shall be corrosion resistant and easily cleanable. All walls, corners and surfaces subject to abuse from materials handling equipment shall be equipped with suitable protection, i.e., corner guards and bumper rails. Refer to Division 10.
 - 4. The dry storage area should include:
 - a. To be sized to accommodate one (1) delivery a week.
 - b. To be located in the rear of the kitchen to accommodate a main receiving corridor and be near baking area to minimize cross traffic.
 - c. Shelving to be 24" wide, height 86" maximum. Five (5) shelves each unit.
 - d. One (1) Can Rack.
 - 5. The cold storage assembly should include:
 - a. To be sized to accommodate one (1) delivery a week.
 - b. Compartment size allocated at 60% freezer / 40% cooler. Freezer compartment closest to receiving door.
 - c. To be located in the rear of the kitchen to accommodate a main receiving corridor.

- d. To be located across from the preparation and production area to minimize cross traffic from the other kitchen support areas.
- e. An alarm system to be provided to monitor the temperature of the freezer and cooler. Alarm system to coordinate/interface with existing Ysleta ISD remote reporting alarm system.
- f. The refrigeration system to be located within 75' of the assembly located on roof above the kitchen.

N. Design Criteria for Bakery Area (Par Baking Operation):

- 1. The bakery area should include:
 - a. Baker's Table.
 - b. 20 qt mixer.
 - c. Mobile heater/proofer cabinet.
 - d. Fill faucet.
 - e. Hot water dispenser.
 - f. Four (4) Ingredient Bins.

O. Design Criteria for Foodservice Office:

- 1. Provide office and administrative facilities for all managerial supervisors and cashier. Provisions for computer terminal(s), printer(s), VoIP phone(s) and other typical office equipment with necessary utility/data connections and storage of supplies.
- 2. The office should include:
 - a. Located near the receiving corridor to monitor all food deliveries into the kitchen area.
 - b. Office window to be located to allow the manager to view the kitchen and the receiving corridor from a seated position.
 - c. Sized to accommodate the total amount of staff required within this space.
 - d. Interconnection to District's POS equipment and Menu Monitors as required by YISD. YISD shall provide district wide menu software.

P. Design Criteria for Restroom/Locker Room:

- 1. The restroom/locker room shall be located near the office and should include:
 - a. One (1) restroom to be provided with locker room for Elementary School, Middle School and High School. Lockers: refer to Division 10.
 - b. Number of lockers and coat hooks to accommodate the total amount of employees within the kitchen.

Q. Design Criteria for Preparation Area:

- 1. The preparation area is to be located across from the walk-in cooler assembly and to be located to minimize cross traffic from the other kitchen support areas.
- 2. The preparation area is to include the following equipment:
 - a. Preparation table with two sinks and pot rack
 - b. ScrapMaster in lieu of disposers
 - c. Support tables
 - d. Food processor
 - e. Can opener
 - f. Pan rack
 - g. Ice maker w/bin
 - h. Hose bibb for wash down of area
 - i. Three compartment sink
 - j. Horizontal Chopping Machine (HCM)

R. Design Criteria for Production Area:

1. Area should be open for maximum visibility of management personnel.
2. The production area should include:
 - a. The production area is to be located across from the freezer assembly. To be located to minimize cross traffic from the other kitchen support areas.
 - b. Production equipment to be sized to accommodate the total student population.
 - c. Production equipment should be on casters with brakes, exception: Steamers / Combi Ovens.
 - d. Exhaust hoods to be designed to accommodate all production equipment. Exhaust system to be short circuit hood and to be sized to accommodate 300 cfm per linear foot of exhaust hood. Supply air to be sized at 60% of exhaust cfm per linear foot.
 - e. Production equipment to include the following, but not limited to:
 - i. Double stacked convection ovens, (2) assemblies each.
 - ii. 40-gallon tilt braising pan
 - iii. One (1) double stack steamer
 - iv. Two burner range
 - v. Combi oven
 - vi. Production cooking equipment to be gas
 - vii. Support worktables with a meat sink and pot rack

S. Design Criteria for Serving Area:

1. The Elementary School servery area is to be designed as a "T" shape traditional servery area with single cashier station. The Middle School servery area is to be designed with (4) serving lines and (2) cashier stations. The Middle School and High School serving areas will incorporate traditional and non-traditional aspects and should be reviewed with the owner on a per school basis. The lines are to be designed to accommodate the owner's menu. Condiment counters and mobile trash receptacles to be located within the dining area as required.
2. The serving area should include:
 - a. The servery area is to be located between the seating and the kitchen area. Storefront glass is to be provided between the serving line and the seating area.
 - b. A full wall with the holding equipment is to be located between the kitchen and the servery area.
 - c. The entrance to the servery is to be located so that the queuing of students does not interfere with the seating or does not interfere with the tray drop location.
 - d. Beverages to be located near the Cashier or at the beginning of the serving line.
 - e. Serving lines to be sized to accommodate the student population and number of periods. The serving line may include, but is not limited to the following:
 - i. Tray dispenser
 - ii. Refrigerated grab n' go merchandiser or milk cooler
 - iii. Hot food wells, recessed to accommodate a sheet pan.
 - iv. Heated merchandiser
 - v. Refrigerated cold pan or frost top with frost top over shelf
 - vi. Flat top counter to accommodate, silverware, chip racks, Ice Dispenser and Frozen Beverage Dispenser.
 - vii. Cashier stations require locking cash drawers. Data connection to be interconnected to office computer.
 - viii. Drop in Ice Cream cabinet to be provided at each Middle School and High School counter.
 - ix. Menu monitoring systems are to be provided by YISD.
 - x. Ysleta ISD incorporates open and closed campuses. Review with YISD on a per school basis.
 - xi. Tray slider on the server side (confirm with YISD)

- T. Design Criteria for Holding:
 - 1. Holding should include:
 - a. Double or single door (verify with YISD) heated pass-thru cabinet and a single door pass-thru refrigerator to be located behind each serving line.
- U. Design Criteria for Warewash Area:
 - 1. Tray Drop and Warewash area to be located adjacent to the servery area if the campus utilizes non disposables.
 - 2. The warewash room to include but not limited to:
 - a. Hot water sanitizing dishmachines in Elementary and Middle Schools only
 - b. Powerwash sink in High Schools only
 - c. ScrapMaster in lieu of disposer
 - d. Soiled/clean dishtables at dishmachines
 - e. 3 compartment sinks in Elementary and Middle schools only
 - f. Tray drying racks
 - g. External booster heater for dishmachines
- V. Design Criteria for Custodial/Chemical/Laundry Area:
 - 1. The custodial/chemical/laundry area should include:
 - a. Mop sink.
 - b. Mop and broom holder.
 - c. One (1) 48" long chemical shelf, five (5) tiers high.
 - d. Hose bibb for wash down of area
- W. Water Filtration
 - 1. Remote common filtration system required for all cold-water equipment, sized to support all cold water equipment (confirm with YISD).
- X. Manufacturer and model preferences to be approved by YISD. Refer to supplemental Equipment information in Ed Specs.
- Y. Floors, walls and ceilings to be non-porous, washable, durable surfaces for ease of cleaning. Floors should be slip resistant and all surfaces shall be moisture proof for cleaning. Work areas shall be well lighted with protective lenses, moisture or vapor proof where applicable, refer to Division 9.
- Z. Additional design considerations:
 - 1. Kitchen floors to be quarry tile.
 - 2. Kitchen walls to be tile (porcelain/ceramic – confirm with YISD), light in color
 - 3. Servery walls to be tile (porcelain/ceramic – confirm with YISD), light in color
 - 4. Servery floors to be tile (porcelain/ceramic – confirm with YISD)
 - 5. Furrdown over serving lines
 - 6. Periods: PreK (1) Elementary School (7-8), Middle Schools (2-3), High Schools (1-2)
 - 7. Participation: Dinner 25%, Lunch 50%, Breakfast in Class 60% - 65%

11.04 Appliances

- A. Architect/Engineer shall specify appliances as approved by YISD including but not limited to the following item and location:
 - 1. Dishwasher (coordinate ADA): Science Prep, Life Skills, Family and Consumer Science.
 - a. Whirlpool Model No. WDF550SAAS or equivalent
 - i. Height Adjustable from 32-1/2" (ADA Height) to 34-1/2" (Standard Height).
 - ii. Stainless Steel Tub
 - iii. Energy Star

2. Range: Family and Consumer Science, Life Skills.
 - a. Whirlpool Model No. GY399LXUB or equivalent
 - i. Ceramic cooktop.
 - ii. Self-cleaning convection oven.
3. Exhaust Vent: Family and Consumer Science, Life Skills.
 - a. Whirlpool Model No. UXT4030ADB or equivalent
 - i. Vented installation: at non-vented installations specify filter kit No. W10355450 or equivalent.
 - ii. Specify switch at knee rail at accessible cooktops.
4. Microwave (Built-in): Family and Consumer Science, Life Skills.
 - a. Whirlpool Model No. WMH31017HB or equivalent
 - i. 1200 Watts
 - ii. Specify trim kit.
5. Cooktop: Life Skills.
 - a. Whirlpool Model No. WCC31430A or equivalent
 - b. 2-8 inch and 2-6-inch-high speed coil elements.
6. Wall Oven: Family and Consumer Science, Life Skills.
 - a. Whirlpool Model No. WOS51EC7A
 - b. Single oven.
7. Undercounter Ice Maker: Clinic and Sports Medicine
 - a. Uline Model No. BI98.
 - b. Accessible counter height.
 - c. 25 lbs. capacity.
8. Upright Refrigerator: Clinic (All Levels), Science Prep, Family and Consumer Science, Life Skills, Teacher's Lounge (All Levels).
 - a. Whirlpool Model No. WRT138FZDW or equivalent
 - b. Freezer on top.
 - i. 18 Cu. Ft.
9. Laundry Equipment:
 - a. When washing machines are specified for schools, consider the following:
 - i. Minimum 3.0 cubic feet capacity
 - ii. Consortium for Energy Efficiency (CEE) Tier 3 rated
 - iii. Front loading feature for Athletics and top loading for Life Skills and Family and Consumer Science
 - iv. Porcelain finish, galvanized steel shell construction
 - v. 115V, 60hz, 10A electrical power capacity. Assign a separate circuit for this equipment.
 - vi. Should have a variety of selections for wash and spin cycles.
 - b. Coordinate location of such equipment with Facilities & Construction.
 - c. Washing machine shall be near a service utility sink and ice machine.
10. Residential Clothes Washer/Dryer: Family and Consumer Science, Life Skills.
 - a. Washer - Whirlpool Model No. WFW5620HW or equivalent
 - i. Top loading.
 - ii. ADA Compliant.
 - b. Dryer - Whirlpool Model No. WGD5620HW or equivalent
 - i. ADA Compliant.
11. Commercial Clothes Washer/Dryer: Athletics.
 - a. Washer - Speed Queen Model No. SCT080
 - i. Hard mount washer-extractor.
 - b. Dryer - Speed Queen Model No. ST120
 - i. Tumble dryer.
12. Color selection for appliances to be approved by YISD.

- B. Architect shall coordinate with MEP engineer for electrical, mechanical, and plumbing requirements of appliances. Casework shall be designed for appliances to be installed with proper fit and trim. Review ADA/TAS for height and reach range requirements.
- C. Upright refrigerators shall be provided by Owner. Water connection should be provided at planned location.

11.05 Athletic Equipment

- A. Basketball Backboards:
 - 1. Elementary school basketball courts; Provide tempered glass backboards for full court play. Also provide two additional sets of stationary fiberglass backboards for half court play. All backboards shall be height adjustable.
 - 2. Secondary school basketball courts; Provide tempered glass backboards for full-court play. Also provide two additional sets of glass backboards for half-court play and equip these backboards with motorized operating lifting devices so that they may be parked in the up position for full-court activities. Provide retractable backboards at multi-purpose gymnasiums. Provide pads at all backboards, bolt-on type. Ensure Basketball backboards do not conflict with HVAC duct work or lighting.
- B. Volleyball Equipment: Provide volleyball poles with pads and nets. Pad color shall match school color. Install inserts into concrete slab under wood gym floor for volleyball net posts. Porter systems used as basis of design.
- C. Gymnasium Wall Padding: Provide a minimum of 16 linear feet of protective mats on walls behind and adjacent to basketball backboards. Pad color and design shall match school color and be approved by YISD.
- D. Roll-up Gymnasium Divider: At secondary school gymnasiums provide an electrically operated roll-up divider to section area in half. The bottom 8 feet of curtain shall be opaque solid vinyl coated polyester fabric. Upper curtain section shall be vinyl coated polyester mesh. Vinyl and mesh to be low emitting VOC. Curtain shall not rest on bleachers and provide passageway when rolled down.
- E. Scoreboards:
 - 1. Provide scoreboards (brand to be approved by YISD) with durable, high-contrast LED digits to ensure optimal legibility with low maintenance. Wide angle LED's allow for viewing from any location. Neoprene gaskets and polyurethane coating protects against outdoor moisture and corrosion. Acrylic cover and conformal coating protect indoor components. Provide wireless controller as standard equipment. Manufacturer shall include a 5-year warranty/maintenance agreement that includes all electronics and labor. Provide the following models at these locations:

	Model #	Location	Features
HS Competition Gym	Confirm model with YISD	Both Ends	Wireless Controller
HS/MS Football/Soccer*	Confirm model with YISD	Varies	Wireless / Add TOL
HS Baseball/Softball	Confirm model with YISD	Varies	Wireless Controller
MS Primary Gym	Confirm model with YISD	Both Ends	Wireless Controller
MS Auxiliary Gym	Confirm model with YISD	One End	Wireless Controller

* At High School and Middle School exterior fields. Provide Spectrum or Nevco scoreboard (or approved equal) at District Stadium locations.

11.06 Evacuation Chairs

- A. Provide evacuation chairs as follows: one evacuation chair per stair-, whether the floor exists to grade or not. It is recommended that evacuation chairs be distributed so that an approximately equal number of chairs are located on each floor above grade. The Architect shall propose locations to the District for approval. Each evacuation chair should be located outside and adjacent to the stair enclosure, clearly visible within the corridor but without obstructing access to the stair or reducing the required exit width.
- B. Do not place evacuation chairs inside the stair enclosures as this violates Fire Department requirements
- C. Avoid building alcoves for placement of the chairs. Each chair comes with wall anchor hooks and should be placed in a manner to meet ADAAG requirements. The device cover should be affixed at all times.
- D. Evacuation chair manufacturer and product: EvacuSafe Excel Evacuation Chair (59101).

11.07 Projection Screens

- A. Projection Screens
 - 1. Housing and Operation:
 - a. Metal casing
 - b. Surface-mounted, manual operation is standard for all classrooms. Motorized operation is allowed and preferred only for screens wider than 10'-0". For motorized applications, provide standard power to screen housing and low-voltage service to wall-mounted controls when possible. Controls shall include a lockable, keyed cover. When unlocked, the controls shall allow push-button operation without turning a key.
 - c. Spring rollers when housing is exposed (surface-mounted).
 - d. Controlled screen return for screens 10'-0" or wider.
 - 2. Material: Vinyl/fiberglass, GreenGuard certified, matte white with black backing and black border, flame-retardant, mildew-resistant, 1.0 gain, min. 60-degree half-gain angle. Glass-beaded screens are not allowed.
 - a. All Screens required to be tensioned.
 - 3. Mounting:
 - a. Screens shall be wall-mounted whenever possible. Mount sufficiently high to allow full viewable area to be visible when bottom is 4'-0" above the finish floor. Specify extension brackets when necessary to so that the screen will clear any projecting obstructions.
 - b. Screens at assembly spaces with stages or raised platforms may be suspended from the ceiling structure in order to be near the stage curtain or edge of stage as appropriate.
 - i. In assembly spaces, screen may have a bottom under 12" to have full viewability from projector.
 - ii. Screen should be Dual Vision to allow for rear projection.
 - 4. Sizes:
 - a. All projection screens shall be standard manufacturer dimensions allowing images that have a 16:10 width-to-height aspect ratio. No custom sizes are allowed without prior approval from the District Project Manager and the District Architect.
 - b. Projection screens shall be specified to include extra black drop at the top of the screen when necessary to allow the bottom of the screen to rest 4'-0" above the finish floor and clear the valance. The A/E shall determine the required black drop based on the mounting height and height of the viewable screen area.
 - c. Classroom screens shall have a viewable area of approximately 96" W. x 60" H.

- d. Screens at assembly spaces, including theaters, multi-purpose rooms, and libraries shall be sized so that the height of the viewable area is no less than $\frac{1}{6}$ the distance from the screen to the last row of seats. See Division 11.11
- 5. Confirm screen type (reverse throw or front projection) with YISD for every location.

11.08 Laboratory Fume Hoods

- A. Laboratory fume hoods are to meet or exceed OSHA requirements per section 8 CCR 5154.1.
- B. Provide ONLY ducted laboratory hoods exhausting air to the exterior of the building. Ducting shall be negatively pressurized inside the building envelope. Re-circulating or "ductless" (filter-equipped) hoods are NOT ALLOWED.
- C. Do not incorporate demonstration (two-sided) laboratory hoods into any designs.
- D. Fume hoods shall be flush to the front of the casework.
- E. Position laboratory hoods away from doors, operable windows, and other air sources that can create turbulence and/or contaminant re-entrainment from the hood.
- F. Provide all trim and accessories to have a complete, functional constant volume fume hood in Chemistry, Integrated Physics, and other areas as defined in the Educational Specifications. The Services included to the fume hood shall be gas, power and water, unless otherwise directed by YISD and flush to the counter top. Provide a combination vertical and horizontal sliding sash. The countertop shall be epoxy resin

11.09 Kiln Hoods

- A. Provide Exhaust Hoods at all kiln locations.
- B. Kilns will be Owner furnished.
- C. Architect shall coordinate with YISD all venting and exhaust requirements, and for specifying the manufacturer-designed mechanical (fan-powered) ventilation ("venting") kit. Ventilation must be exhausted directly to the exterior of the building at a location away from foot traffic, play areas, windows, or building air intakes.
 - 1. Basis of Design: Vent-a-Kiln.
- D. The exhaust system is to have a separate electrical circuit.
- E. Through the use of the venting kit, points where firing and combustion products may escape from the kiln's firing chamber and into the room must have air flowing into the firing chamber, unless the kiln itself is housed inside of an exhaust hood or ventilated enclosure. Such exhaust hoods or ventilated enclosures must have air flowing into them from the surrounding room in sufficient volume and velocities to capture firing and combustion products emitted from the kiln and prevent their escape into the room.
- F. During kiln operation fans in venting kits must be operated in strict accordance with the manufacturer's recommendations. Kilns housed in exhaust hoods or ventilated enclosures must be equipped with electrical interlocks to prevent the kiln from firing unless the fans are operating.
 - 1. Tie the room heat detector into the shunt-trip breaker of the kiln.

- G. Pottery rooms need clay traps in sinks and storage for the work.
- H. YISD will secure the kilns to their working surface.
- I. High temperature sprinkler heads required at kiln rooms.

11.10 Playground Equipment

- A. To be reviewed by Playground Equipment Consultant.
- B. Pre-engineered steel structures
- C. Architect shall require written certification prepared and signed by a Professional Engineer registered in the State of Texas, verifying that the steel structure design meets specified loading requirements and codes of authorities having jurisdiction. Refer to Division 32.11

11.11 Motorized Projection Screens

- A. Provide ceiling-recessed, motorized projection screens at Cafetorium/Stage, Auditorium, Band Hall, Orchestra Hall, and other areas per Educational Specifications and confirmed through YISD. Screen size shall be determined by projector location and room size. Provide extra drop to lower screen within 2'-0" above the finish floor. Screen shall be operated by 3-position control switch (pixie). On Stages where there is a valence, the top black masking of the screen needs to be longer to ensure projection clearance. Reverse throw projectors may be used in Cafetoriums and Auditoriums, confirm with YISD.
- B. Please reference Division 27

END OF DIVISION 11

Division 12 – Furnishings

12.01 Horizontal Blinds

- A. Provide 1" wide x 0.0085" thick, slat-type aluminum blinds in classrooms, science labs, library, and administration areas and other areas as specified by the Educational Specifications. Provide 1" valance for each blind. Unit shall tilt the slats to any desired angle and hold them at that angle. Operation shall be by wand of sufficient length and swivel for easy operations. Lift cord shall be of adequate diameter, braided of high-strength synthetic fibers. Color to be approved by YISD.

12.02 Window Shades

- A. Window shades shall be provided at cafeterias, assembly areas, libraries, gyms, lecture halls, and where black out conditions are required and as specified in the Educational Specifications. During the design phase, the architect shall discuss the use of window shades in assembly areas with YISD.
- B. Recessed ceiling shade pockets at suspended acoustical ceiling or dropped drywall ceilings are not allowed.
- C. Side and Sill Channels: For room darkening shades or blackout shades, provide 2-piece extruded aluminum side and sill channels to eliminate left, right and bottom edge light gaps. One-piece side channels will not be acceptable.
- D. Shade Cloth Material:
 - 1. All shades shall be made of interwoven non-combustible fiber, inherently flame-retardant and permanently flame-resistant. Material shall pass test per NFPA 701-1999, Test Methods 1 and 2. Fire rating: NFPA Class A.
 - 2. Room-darkening shades shall be hemmed top and bottom, with both hems double needle stitched and back stitched at edges. Hems must be turned so that stitching passes through three thicknesses of fabric.
 - 3. Sufficient length of materials to allow two complete wraps around roller when shade is fully extended. Roller in hem construction prevents fabric from being pulled off roller. Fabric is to be attached by double wide staples. No adhesive is allowed.
 - 4. Material for general shading shall be Phifer SheetWeave Performance Plus Interior Sun Control Fabric Style 2410, or Mermet Silver Screen VS05 series, or approved equal. Greenguard certified, PVC-free.
 - 5. For black-out shading, material shall be Phifer Sheerweave Interior Sun Control Fabric Style 7500 or approved equal. Greenguard certified, PVC-free.
 - 6. Fabric Openness Factor: 3% where blackout shade not required.
- E. Cord: Shall be stainless steel chain. Nickel plated steel chain not acceptable. Include cord clasp to be mounted at an appropriate height above windowsill side wall. Chain shall be rated for 90 lbs. breaking strength.
- F. Fascia:
 - 1. Continuous extruded aluminum "L"-shaped profile to conceal the roller shade tube mechanism. It shall be attached to the tube mounting brackets by snapping it in place on a hinge rib clip, without the use of adhesives, magnetic strips, or exposed fasteners. It shall be able to be installed across two or more shade bands in one piece as specified.
 - 2. Fascia minimum thickness of 5/16-inch with paint finish in color as selected.

3. Provide bracket/fascia end caps where mounting conditions expose outside of roller shade brackets.
4. Notching of fascia for manual drive chain is not acceptable.

12.03 Laboratory Casework and Equipment (Middle and High School)

- A. Casework: Provide Red Oak Premium Grade veneer at all exposed exterior and semi-exposed surfaces of casework. Cabinet front and drawer style shall be flush overlay with vertical matching grain direction. Classroom upper and base cabinets shall be lockable with stainless steel wire finger pulls. Use 1" thick epoxy-resin countertops at base cabinets, tables, sinks and workstations. 4" high epoxy-resin applied curb backsplash where base cabinets, tables, and workstations are adjacent to a wall. All cabinets shall have locks, except where noted; coordinate with YISD.
- B. General: At Teacher's demonstration table provide valve to shut off gas and water from student work stations. Provide separate switch to shut off electrical at student work stations. Located on the wall, behind Teacher's demonstration table, provide emergency shut off button that disables all utilities in the labs (water, gas and electric) including teachers demonstration table. Dedicated computer outlets and YISD provided equipment outlets should not be tied to emergency shut-off. Provide reset button for utilities in adjacent prep room. Wall mounted VoIP phone
- C. Equipment: For each science lab provide fire blanket, handheld emergency eyewash (teacher station), emergency shower/eyewash station (with floor drain under shower), fire extinguisher, goggle storage (provide electrical outlet), acid storage cabinet, and flammable liquid storage cabinet. First aid kit will be provided by YISD. Coordinate all utilities with YISD during the design phase.

12.04 Library Furniture and Equipment

- A. Architect shall coordinate with YISD for library furniture layout. Furniture shall be included in the project drawings and specifications. The General Contractor will furnish circulation desk, bookshelves, computer tables, study carrels, tables, chairs, and all related equipment for the library. Architect shall coordinate electrical and data requirements at the circulation desk and computer stations with YISD. Furniture finish shall be coordinated with YISD. Refer to Education Specifications
- B. Furniture shall support collaboration and allow for easy flexibility and change.

12.05 Musical Instrument Cabinet System

- A. At middle and high school level provide storage cabinets for musical instruments that are chip and abrasion resistant under normal usage and protect instruments and cases from damage. Shelving should withstand continuous use without surface or front edge breakdown. Provide heavy duty doors. Hasps for owner provided padlocks shall be provided at each door. Provide Wenger cabinets or approved equal. The layout and type of cabinets shall be coordinated with YISD.

12.06 Fixed Audience Seating

- A. Auditorium: Provide Citation by Irwin Seating Company or approved equal. Seating shall be comprised of an enclosed aisle end panel with veneer surfaced insert panel, a one-piece injection molded polymer high impact-resistant rear panel that shall be not less than 25" in length, extending down to the rear of the seat. Backs shall be rectangular shaped, padded and upholstered on their face. The seat pan shall

be self-lifting with a torsion spring seat lift mechanism and have a 3" formed cushion over an ergonomic-formed polymer substrate. The seats shall be supported by a 14 ga. steel standard chair platform with a solid wood arm rest. Row and seat shall have identification plates. Provide ADA accessible seating as required. Seats shall be 20"-22" wide with color selected from manufacturer's standard and premium colors as approved by YISD.

- B. Lecture room seating in secondary schools shall be similar to auditorium seating, with a foldaway tablet.

12.07 Telescoping Nonfriction Bleachers

- A. Telescoping Nonfriction Bleachers: Provide multiple-tiered seating rows comprised of seat and deck components, risers, access doors and supportive understructure. It shall be operable on the telescoping principle, stacking in minimum floor area when not in use. Vendor information and parts list should be included as part of the close-out documents.
- B. Accessories:
 1. Steel, self-storing and 42" high "safety end rail" with 4" on center vertical balusters for exposed bank ends.
 2. End panels/curtains: Full height, contoured stack closure panel at each exposed bank ends. Panels shall be constructed of 5/8" southern pine plywood attached to a steel framework. Panels shall be finished to match the deck board surface of high-density polyethylene plastic in light grey or dark brown coating (color as selected by Architect), trimmed with aluminum edging.
 3. Provide 48" high guardrail at the back of the Reverse Fold bleachers.
 4. Provide full width automatic aluminum aisle closures.
 5. Provide standard 4'-6" wide foot level aisles at all aisle locations with intermediate tread and riser.
 6. Provide center handrail at each aisle to conform applicable code requirements.
 7. Accessible Seating Provisions: Provide first tier accessible cutouts per requirements of (ADA) Americans with Disabilities Act and Texas Accessibility Standards. Include manufacturer's standard front guardrail and closure panel below guardrail. Reference drawings for locations.
 8. Rear Panels at Reverse-Fold Bleachers: On units not wall-attached, provide full width rear closure panels. Panels shall extend vertically from underside of top row to within 1½" of floor. Paneling to be 5/8" southern pine plywood attached to a steel framework. Panels shall be finished to match the deck board surface of high-density polyethylene plastic in light grey or dark brown coating (color as selected by Architect), trimmed with aluminum edging.
 9. Seats shall be contoured, molded plastic.
 10. Wheels, soft face non-marring rubber 3½" diameter x 1½" face. 4 wheels shall be located directly under each moving column through row 10, 5 wheels per vertical column through rows 11-15 and 6 wheels per vertical column above row 15. Where bleachers are installed on wood flooring, provide solid substrate under path of wheels in bleacher (ref. division 9 in this document for additional information).
- C. For bleachers greater than 5 rows provide a non-friction electrical power system with manual override and two plug-in remote controls.

12.08 Site Furnishing

- A. Bicycle Rack Design to be approved by YISD:
 1. Racks shall be designed to accommodate "U"-shaped locking devices and support the bicycle horizontally in two places.
 2. The racks shall be stainless steel.

3. All Bicycle parking spaces must be hard surfaced and dust free.
 4. Racks shall be embedded in concrete paving. Bolted connections are not allowed.
 5. Located near main entry and at secondary entries that will be open during student arrival.
 6. Refer to City Zoning Ordinance for additional requirements.
- B. Seating and Tables: Adjacent to Cafeteria, the Architect should consider the use of outdoor seating and tables to accommodate additional student seating. Units should be surface mounted and powder-coated expanded metal. Provide seating and tables for (High School, Middle School, or Elementary School) students with a position meeting ADA/TAS requirements.
- C. Benches and Trash Cans: Powder-coated expanded metal benches shall be provided near the main entry for students waiting. Bench shall be surface mounted on concrete paving for permanent installation.

12.09 Manufactured Casework

- A. Casework shall meet Architectural Woodwork Institute's Architectural Woodwork Standards Custom Grade or better. Drawers and cabinets to be locked are to be keyed differently, with locks in individual rooms keyed alike. Locks shall be provided at teacher cabinets, clinics, and offices. Provide a master key. Shelf supports for adjustable shelves shall be twin pin design with anti-tip-up shelf constraints for both 3/4" and 1" shelves. Design to include keel to retard shelf slide-off and slot for ability to mechanically attach shelf to clip. Load rating to be a minimum 300lbs at each support without failure. Hinges shall be 170-degree five knuckle type. Manufacturers shall be approved by YISD. Refer to Division 6.

END OF DIVISION 12

Division 13 - Special Construction

13.01 General

- A. The design team shall coordinate with Ysleta ISD to establish minimum performance requirements for all items, including the following items listed below within this chapter as defined by the CSI Master Format. The minimum performance standards are to be developed on a per project basis and reviewed with Ysleta ISD prior to the issue of Construction Documents for bidding or permitting.
 - 1. Cooling Tower enclosures
 - 2. Insulated Rooms
 - 3. Steel Structures
 - 4. Canopies/Awnings
 - 5. Grandstands
 - 6. Frame-Type Bleachers
 - 7. Metal Storage Buildings
 - 8. Metal Building Systems
 - 9. Pools

13.02 Sound-conditioned Rooms

- A. Design Requirements: Provide modular, sound-isolating enclosures with internal acoustical environments suitable for music instruction and rehearsal, voice announcements, tape recording, private consultations, testimony and remedial instruction.
 - 1. Rooms shall be modular in 15" increments with individual panels that are removable and replaceable with only partial disassembly of module. Flooring to be approved by YISD.
 - 2. Standard module should include perimeter neoprene floor seal, door with full window, corner posts with integrated speakers, PA, enclosures and wiring. Wall panels shall have integrated wiring and mountings for microphones. Ceiling grid and panels shall be included with integrated ventilation, illumination, power and signal distribution systems. Components should allow for upgrade to V-Room Practice without disassembly. Manufacturer shall be Wenger Corporation or approved equal.
 - 3. YISD will also consider built-in-place sound-conditioned rooms where budget is a concern.

13.03 Modular Buildings

- A. Modular classroom buildings are not allowed.

END OF DIVISION 13

Division 14 - Conveying Equipment

14.01 Hydraulic Elevator

- A. Provide hydraulic, holeless passenger/stretcher (Offset Entry) elevators at all multi-story facilities, including existing facilities so designated. Provide 3'-6" clear opening for door and inside of cab dimension of 4'-9" x 6'-8". Car speed shall not exceed 150 feet per minute. Capacity shall be a minimum of 3000 lbs. Walls shall be high pressure laminate with hooks for removable pads. Floor shall be vinyl composition tile and ceiling a suspended white translucent diffuser. Provide 1-1/2" round handrail with stainless steel finish. Elevator shall have keyed hall switch for access at all levels. Pit shall have a ladder and permanently installed sump pump that complies with State of Texas Elevator Code and Local Municipal requirements. Emergency level shall be determined by building and shall be to the main exit level.
- B. Elevator shaft shall be rated as per the building code requirements. Machine Rooms shall have the same fire rating as shaft. Machine Room door shall be minimum 3'-6" wide self-closing and self-locking. Provide class ABC fire extinguisher in each machine room. Refer to the State of Texas Elevator Code for additional requirements.
- C. Elevators, hoistway shafts, and machine rooms shall comply with IBC Chapter 30, including all standards referenced therein.
- D. Per ASME A17.1, article 8.4.11.1, where buildings are designed with expansion joints, the machine room and the hoistway shall be located on the same side of an expansion joint.
- E. Isolate pumping plant and piping from building structure.
- F. Submittals are to be reviewed by the District, Project Architect.
- G. Emergency telephone shall ring the main site office and after four rings shall roll over to the emergency repair line (weekdays 7:30 to 4:00) and (after hours and weekends). Elevator shall be equipped for Cellular phone line.
- H. Provide telephones and have them identified at the main telephone board with a durable, permanently marked tag with assigned phone number and "Elevator Emergency Telephone."
- I. Elevators, elevator machine room, and elevator fire recall are to be standardized and approved by YISD.
- J. Maintenance service
 - 1. Initial Maintenance Service: Beginning at Substantial Completion, provide twelve (12) months' full maintenance service by skilled employees of the elevator Installer to include:
 - a. Monthly preventative maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity.
 - b. Provide parts and supplies as used in the manufacture and installation of original equipment.
 - c. Provide emergency callback service 24 hours-per-day, 7 days-per-week with a response time of 2 hours or less. Provide emergency callback service 24 hours-per-day.

14.02 Wheelchair Lifts

- A. Provide manufacturer's standard wheelchair lift system to meet IBC, ADA, TAS Standards, and State Elevator Code. The rated load shall be 750 lbs. minimum with a speed of 9 feet per minute. The station controls shall be push button with key operated on/off switch. Provide key operated call-send controls at upper and lower stop. Platform shall be non-slip. Finish to be electrostatically applied powder coat selected from manufacturer's standard and optional colors.
- B. Vertical platform lifts are the preferred product for most applications.
- C. Incline lifts mounted along existing stairs are not allowed.
- D. Provide appropriate signs related to ADA, TAS, and State Elevator Code. For type of signs, mounting heights and other related information, refer to Division 10 for signage.
- E. Provide emergency power back-up and same maintenance/operation and certification submittals as required for elevators.
- F. Exterior lifts not allowed.
- G. Vertical platform lifts shall be pit mounted.
- H. Paint a "keep clear" zone on the floor, adjacent to the top and bottom landings. The "keep clear" zone includes the floor area needed to access the lift controls.
- I. The first two years of lift maintenance are to be included in the Construction Contract. Contact telephone numbers and maintenance records must be made available to the District. A final service and inspection are required three weeks before the expiration of the two year's warranty maintenance, as coordinated with YISD Maintenance Department.

END OF DIVISION 14

Division 21 - Fire Suppression

21.01 General Provisions

- A. All new facilities, new additions to existing facilities and remodeled facilities with existing fire suppression systems for YISD shall be provided with full and complete fire suppression system as required for all applicable regulations, codes, and ordinances.

21.02 Fire Sprinkler Systems

- A. All fire sprinkler systems are to be designed and installed by a Texas State Fire Marshal licensed company. The fire sprinkler system shall also be designed and installed per current edition of NFPA 13, Standard for the Installation of Sprinkler Systems, current edition of International Building Code, and the current edition of International Fire Code. The sprinkler system also has to be approved by the City Fire Marshal and YISD.
- B. Fire sprinkler water lines shall not cross over any MDF and IDF closets. Refer to Division 27.

21.03 Existing Systems and Conditions

- A. The design professional shall visit the existing facility, accompanied by YISD and YISD Project Management Staff, to determine the condition of the existing plumbing systems and equipment. The design professional shall provide a written recommendation detailing the condition of the system.
- B. Ensure existing conditions meet current fire codes to include fire rated walls and wall penetrations.

21.04 Pipe Routing

- A. The piping shall be run as direct as possible parallel to and at right angles to the walls.
- B. Water pipes shall not cross over MDF / IDF closets.

21.05 Utilities

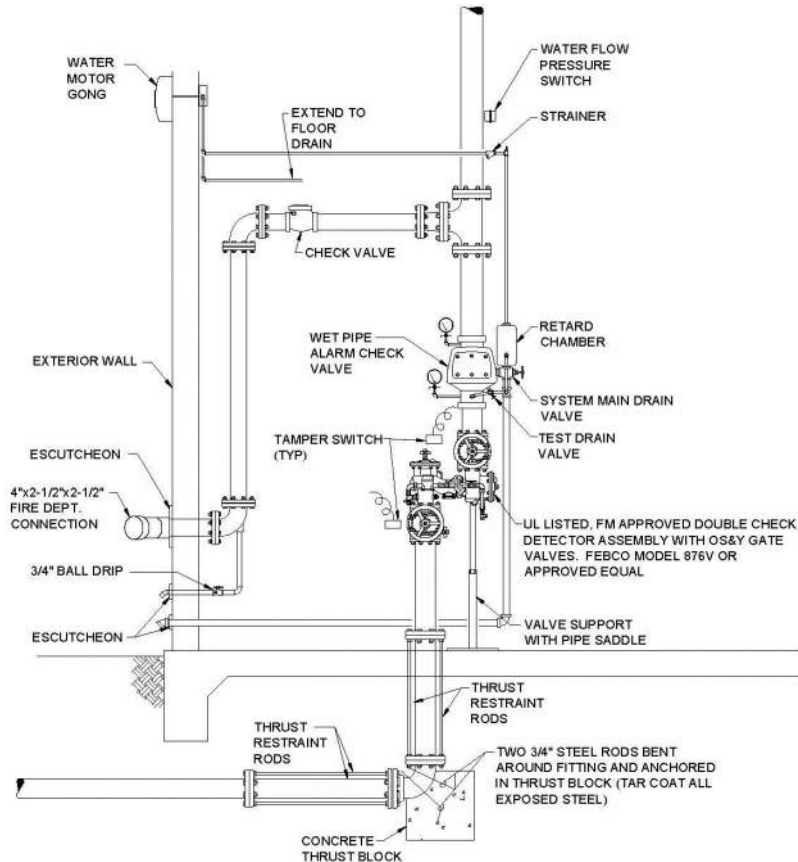
- A. The Architect/Engineer shall verify with the El Paso Water Utilities the size, location, direction of flow and depth of the water main. A Hydrant Flow Test shall be executed on the two closest hydrants. The riser room shall be on an outside wall closest to an acceptable water main.
- B. Fees and Charges: YISD will not provide direct separate payment of fees, permits, connection charges, or otherwise perform any services to or at the project without specific prior advisement by YISD.
- C. Construction Documents:
 1. Indicated Services: Indicate location, depth, size, and direction of flow of and pressure of existing and proposed new water mains.
 2. Existing Conditions: Plans shall indicate all known existing underground work that is in the area related to the project, including piping, valves, manholes, pits, vaults, transformers, electrical wiring, telephone facilities, etc., whether or not being connected or otherwise involved with this project and should include signage to meet fire code.
 3. An independent water tap shall be provided for fire systems.
 4. All exterior backflows and water pumps shall include a hot box.

21.06 Design Criteria

A. Wet Pipe Sprinkler Systems

1. Hydraulically design per NFPA 13 to provide:
 - a. Light Hazard Occupancies - a density of 0.10 gpm/ square feet. over the most hydraulically remote 1,500 square feet plus 100 gpm hose stream allowance and maximum sprinkler of 225 square feet. This includes offices, lobbies, and common areas.
 - b. Ordinary Hazard Group I - a density of 0.15 gpm/ square feet over the most hydraulically remote 1,500 square feet plus 250 gpm hose stream allowance and maximum sprinkler spacing of 130 square feet. This includes kitchen areas, heated parking garages, etc.
 - c. Ordinary Hazard Group II - a density of 0.20 gpm/ square feet over the most hydraulically remote 1,500 square feet plus 250 gpm hose stream allowance and maximum sprinkler spacing of 130 square feet. This includes mechanical rooms, electrical rooms, storage areas (not including high piled storage over 12 feet high), and other areas as defined by NFPA 13.
 - d. Extra Hazard Group I – a density of 0.30 gpm/ square feet over the most remote 2500 square feet.
 - e. Extra Hazard Group II – a density 0.40 gpm/ square feet density over the most remote 2500 square feet.
2. High piled storage over 12 feet high (as defined by NFPA 13) is required to provide the appropriate density per NFPA 13 based on storage height, distance between aisles, the type of commodity being stored, and whether the commodity is encapsulated or unencapsulated. The maximum sprinkler spacing for Extra Hazard and storage occupancies is 100 sq. ft.
3. Piping shall be black Schedule 40 piping for sizes six inches and smaller. Piping larger than six inches shall be black Schedule 10.
4. Provide white concealed sprinklers in areas with suspended ceilings and brass upright sprinklers in areas exposed to structure. For areas containing special architectural features. Coordinate with Architect/Engineer and receive approval from YISD.
5. Provide a reduced pressure detector assembly at the service entrance. Manufacturers to be approved by YISD. Enclosure to be heated.
6. Do not install any piping through MDF and IDF closets of server rooms.

FIRE SPRINKLER SYSTEM DETAIL (DCDA WITH APPROVAL ONLY) RPDA TO BE PROVIDED IN EXTERIOR OF BUILDING INSIDE INSULATED/HEATED ENCLOSURE.



NOTE: ALL UNDERGROUND BOLTS & NUTS SHALL BE STAINLESS STEEL

B. Dry Pipe Sprinkler Systems:

1. Use Dry pipe sprinkler systems for areas that are not conditioned and may fall below 40°F.
2. Use Dry pipe sprinkler systems for areas with wood floors that exceeds 1,000 square feet.
3. Using the Occupancies in section A., increase the required remote area by 30% increasing the minimum remote area to 1950 square feet for light and ordinary hazard occupancies.
4. An air compressor is required to provide the pressurization of the system. The air compressor must restore the air pressure for the dry pipe system within 30 minutes. Acceptable manufacturer is Gast or equal.
5. Piping shall be black Schedule galvanized schedule 40 piping for sizes six inches and smaller. Piping larger than six inches shall be black galvanized schedule 10.
6. Piping must be sloped at 1/4" per 10 feet for main piping and 1/2" per 10 feet for branch line piping.
7. Provide concealed sprinkler heads.

C. Antifreeze Sprinkler Systems are prohibited.

D. Clean Agent Fire Suppression Systems

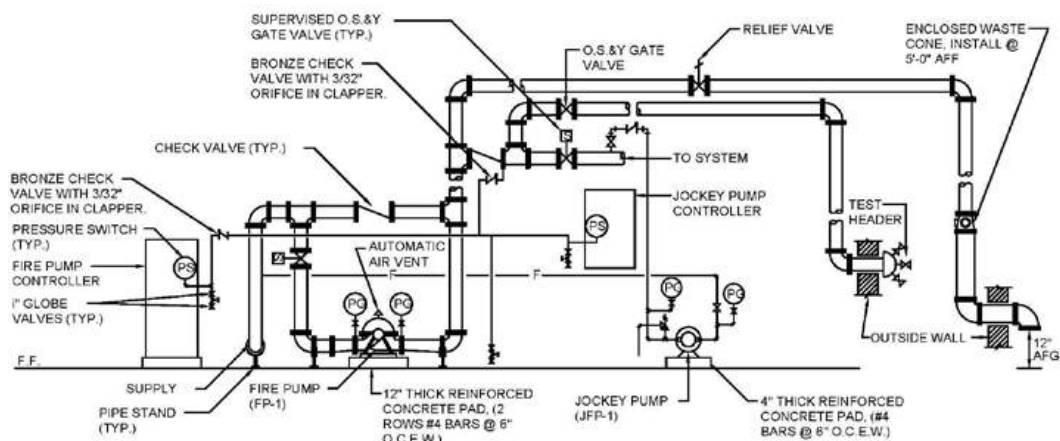
1. Clean agent systems are only required in rooms with high value critical systems. These are to be coordinated on a case-by-case basis with YISD.
2. Use FM-200, HFC-227ea or equal. Double the amount required for a redundant system.
3. Coordinate with Ysleta ISD for room considerations.

E. Standpipe Systems

1. Standpipe systems are to be designed and installed in accordance with the most current versions of NFPA 14, Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems, International Building Code, and International Fire Code.
2. Sprinkled buildings with floors greater than 30 feet above the lowest level of fire department vehicle access are required to have Class I standpipe systems with a 2 ½" hose valves located in the intermediate landing. Buildings that are not sprinkled require a Class III standpipe. A Class III standpipe requires a 1 ½" and a 2 ½" hose valve.
3. The standpipe must deliver 500 gpm to the most remote standpipe and 250 gpm to any additional standpipe up to a maximum of 1000 gpm as required by NFPA 14 for building that are sprinkled and 1250 gpm for buildings not fully sprinkled.
4. Buildings having floors greater than 75 feet above the lowest level of fire department vehicle access are required to have standpipes with a flow rate at 100 psi of pressure at the top of the most remote standpipe.

F. Fire Pumps

1. Fire Pumps are to be designed and installed in accordance with the most current versions of NFPA 20, Standard for the installation of Stationary Pumps for Fire Protection and The National Electrical Code, NFPA 70 for the electrical service.
2. The fire pump should be based on the greater of either the flow based on the standpipe system demand or the most demanding sprinkler system.
3. Provide a service entrance rated fire pump controller with a service disconnect.
4. If a secondary power source is available, provide an automatic transfer switch. If a secondary power source is not available, provide a standby generator or a diesel fire pump could be installed.
5. A fire pump should be used if the water supply cannot provide the pressure to support the standpipe and or sprinkler system and protected from weather.



END OF DIVISION 21

Division 22 – Plumbing

22.01 General Provisions

- A. All new facilities, new additions to existing facilities and remodeled facilities for YISD shall be provided with full and complete plumbing systems as required for practical operation and in conformance with all applicable regulations, codes, and ordinances.

22.02 Fixture and Equipment Determination

- A. Quantity and location of plumbing fixtures will be determined and confirmed by the ME and, where YISD has preferences, as indicated herein.

22.03 Coordination

- A. The Architect/Engineer shall design, coordinate, size, and locate all equipment and support systems for the proposed plumbing work and shall coordinate all ventilation and space requirements for equipment installation and pipe concealment. Service access and valve locations shall include coordination with YISD.

22.04 Existing Systems

- A. The design professional shall visit the existing facility, accompanied by YISD and Project Management Staff, to determine the condition of the existing plumbing systems and equipment. The design professional shall provide a written recommendation detailing the condition of the system.

22.05 Energy Conservation

- A. Projects for all new facilities, new additions to existing facilities and remodeled facilities, where appropriate, shall conform to ASHRAE Standard 90.1, 2010 edition as related to energy conservation in plumbing systems design and construction.

22.06 Special Requirements

- A. The Architect/Engineer shall verify and confirm with YISD the need for any special systems, such as gas, compressed air, vacuum, distilled water, grease waste, acid waste, or other special plumbing application.

22.07 Pipe Routing

- A. In general, piping shall be run as direct as possible; however, except for piping buried underground, all piping shall be run parallel to and at right angles to the walls, partitions, etc., and shall be neatly grouped in parallel lines. No plumbing piping shall be installed in, through, or above ceiling of transformer vaults, electrical rooms, or telephone rooms, equipment room, service entrance room or MDF/IDF rooms.
- B. No piping shall be run horizontally in concrete floors except in science lab that require gas pipes at the teacher's desk. These runs shall not exceed 4 feet in length and shall be crimped or welded. Threaded pipe connections are not allowed.

22.08 Future Expansion

- A. In sizing the various plumbing systems, ample provisions shall be made for anticipated future additions to the building and future modifications by the utility providers.

22.09 Utilities

- A. Verification: Architect/Engineer shall verify with the affected utility agencies the size, location, direction of flow, and depth of all sanitary sewer, storm sewer, water, and gas mains adjacent and/or available to the project as well as metering/monitoring equipment. Verify the pressure for all water and natural gas lines. Connections to public sewers and water main taps and/or services shall comply with all governing codes.
- B. Fees and Charges: YISD will not provide direct separate payment of fees, permits, connection charges, or otherwise perform any services to or at the project without specific prior advisement by YISD.
- C. Construction Documents:
 - 1. Indicated Services: Indicate location, depth, size, and direction of flow of existing or proposed new sanitary and storm sewer mains and indicate location, pressure, and size of existing and proposed new water and gas mains.
 - 2. Elevations: Finished floor elevation(s) for the building shall be clearly and prominently indicated. Building sanitary and storm water lines shall indicate finish grade and invert elevations at manholes, leaving the building, and other critical points. Building shall be designed to permit gravity drainage of stormwater.
 - 3. Existing Conditions: Plans shall indicate all known existing underground work that is in the area related to the project, including piping, valves, manholes, pits, vaults, transformers, electrical wiring, telephone facilities, etc., whether or not being connected or otherwise involved with this project.
- D. Provide separate services for domestic, irrigation, and fire sprinkler systems.

22.10 Design Criteria

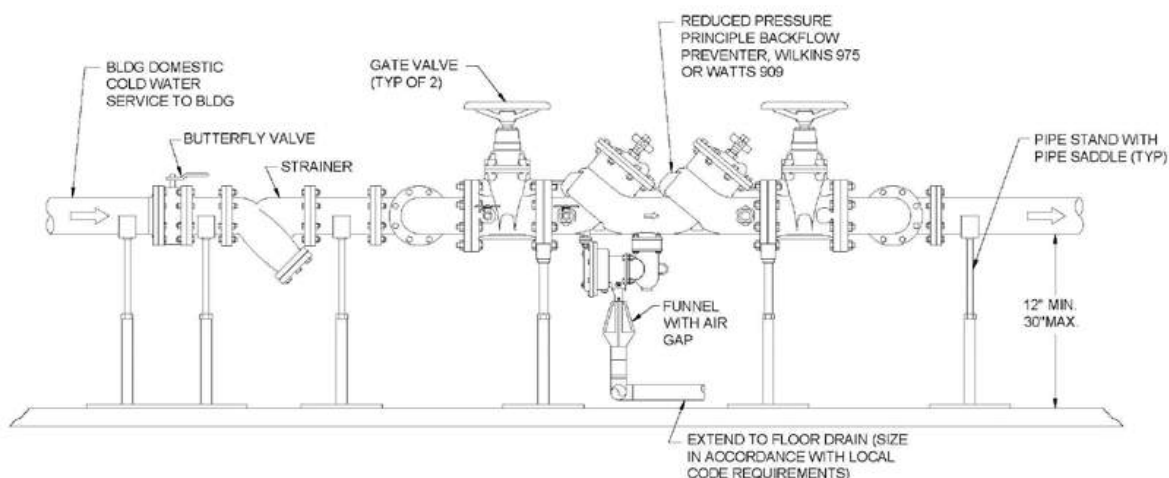
- A. All plumbing systems shall be designed in accordance with the following criteria:
 - 1. Cold Water System:
 - a. General: The Architect/Engineer shall contact the local water department for the availability of a public water system, ascertain probable maximum and minimum street pressures, information about the water analysis, the type of meter, the location of the meter, and what work is to be done by the water department or water company.
 - b. Isolation: All building water services shall be provided with curb valves. Where site water mains are looped, sectionalizing valves shall be provided. Provide isolation valves at all outside hose bibbs.
 - c. Sizing Criteria:
 - i. Velocities: The maximum allowable velocity in the water piping shall be as follows:

PVC or Copper Pipe:	
Mains	10 fps
Copper:	
Mains	8 fps
Risers	7 fps
Branches	5 fps

- ii. Friction Factors: All pipe sizing shall be in accordance with the Hazen and Williams Formula "C" Factor as follows:

Copper	130
PVC	130
Cast-Iron	100
 - iii. Flow Rates: Water flow requirements shall be developed in accordance with the fixture unit method as indicated in the international plumbing code. All building water supply system operating pressures shall be designed for a minimum of 15 psig and a maximum of 80 psig.
- 2. Piping:
 - a. Exterior: All exterior underground piping shall be class 150 AWWA cast iron with mechanical joints, class C-900PVC pipe, or type L copper.
 - b. Interior: Prefer all interior piping to be type L copper. Piping above grade shall be hard drawn with solder joints. Piping below concrete slabs on grade or fill shall be held to a minimum but, where required, shall be soft drawn and installed with no joints or connections up to points 4" or more above finish floor lines. Pro-press fittings allowed above ground.
- 3. Backflow Prevention: Backflow preventers and/or vacuum breakers shall be provided at all interconnections between the potable water system and points of possible contamination, in accordance with the requirements of applicable plumbing code. No plumbing fixture, equipment item, or pipe connection shall be installed and located so that any part of the device will be submerged. Allow access for maintenance and testing.
 - a. Reduced Pressure Zone Assembly:
 - i. The main service entrance
 - a. Horizontal applications 2" diameter and smaller use Wilkins 375XL or Watts 009. Applications 2 1/2" and larger service use Wilkins 375 or Watts 909.
 - b. Vertical application 2" diameter and smaller use Wilkins 975XLSE and for applications 2 1/2" and larger service use Wilkins 475V.
 - c. Provide ASSE rated enclosure installed on a concrete base. Enclosure to be provided with electric heater to protect from freezing.
 - ii. For Laboratories use Wilkins 975XL, 975XLSE or Watts 009.
 - iii. For hydronic systems or cooling tower separation provide Wilkins 375XL.
 - b. Double Check Valve Assembly:
 - i. For Irrigation use Wilkins 950XL or Watts 007. Use top access assembly only.

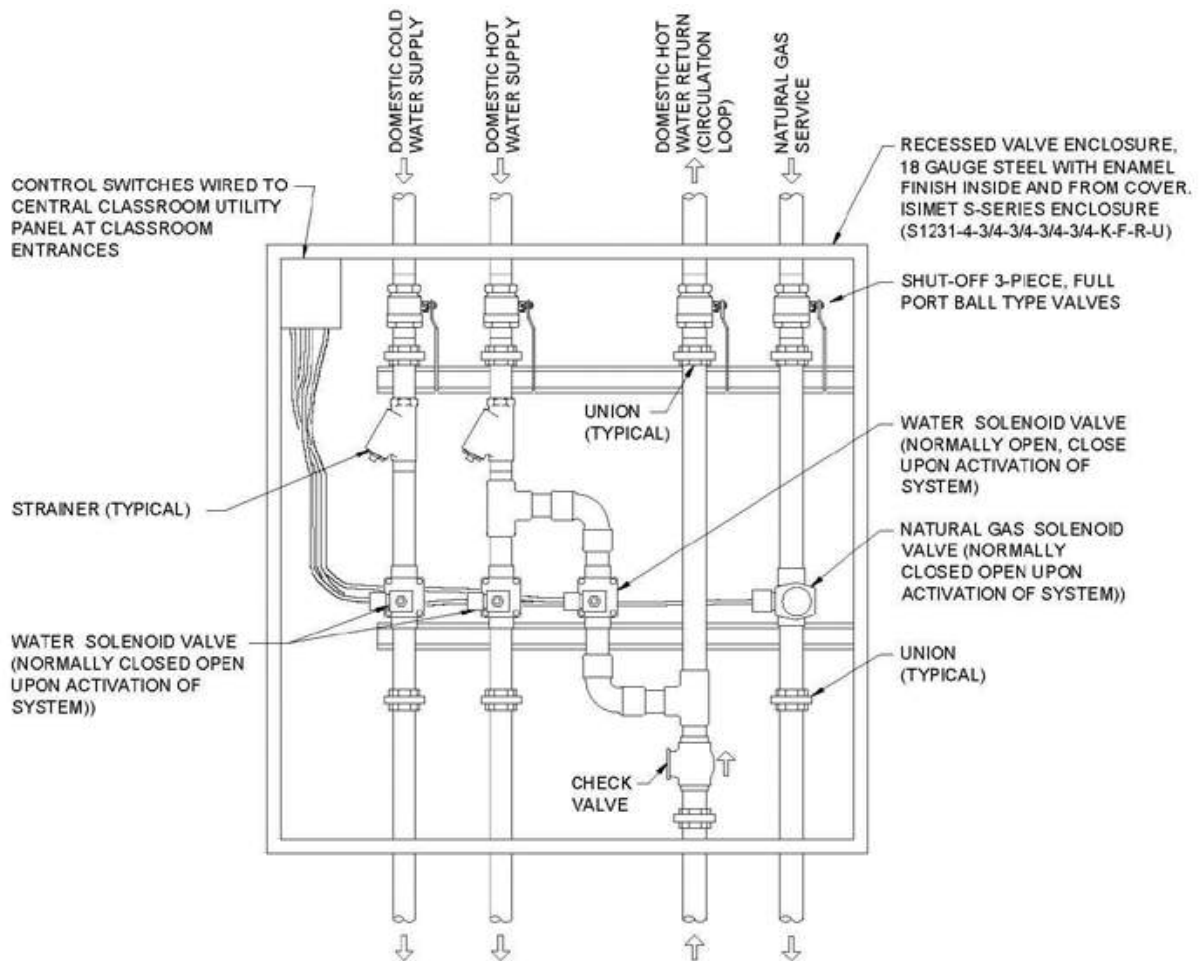
REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER DETAIL



4. Valves:

- a. General: Isolation valves for all types of plumbing equipment or piping assemblies above grade shall be ball pattern. Use gate valves for all below-grade installations. Butterfly valves are not acceptable for any purpose.
- b. Laboratories: At laboratory classrooms, water and natural gas piping shall be routed through teacher's shut off station first (with shut-off valve and solenoid valve), then on to student stations.

CLASSROOM EMERGENCY UTILITY VALVE



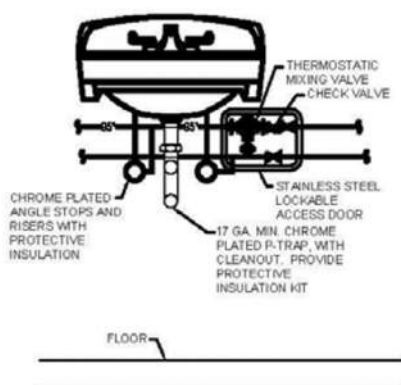
- c. Pressure-Reducing Valves: Provided for domestic water service lines where static pressure exceeds 80 psig.
- d. Tempered Water to Students' Restrooms: Leonard mixing valves 20300, Bradley S59-4000, or equal; under each lavatory.
5. Miscellaneous Trim: Water hammer arresting devices shall be provided at each toilet room assembly and elsewhere as appropriate. Devices shall be located and sized per the recommendations of The Plumbing and Drainage Institute Standard PDI-WH 201, Revised 2010.
6. In addition to primary water meter at each facility, provide deduct meters for boiler make-up water and cooling tower make-up water.

7. Specify separate meters for domestic and irrigation water systems.
 - a. All indoor water usage
 - b. Landscaping if irrigated
 - c. Recreational fields if irrigated
 - d. Swimming Pool
 - e. Cooling towers
 - f. Hydronic systems

B. Hot Water Systems:

1. General: Hot water systems shall be designed to the same general criteria as cold-water systems. Kitchen facilities shall be provided with a separate hot water system (140° F) from the remainder of the building hot water system (105° to 140° F). Where impractical to provide hot water to a remote location, point-of-use, electric-resistance type heaters may be used.
2. Dishwashing Equipment: A booster heater to supply 180° F final rinse water shall be provided for dishwashing equipment. Booster water heaters for dishwater will normally be provided with the washers by YISD under a separate contract, but where directed by YISD, shall be included as part of the project.
3. Showers: Where shower areas are provided, an adequate supply of hot water at sufficient pressure to ensure proper operation shall be maintained. Showers for student use shall be provided with limited-access blending valves to control water temperature to the showerheads. Typical adjusted shower water temperature shall fall between 105° and 115° F. Showerheads shall be equipped with flow restrictors limiting total flow of water to a maximum of 2 gpm per head.
4. Lavatories: Tempered water shall be supplied through a water temperature limiting device that conforms to ASSE 1070 and shall limit the tempered water to a maximum of 110° F (43° C). This provision shall not supersede the requirement for protective shower.
5. Sizing: Hot water service piping shall be sized on fixture demand and process requirements, and generally in conformance with the chapter on "Service Water Heating" in the ASHRAE Handbook Series, current edition.

LAVATORY WATER TEMPERING DETAIL AND VALVE SCHEDULE



TEMPERING VALVE SCHEDULE							
MARK	CAPACITY		HOT WATER INLET TEMP (°F)	COLD WATER INLET TEMP (°F)	DELIVERED WATER INLET TEMP (°F)	MAX PRESSURE DROP (PSIG)	MANUFACTURER AND MODEL #
	MIN (GPM)	MAX (GPM)					
SINGLE LAV/SINK	1	7	120	45	95	15	LEONARD, MODEL TM-15-E
TWO TO FOUR LAVS/SINKS	1	9	120	45	95	15	LEONARD, MODEL TM-20-E
MORE THAN FOUR LAVS/SINKS	1	13	120	45	95	15	LEONARD, MODEL TM-28-E

6. Circulating Systems:

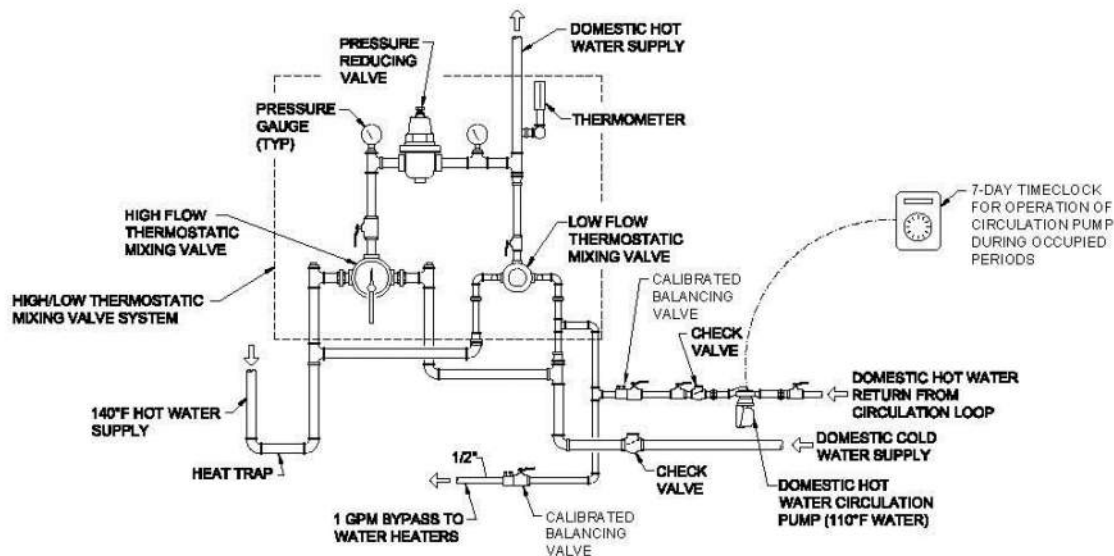
- a. General: Each hot water system shall be provided with a pumped circulating return unless the distance between the heater and furthest fixture is within 60' (lineal) developed pipe length. Systems shall meet the following criteria:
- b. Pump Control: Each pump shall be provided with H-O-A switch and aquastat. The aquastat shall be connected through the automatic side of the H-O-A switch and in series with YISD EMS. Project plans shall include extension of this automatic circuit to numbered terminal strips at the HVAC/Security/EMS interface panel.

- c. Valves and Trim: Line size ball valves with unions (in addition to any bolted flange connections) shall be provided on each side of pump. Pressure taps and thermometer wells are not required on in-line circulators. Use cartridge type in-line circulators. In-line circulators shall be Armstrong stainless steel or brass body type.
- d. Provide thermostatic mixing valves on all remodels.
- e. Provide Hi-Low thermostatic mixing valves with on all new schools or new additions. Leonard TM-1520A-LF-RF.
- f. All kitchens to be provided with hot water recirculating systems.

C. Sanitary Drainage:

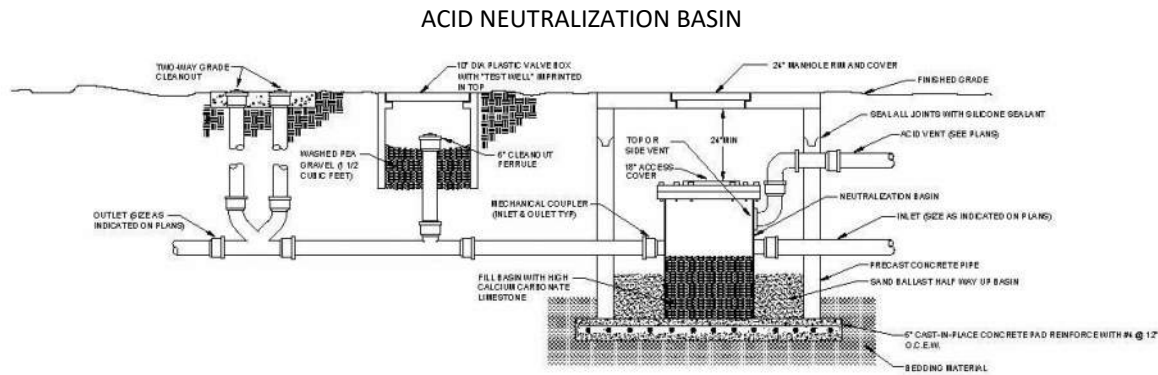
1. General: All sanitary drainage shall drain by gravity to public sewer.
2. Sizing: The size and slope of all building waste and vent piping shall be in strict accordance with applicable plumbing code.
3. Piping: Except as otherwise noted, schedule 40 solid core PVC shall be used. Condensate piping shall be type L copper. All interior and exterior waste and vent piping shall be schedule 40 PVC solid core piping. Cast iron soil pipe and SDR-35 site sewer lines are not allowed.
4. Joints: Joints shall be PVC schedule 40 DWV type throughout. Below-grade joints shall be similarly made or may be elastomer-ring type.
5. A one way backwater valve is required on all new sewer lines prior to tapping into the city sewer main. Access shall be provided with a concrete manhole-type structure with a steel or cast iron manhole cover.

HI-LOW THERMOSTATIC MIXING VALVE DETAIL



6. The use of “no-hub” joining methods is allowed for sanitary waste, vents and sewers, as well as roof drains via the use of four banded heavy duty stainless-steel clamps. Two banded clamps are not allowed.
7. Installation Restrictions:
 - a. Sanitary lines shall be planned so as to minimize runs below floor slabs on grade.
 - b. Pressure piping shall not be placed under concrete slabs on grade or fill except as noted in Section 7(a).
 - c. All condensate piping shall be designed to flow by gravity to the sanitary sewer system or other approved disposal points and be properly insulated. Condensate drains may be

discharged into roof drains if they do not discharge in a publicly exposed area. Slope at 1%. The use of Y-branch drains into sink other than janitors' sinks is prohibited. Refer to Division 7 for roof top piping support.



D. Acid Waste Drainage:

1. General: All fixtures and equipment where acids are (or may be) used shall be neutralized before being discharged to the sanitary drainage system. General design criteria for acid waste systems shall be the same as for sanitary waste and vent systems.
2. Piping: All waste piping serving laboratory sinks, cup drains, floor drains, etc. (where acids might be used), extending to acid-neutralizing tanks, and all vent piping serving these fixtures or systems shall be of approved acid-resistant materials, such as "Enfield Lab/Line" flame-retardant polypropylene. Glass piping is not acceptable. No hub drains allowed at acid waste piping. At the consultant's discretion Charlotte or Spears CPVC acid waste systems may be used.
3. Acid Trap Tank shall not be located near any fresh air intake, operable windows, doorways, or driveways.

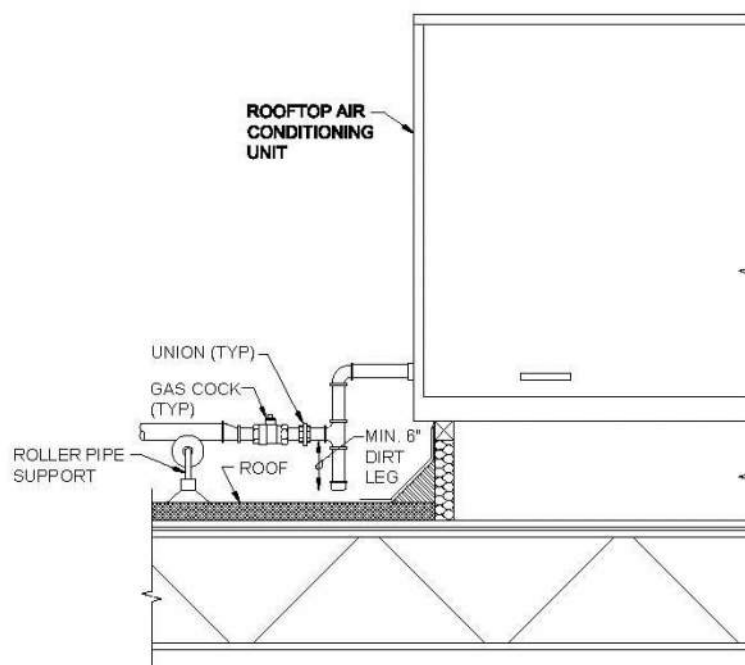
E. Storm Drainage:

1. General: All building roofs, plazas, paved areas, and unpaved areas as required shall be drained by gravity to a public storm sewer wherever possible. Where storm sewers are not available, storm drains shall be terminated with proper headwalls at approved outfall locations.
2. Installation Requirements:
 - a. Cleanouts: Cleanouts shall be provided as required by code and as otherwise necessary for proper maintenance of the system.
 - b. Roof Drains: Roof drains shall be kept 12" to 24" away from all parapet walls to allow for proper flashing.
 - c. Insulation: All horizontal runs inside the building and above the lowest floor line shall be insulated.
 - d. Flumes: Flumes may be used in special cases only; otherwise, standard curb inlets and laterals shall be used.
 - e. Details: Details shall be provided for all connection boxes, headwalls, or flumes.
3. Sizing: The size and arrangement of building storm drainage lines shall be in accordance with the City of El Paso Plumbing Code and good engineering practice, designed for a 3" per hour rainfall rate.
4. Piping:
 - a. All interior and exterior storm and roof drain piping shall be schedule 40 PVC solid core piping.
 - b. Below-Grade: All below-grade piping within building perimeter or below vehicular paving shall be same as for sanitary drainage systems, except that lines larger than 15" shall be class 350 ductile iron pipe with mechanical joints.

- i. Exception: Exterior underground piping 8" and larger and more than 5'-0" beyond edges of vehicular paving or building perimeters, may be reinforced concrete hub and spigot type, conforming to ASTM C76 or AASHTO Standard M170, Class III.
 - 5. Prohibited Materials or Installation:
 - a. Combined storm water and sanitary drainage.
 - b. Flow-controlled type roof drains.
- F. Sub-drainage System:
 - 1. General: When basement or other sub-grade building areas are to be provided, sub- drainage systems shall be required around the exterior perimeter, at or slightly below floor level. Sub-drainage may also be required beneath sub-grade floors, where directed by YISD.
 - 2. Design Criteria: Sub-drainage shall drain by gravity into a depressed sump or to a storm drain, if available. Sub-drainage systems shall not interconnect directly with the storm drain system, or in any fashion with the sanitary sewer system. Particular attention shall be given to the normal groundwater conditions at the building site for appropriate determination as to the necessity of providing under-floor drain pits, drainage lines, etc.
 - 3. Piping: "Open-Joint" sub-drainage piping shall be perforated schedule 40 PVC pipe or butt joint farm tile. "Tight-Joint" piping shall be the same as for sanitary drainage systems.
 - 4. Installation: Collector pipe shall be placed on a slight grade for gravity drainage in a filter medium of clean, washed gravel not less than 6" thick on all sides of pipe.
- G. Gas System:
 - 1. General: Gas system shall be designed in accordance with utility company requirements, the applicable plumbing code, and applicable requirements of NFPA Standard 54 and the National Fuel Gas Code.
 - 2. Availability Verification: The Architect/Engineer shall contact the local gas company for the availability of gas in the area, including locations and sizes of existing or proposed new gas mains, pressure, Btu/cu.ft content, and requirements regarding gas metering.
 - 3. Metering: The gas meter shall be located as close to the building as possible, with a main supply shut-off valve.
 - 4. Pressure Regulators: Gas pressure regulators shall be installed at the exterior of the building whenever possible. A test tee with nipple and cap shall be provided downstream of each regulator.
 - 5. Unions and valves shall be provided on each side of each regulator.
 - 6. Installation:
 - a. No gas piping shall be designed to be installed in or on the ground under any building or structure.
 - b. No piping shall be run horizontally in concrete floors except in science labs that require gas pipes at the teacher's desk. These runs shall not exceed 4 feet in length and shall be fused or welded. Threaded pipe connections are not allowed.
 - c. Gas piping shall be run exposed inside the building as required by applicable plumbing code.
 - d. All gas piping shall pitch not less than 1/4" in 15' to prevent traps. Branches and take-offs shall be off the top of the mains. All horizontal lines shall pitch to risers or appliances.
 - e. All exterior gas piping placed on the roof shall be provided with special supporting means to allow for normal movement and to protect the roof, and with not less than 8" clearance between piping and roof. All piping run across roof surfaces shall have welded joints and shall be painted yellow. All exterior gas piping shall be sleeved when installed under concrete patios or sidewalks. Refer to Division 7 for roof top supports.
 - 7. Sizing:
 - a. Gas loads for equipment shall be taken from the manufacturer's ratings.
 - b. Gas use factors for major kitchen equipment shall be 100%.
 - c. Gas load for laboratory outlets shall be a minimum of 5,000 BTUH for small burners and a minimum of 10,000 BTUH for large burners.

- d. Gas piping shall be sized to include anticipated loads and to provide for normal flexibility in laboratory areas.
- 8. Piping:
 - a. Above-Grade: Piping above grade or within buildings shall be schedule 40 black steel (American-made) with welded fittings for sizes 2" and larger and screwed malleable iron fittings for smaller sizes or gas-tight flexible piping.
 - b. All gas lines running on roof shall be welded to the threaded or flanged gas cock service valve or regulator.
 - c. Below-Grade: Exterior below-grade piping shall be flexible polyethylene plastic, ASTM-D-1248-65T, with thermal fusion type joints.
 - d. Gas manifold serving kitchen appliances shall be welded to the threaded/flanged gas cock service valve.
 - e. All steel gas piping shall be domestic type made in the USA and not foreign.
- 9. Valves:
 - a. General: All equipment using gas shall have a full line size shut-off valve located at the equipment and iron body lubricated plug cocks over 2"; over 2-1/2", use lubricated ball valves. Gas-rated 1/2"- 2" ball valves shall be required.

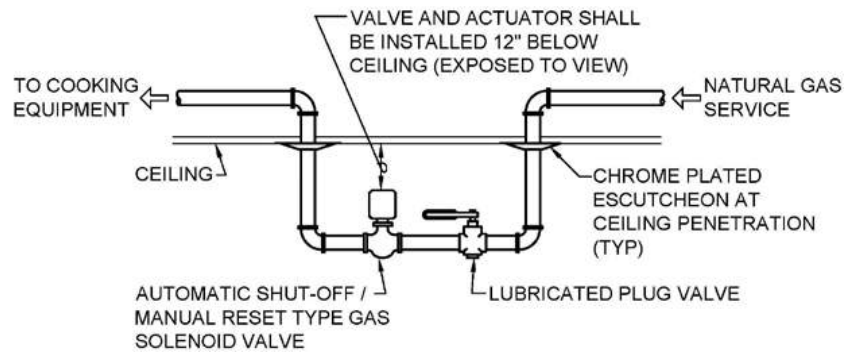
TYPICAL ROOFTOP UNIT - NATURAL GAS CONNECTION DETAIL



- b. Kitchen Equipment: Gas piping serving kitchen equipment shall be provided with an accessible electrically operated emergency shut-off valve and clearly identified wall-mounted emergency actuation switch installed in a conspicuous location near the main exit door.
- c. Laboratories: At laboratory classrooms, gas piping shall be routed through teacher's shutoff station. Provide with accessible manual shut off valve and automatic solenoid shut off.

10. Miscellaneous Trim: Gas pressure regulators shall be provided at each major appliance requiring such protection, with 3/4" copper vent lines extended to outside of the building. When providing medium pressure gas (5psi) provide individual pressure regulator at each device.

KITCHEN GAS VALVE DETAIL



H. Laboratory, Kitchen, and Special Equipment:

1. General: Equipment and laboratory furniture rough-in requirements and final connections for laboratory furniture, kitchen equipment, and special equipment shall be clearly specified and shown in detail.
2. Owner-Furnished Equipment: Specifications shall include definition of those items which will be furnished by equipment and furniture suppliers, but installed by mechanical subcontractor (i.e., laboratory fittings such as gas, air, vacuum, water, and steam cocks), and those items which will be furnished and installed by the plumbing subcontractor (i.e., piping, stop valves, sink traps). Particular attention shall be given to specifying any special fittings or attachments required to make the final connections to pieces and laboratory fittings.
3. At lab storage rooms, provide extended goose-neck style faucet spout in order to wash tall beakers.
4. Provide grease interceptors at all kitchens, size per application and local code, minimum 1000 lb capacity, precast concrete type. Grease traps to be sized for connected capacity. Premanufactured poly grease traps acceptable. Manufactured steel grease traps not allowed.
5. Grease Trap shall not be located near any fresh air intake, operable windows, doorways, or driveways.

I. Shock Absorbers:

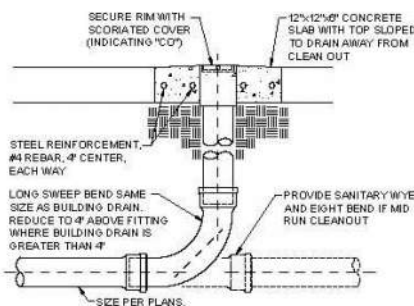
1. General: Commercial-type water hammer arresters shall be provided on cold water supplies serving one or more flush valves, and on any water line serving equipment having quick-closing valves. Air chambers shall be provided as appropriate elsewhere.
 - a. Commercial-Type Arresters: Commercial-type water hammer arresters shall be tested, sized, and located in accordance with PDI WH-201 and installed as recommended by the manufacturer. Arresters shall be located adjacent to fixture or valves and shall be accessible.

J. Traps and Drains:

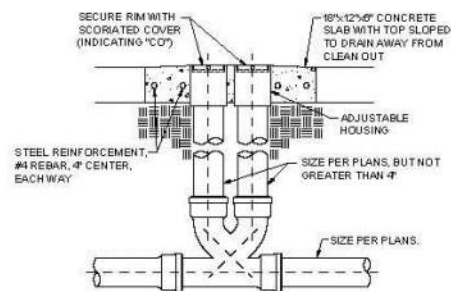
1. Traps, General: Each fixture and piece of equipment requiring connections to the drainage system, except grease interceptors, shall be equipped with a trap.
 - a. Materials: Traps installed on cast iron soil pipe shall be service weight cast iron, hub and spigot pattern. Traps installed on steel pipe or copper tubing shall be recess drainage pattern, or brass tube type. Traps for acid-resisting waste shall be of the same material as the pipe.
 - b. Locations: Each trap shall be placed as near the fixture as possible, and no fixture shall be double trapped. P-traps shall be placed under all floor drains and at such other points as may be required. Where circumstances require, traps shall be "deep seal" types, with seal not less than 4" size for 2" size or not less than 5" for larger sizes.

- c. All floor drains must have a drain trap seal device. Electronic trap primers are required on new builds and shall be model Zurn Z1020/Z1020xl or equal. Trap seals or guards may be used where electronic trap primers are not feasible or cost effective with YISD approval. Manual trap primers that work on pressure differential are not allowed. This includes all mop service basins, floor sinks, and shower drains.
2. Drains, General:
- a. Floor and Shower Drains: All general-use floor drains and all shower drains shall be "Josam" Series 30000, "Zurn" Z-415, "Wade" Series 1100, or equal cast iron floor drains with double drainage flange, weep holes, inside caulk bottom outlet, and round adjustable nickel-bronze strainer. Provide floor drains at all restrooms, either group or single use.
 - b. Kitchen and Mechanical Room Floor Drains: Floor drains in all kitchens and mechanical rooms shall be (except as otherwise specifically noted) "Josam" Series 32100, "Zurn" Z-540, "Wade" 1310, or equal cast iron round drain with double drainage flange, weep holes, inside caulk bottom outlet, flashing clamps, loose set heavy-duty nickel-bronze grate, and removable sediment bucket.
 - c. Area Drains: Area drains shall be "Josam" Series 23510 or equal cast iron floor drains with double drainage flange, weep holes, inside caulk bottom outlet, flashing clamps, removable sediment bucket, and heavy-duty nickel-bronze grate secured with vandal-proof screws.
 - d. Roof Drains: Roof drains shall be "Josam" Series 21500, "Zurn" Z-100E, "Wade" 3000, or equal cast iron roof drains, with large sump, inside caulk bottom outlet, removable cast iron dome, non-puncturing flashing clam device, and roof-deck clamp. All new facilities and new additions shall use chases. Refer to Architectural Division.
 - e. All floor drains must have a drain trap seal device. This includes all mop service basins, floor sinks, and shower drains. Only electronic trap primers are allowed.

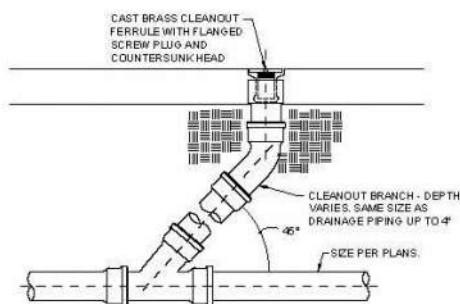
CLEANOUT DETAILS



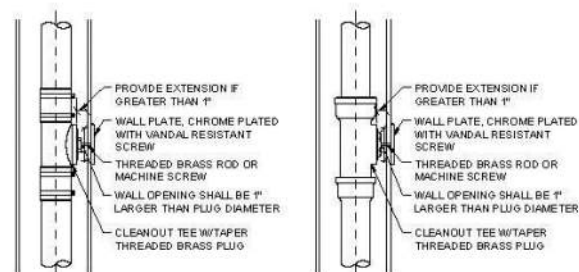
GRADE CLEANOUT DETAIL



TWO-WAY GRADE CLEANOUT DETAIL



FLOOR CLEANOUT DETAIL



WALL CLEANOUT DETAIL

K. Cleanouts:

1. General: Full line size cleanouts shall be located at each major change in direction, at the end of each continuous waste line, at foot of each riser within the building, and at intervals of sewer run not exceeding 75'. Clean outs, except at traps and fittings on horizontal branches, shall be of same material and of same size as pipe up to 4" and 4" size for all larger pipe.
2. Interior Locations: Cleanouts that occur in pipe chases or other inaccessible locations shall be brought through the walls and provided with cover plates. All interior wall cleanouts shall be within 1" of the finished wall. Cleanouts in floor slabs shall be flush with the floor and provided with cover plates. All cover plates on cleanouts shall be attached with vandal-proof screws. Cover plates shall conform to the following or equal criteria:

Steel	Wall	55540-20	58610
Cast Iron	None	58720	N/1
Cast Iron	Wall	58720	58610
Cast Iron	Floor	58670	Incl.
Cast Iron	Terrazzo	58670	58660
Cast Iron	Carpet	55000	Cpt. Marker
Steel	Wall	58540-20	58610
3. Exterior Locations: Exterior cleanouts, unless otherwise specifically noted, shall be 4" cast iron cleanouts with a plug and brought up flush with paving in paved areas, or encased in an 18" x 18" x 6" reinforced concrete pad flush with grade in unpaved areas, and terminated with an extra heavy cast iron caulking ferrule having an extra heavy cast brass or bronze countersunk head screw plug, "Josam" Series 58900, or equal.

L. Fixtures and Equipment:

1. Plumbing Fixtures:
 - a. General: Plumbing fixtures shall be Kohler commercial grade or equivalent fixtures manufactured by American-Standard, Kohler, or Zurn.
 - b. Provisions for Accessibility: Plumbing fixtures for the use by the disabled shall be provided at the minimum levels required by applicable law as to types, quantities, and locations.
 - c. Materials: All plumbing fixtures specified shall be vitreous china, porcelain-enameled cast iron, or stainless steel, of latest design and type for their intended use.
 - d. Trim, General: All trim shall be first line quality and shall be clearly marked for corroborative identification. Trim, unless otherwise specifically noted, shall be manufactured by the same manufacturer as the respective fixture or, if manufactured by others, shall be trim regularly furnished with the fixture, catalogued as such, and fully guaranteed by the fixture manufacturer.
 - i. Supplies: All supplies shall be rigid IPS brass with loose-key stops and chrome-plated, cast brass, setscrew-held escutcheons. All exposed finish metal parts shall be chromium plated; rough-bodied parts shall be heavily nickel plated. All enameled ironware shall be acid resisting. Ordinary stops with compression couplings and/or flexible risers will not be permitted at any fixture.
 - ii. Traps: Traps for lavatories and sinks shall be three-piece chromium-plated cast brass with cleanouts, IBS tailpieces, and chromium-plated nipple to wall (17 gauge).
 - iii. Science lab – do not use plastic fixtures.
 - e. Support: Wall-hung fixtures, not specified to be supported by concealed-arm carriers, shall be hung with 2" x 4" solid lumber backup piece inside chase, with bolts extending through wall to fixture hangers. Such fixtures shall be secured from the bottom in addition to standard hangers, either by toggle bolts through the wall and perpendicular to the wall, or by brackets secured to the wall below the fixture.

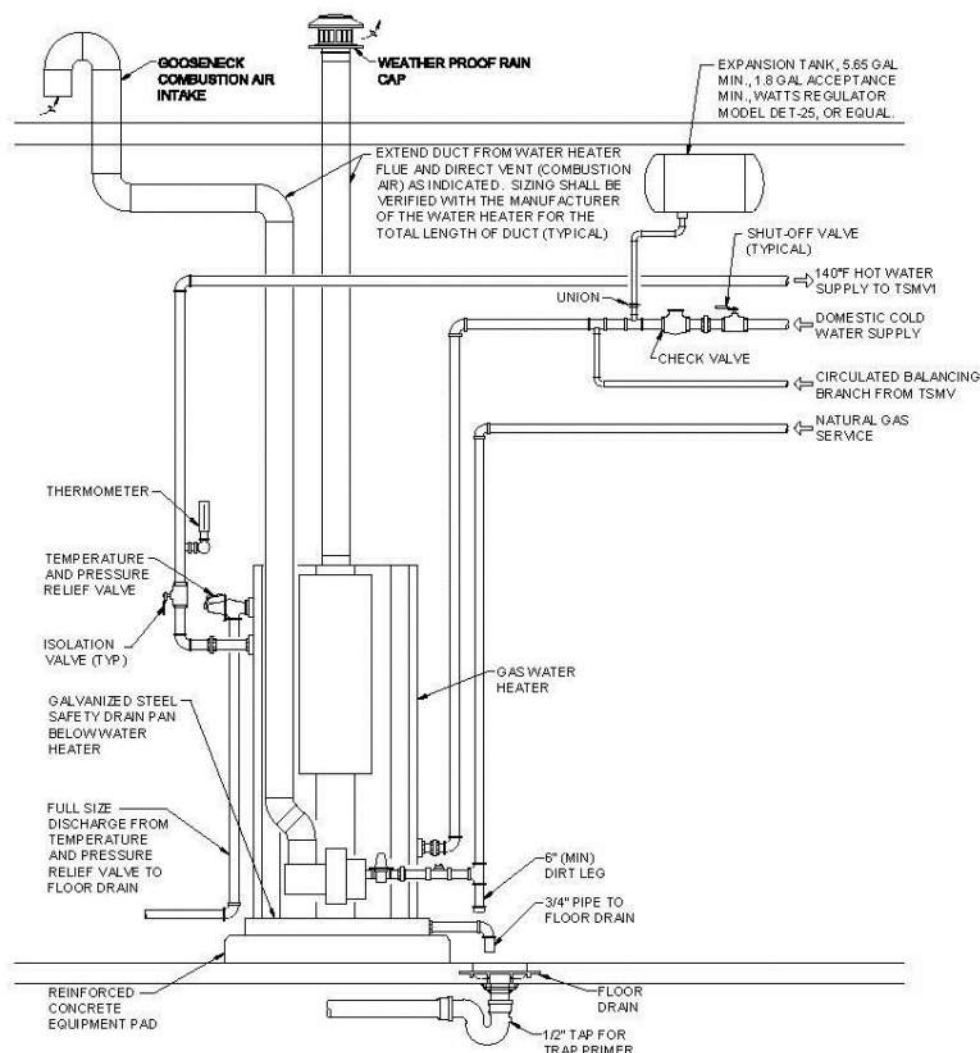
- f. Fixture Types:
 - i. Water Closets: Water closets shall be floor-mounted, vitreous china, siphon jet type. Sloan or Zurn diaphragm manually operated flush valve with vacuum breaker and screwdriver stop. Piston type flush valves not allowed. Seats shall be white plastic, open front, reinforced construction with check hinges and without covers.
 - ii. Urinals: Urinals shall be wall-hung, vitreous china, siphon jet type. Urinals use Sloan or Zurn diaphragm manually operated flush valve with vacuum breaker and screwdriver stop. Tank-type flushing or floor mounting styles of urinals are not acceptable.
 - iii. Lavatories: New facilities and new addition shall use vitreous china, wall hung, four-inch centers, with metering-type faucets Zurn Aquaspec and solid grid strainers. Lavatories shall be provided with mixing-type lever handle faucets Delta 2529-HDMTP, 3559-MPU-DST, 8278SMF15, or Zurn equivalent. Solid surface, one piece, reinforced lavatory countertops are also acceptable. Lavatories for use in food service restrooms shall be similar, but with wrist-blade faucet handles. Lavatories in food service work areas shall be similar, but furnished with Zurn Aquaspec. Where authorized by YISD, self-rimming vitreous china or enameled cast iron countertop lavatories may be used. Soap dispensing services are not to be provided at any lavatories. Bradley circular or half-circular wash sinks are not acceptable.
 - iv. Showers: Pedestal-type shower valves are not acceptable.
 - v. Water Coolers: Halsey Taylor model GreenSpec HTHB-HACG8BLPV-WF or equal.
 - vi. Janitors' Sinks: Floor-mounted stainless. Precast terrazzo not acceptable.
- g. Mounting Heights: Construction Documents shall incorporate appropriate fixture mounting heights. Such data shall be in accordance with the following, modified as appropriate to the most recent state design requirements for access by the handicapped.
 - i. Lavatories mounted at standard heights and/or those with closed fronts (including cabinets) will be permitted if adequate and unobstructed space (preferably 60" x 60" minimum) is provided in front of them, and if the centerline of the fixture is a minimum of 24" from the nearest side obstruction.
 - ii. All heights are measured from finished floor.
- h. Connections: Sizing of branch lines or runouts to plumbing fixtures shall be in accordance with the City of El Paso Plumbing Code and other recognized practices and standards.
- i. Support Methods: Wall-hung fixtures shall be supported by appropriate chair carriers when mounted on "drywall" stud partitions or masonry wall.

M. Water Heaters:

1. General: Where natural gas is available, water heaters shall be gas-fired. Electrically operated water heaters may be used only for minor "point-of-use" applications or otherwise when specifically authorized by YISD.
2. Construction: Water heaters shall each be complete with adjustable thermostat, high temperature shut-off, metal-jacketed insulated glass-lined steel tank, magnesium alloy anti-corrosion rod, hot and cold-water connections, and extra tank opening for direct installation of relief valve. Insulation and performance ratings shall be in conformance with ASHRAE Standard 90A. All heaters must be installed with an expansion tank.
3. Accessories: All water heaters shall be completely automatic. Gas-fired heaters shall have pilot-monitored automatic gas cut-off for flame failure and shall be approved for the intended use by the American Gas Association. Electrically operated heaters shall utilize enclosed-type

- immersion heating elements with overheating thermal cutouts and shall be labeled by Underwriters Laboratories, Inc.
4. Sizing: Water heater recovery and storage capacities shall generally be determined on the basis of current need in accordance with appropriate procedures outlined in the chapter on "Service Water Heating" in the ASHRAE Handbook series, latest edition, "Systems" volume. Minimum storage capacity for recirculating systems shall be 85 gallons, and for decentralized or "point-of-use" systems, shall be five gallons.
 5. Trim: Each heater shall be equipped with an ASME properly rated relief valve, with the outlet piped downwards to a floor drain.
 6. Acceptable Manufacturers: AO Smith. Preferred for standardization. Substitutions must be approved in writing by YISD.
 7. Acceptable Products: LOW-NOx with storage tank A.O. Smith glass-lined, jacketed and insulated. Only water heaters under 199,999 BTU's will be accepted unless the sizing requirements dictate otherwise, which requires notification and approval by YISD.

GAS WATER HEATER DETAIL



N. Interceptors:

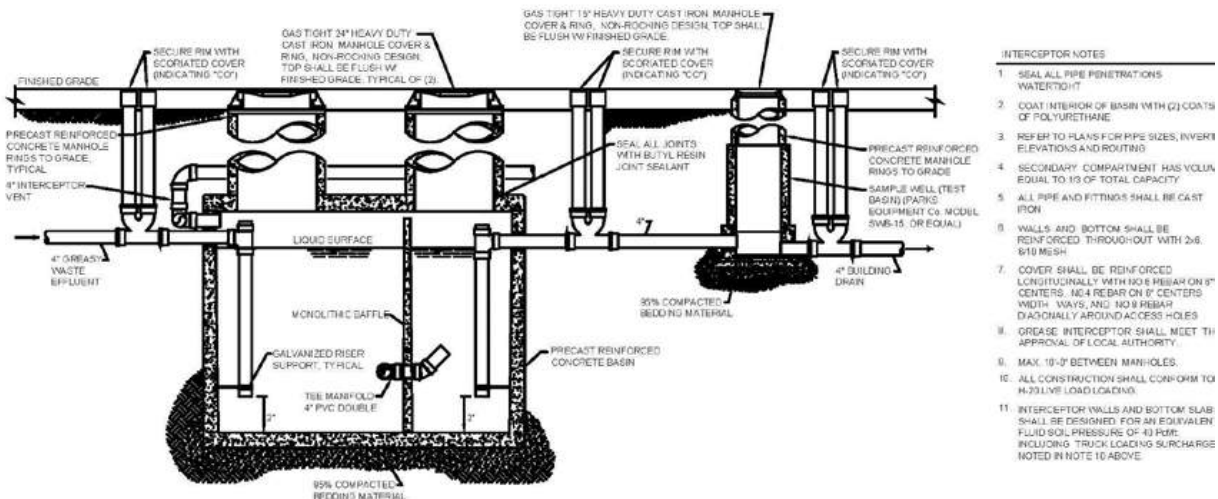
1. General: A grease interceptor shall be installed where required by applicable plumbing code or otherwise wherever any liquid waste containing large amounts of grease, fats, or oils are discharged to the sanitary waste system. Food waste disposers shall not be connected through a grease interceptor.
2. Installation: Grease interceptors shall be installed as close as possible to the source of grease and on the exterior of the building with convenient truck access. Every interceptor shall be provided with a cleanout for removing the offending material by means of a hand hole or removable cover. Top or cover shall be gas tight and of such construction to withstand traffic weight over trap.
3. Selection: Design and selection of grease interceptors shall be in accordance with applicable plumbing code.
4. Provide sampling well where required by Health Department.

O. Manholes: New manholes shall be provided where required and shall be detailed on the drawings in strict accordance with applicable plumbing code.

P. Pumps:

1. Hot Water Circulators: Hot water circulators shall each be a line-mounted, close-coupled, centrifugal pump. Pump shall have hardened, ground, and polished steel or stainless-steel shaft, with integral thrust collar, bronze impeller, mechanical seal, bronze body and trim, and shall be driven through a flexible coupling by an electric motor. Pumps shall be cartridge type. Acceptable manufacturers are "Bell and Gossett", TACO, Armstrong. Acceptable products are Taco 008-0012.

GREASE INTERCEPTOR WITH SAMPLE WELL



2. Sewer Sump Pump (Require YISD approval prior to design):

- a. General: Sump pump unit shall be duplex type, each pump complete with bronze impeller, stainless or polished steel shaft, ball-thrust type bearing on elevated bracket, grease-lubricated bronze sleeve casing, radial bearings, flexible coupling, steel or cast iron floor plate, motor, etc., as required for a complete unit. Pump shafts in excess of 4' length below basin cover up to 6' to 9' length shall have two intermediate bearings; shafts in excess of 9' length shall have three intermediate bearings. Each intermediate bearing shall be fitted with an extended lubrication line to basin cover and terminated with an alemite fitting. Where conditions require pump shafts to be sectional, such criteria shall be clearly indicated in the Construction Documents. Similar pumps of simplex design (single pump) may be utilized only when specifically authorized by YISD.

- b. Basins and Trim: Sump basin shall be reinforced fiberglass, or precast concrete with cast iron manhole covers (which shall be detailed on the drawings). Pump units shall be furnished with factory-fabricated, gas-tight cast iron or steel plate covers with manholes, high water alarms, and approved operating controls, including:
 - i. Automatic float switch, with rod, rod-guide, and copper float.
 - ii. Automatic mechanical alternator (separate circuits and circuit breakers for individual pumps and separate circuit and circuit breaker for alarm). a) Sewage Pumps: Pump units designed to handle sanitary sewage shall be similar in design and construction to conventional sump pumps, except impellers shall be specifically designed for non-clog operation with raw unscreened domestic sewage with solids as large as 2" diameter.

END OF DIVISION 22

Division 23 - HVAC

23.01 Conditioned Areas

- A. All occupied areas of new facilities, new additions to existing facilities and remodeled areas of existing facilities shall be mechanically heated and cooled. Heating shall be provided for all areas subject to freezing that are not normally occupied.
 - 1. New facility HVAC system selection shall be based initially on the size of the facility. If the planned facility is large enough to warrant consideration of a chilled water system or heat pump system then a recommendation from the design professional shall be sent to YISD for written approval. Smaller facilities, new gymnasiums or smaller out buildings on a larger campus, will be conditioned using the YISD standard design for rooftop equipment.
 - 2. With additions to existing facilities the design professional shall determine the existing system type. In the case of an existing chilled water or heat pump system the systems shall be analyzed to determine if the existing system has the capacity to serve the proposed building addition. The intent is to utilize existing system capacity if present and to limit the number of system types at a facility. If the existing facility is served by rooftop equipment or another type of system the new addition will typically be conditioned using the YISD standard design for rooftop equipment.
 - 3. Where a facility is being remodeled the existing systems shall be reused if appropriate for the new space configuration and use, as long as the units/equipment is not past half of its lifecycle. If the existing systems will not work with the new space use then new equipment of the same type as the existing shall be the basis for the new system design.

23.02 HVAC System Selection Criteria

- A. There are three criteria that must be considered when selecting the appropriate system for a YISD project: space control, energy efficiency and maintainability.
 - 1. Space control is critical in educational facilities, individual space temperature control for each major space (classroom, library, cafeteria, gymnasium, office suite, etc.) is needed to accommodate the variable space usage inherent to education facilities.
 - 2. Energy efficient equipment is mandated by the current version of the International Energy Conservation Code as adopted by the City of El Paso; however, YISD considers this a minimum threshold with the intent being to provide equipment that surpasses the minimum standard. Design Professional to provide modeling to compare proposed systems with ASHRAE 90.1 requirements.
 - 3. Systems at all YISD facilities require routine maintenance and in some cases repair, it is not acceptable to have equipment that must be maintained located above the ceilings. Equipment shall be located in mechanical rooms, outside the building on grade or on the roof. One exception to this is single duct variable air volume (VAV) terminal units that must be located near the area served. In this case the VAV terminal units shall be located above the ceilings in corridors, storage rooms, lounges, etc. to all equipment maintenance without accessing educational spaces.

23.03 Separate System Requirements

- A. All auditoriums, administrative areas, fine arts suites, cafeterias, gymnasiums, office suites, libraries, band rooms, choir rooms, new and existing file server rooms, computer centers, and athletic dressing rooms shall be provided with separate HVAC systems. Each system shall be capable of heating or cooling operation independently of each other and of the rest of the building. Design Professional shall propose and coordinate with YISD personnel systems selection.

B. Special Design Considerations:

1. File Server Rooms and AV/Dimmer Rooms: All facilities have at minimum one server room on a campus and sometimes more. Because of the continuous heat output of the equipment mechanical cooling is required regardless of time of day or facility occupancy. To maintain the room temperatures a separate ductless split system will be used for each room. The design professional shall coordinate with YISD to include the YISD Technology Department designee. The ductless split system shall be sized to accommodate the heat load and then the next model size larger will be used for the project. Compressor shall be capable of handling variable loads. Refer to Division 27 for additional requirements. This system would be connected to the YISD energy management system.
2. Athletic Dressing Rooms (AKA locker rooms): Because locker rooms are a potential source of odors, the spaces should always be at a negative air pressure compared to the surrounding spaces. The high ventilation rate required by the mechanical code makes these spaces expensive to construct and operate because the air conditioning equipment is sized to accommodate 100% outdoor air and then YISD has to operate the equipment for the life of the building. If possible, YISD would like to avoid the use of 100% outdoor air units to condition these spaces. The design professional shall consider the use of air transfer and energy recovery strategies to reduce the cooling/heating required for the space. To assist in reducing equipment and operating cost, the design professional shall analyze the locker room proximity to an air-conditioned gymnasium. Typically, the outdoor air requirements for gymnasiums are high enough that there is a need for relief air, or the space is over pressurized. If excess, already cooled, air is available via the gymnasium system it is acceptable to mix the gymnasium system with the locker room system so that as much ventilation makeup air as possible is provided by transferring air from the gymnasium to the locker rooms. The shared ventilation scheme will not work in all facilities; so other energy savings strategies need to be investigated such as energy recovery units with energy wheel purge on the exhaust side of the wheel, ionization equipment and other equipment that demonstrates compliance with the currently adopted version of ASHRAE-62.1.

23.04 HVAC Design Conditions

	Summer	Winter
Outside	105° F Dry Bulb 64° F Wet Bulb.	21°F
Room Design:	75° F Dry Bulb	70° F
	50% Relative Humidity (Max. 60%)	

23.05 Ventilation Standards

- A. General: All facilities shall be provided with positive ventilation through the HVAC equipment. The design professional shall provide a building air balance calculation showing the International Mechanical Code required outdoor air for the facility and the same codes required exhaust for toilet rooms, janitor's closets, etc. for the facility to show the total building positive pressurization. The building air balance calculation shall be shown on the construction drawings. The exceptions to positive pressurization are cafeteria/kitchens, weightlifting rooms and locker rooms where positive pressure would force odors into the surrounding spaces. In these areas the pressure shall always be negative.
 1. Outdoor air shall be introduced into the facilities using weatherproof outside air intakes for rooftop equipment, low-leakage motorized dampers and ducted connections to mixed air

plenums for indoor handling units. Duct tie-ins shall be so arranged as to minimize the tendency of outside air to channel, as opposed to mixing with the return air.

23.06 General Design Criteria

- A. Remodels and Expansions: The design professional shall visit the existing facility to determine the condition and suitability of the HVAC equipment for reuse in the remodel project. The design professional shall provide a brief written recommendation detailing whether the existing equipment is suitable or not for reuse (system size, type, etc.) or if the equipment is at the end of its useful life and should be replaced for that reason.
 1. Energy conservation and consequently the efficiency of HVAC equipment is important to YISD. If, during existing equipment surveys, the design professional finds direct expansion (DX) HVAC equipment that is 7 years old or more and/or utilizes refrigerant R22, then that equipment should be listed for replacement.
- B. New Facility/Additions: When starting the design for a new facility, the design professional shall first determine, in conjunction with YISD, if the facility will utilize a heat pump system or a chilled/hot water system. Chilled water system and equipment are detailed later in this section, heat pumps are detailed in section 1.16.

23.07 HVAC System Types

- A. Package Heating/Cooling Systems, General:
 1. Packaged rooftop direct expansion (DX) shall be designed per application and the following energy efficiency ratings:
 - a. 3-5 tons – minimum rating of 17 SEER
 - b. 6-20 tons – minimum rating of 12 EER
 - c. Over 20 tons – minimum rating of 10 EER
 2. DX Packaged Rooftop or Split System Cooling/Heating Systems: DX systems shall be sized to accommodate the load from the building envelope, ventilation load, electrical equipment loads, and the occupants as required by the adopted City of El Paso energy code. Over-sizing equipment will lead to loss of humidity control, cost more to operate and have a higher first cost, all of which are of no value to YISD. All DX equipment shall use R-410A refrigerant and/or latest refrigerant and shall, where available, use natural gas for heating. If natural gas is not available, electric resistance heating shall be used.
 - a. When sizing an electric heater, the heater shall be sized to produce a minimum 95-degree F discharge air temperature.
 3. Outdoor Air Delivery: The use of 100% outdoor air rooftop units is not acceptable for delivery of outdoor air to YISD facilities. Each rooftop unit shall provide the minimum outdoor air volume as required by ASHRAE 62 and the City of El Paso adopted version of the International Mechanical Code. A table shall be provided on the construction drawings showing the outdoor air calculation and total outdoor air selected for each air conditioning unit.
 4. Economizers for Rooftop Units: Rooftop units that are 3 tons and larger shall have a dry bulb economizer. The preferred means of relief air is via an integral barometric relief but at the design professional's discretion fan powered relief or additional relief sources can be used.
 5. Rooftop Unit Control Interface: All rooftop units shall have a network interface card to be compatible with DDC control system specified on the project.
 6. Accessories: Each rooftop unit shall be provided with a factory unit mounted, disconnect switch that cuts off all power to the unit. Each rooftop unit and ground or room mounted condensing unit shall have condenser coil hail guards.
 7. Acceptable package rooftop or split system manufactures are Trane or Carrier only.

- B. Chilled Water-Cooling System: New facilities that are to be provided with central plant type HVAC systems, comprised of air or water cooled chillers and natural gas fired boilers with piping and pumping arranged in a four pipe system. Whenever possible, Cooling system shall be located out of public view. Trane preferred.
1. 300 Tons or Less: Chilled water systems of 300 tons total capacity or less shall be provided with screw-type compressor water chilling equipment and have air-cooled condensers, whether packaged outdoor style or (where space permits) indoor compressor/chilled assemblies with outdoor condensers.
 - a. Chiller Quantity: All systems, regardless of size, shall be provided with multiple chillers to provide redundancy.
 2. Over 300 Tons: Systems in excess of 300 tons total capacity shall use multiple water-cooled screw-type compressor water chilling units with outdoor cooling towers. When the facility design HVAC load is over 300-tons, the design professional shall submit this information to YISD. YISD will provide written approval or request an alternative design approach.
 3. System Flow Type: Systems involving multiple water chilling units shall be configured in a primary/secondary pumping arrangement with the primary pumps being constant flow and the secondary pump being variable flow type, with two-way modulating flow valves at points of use. All two-way control valves shall have the same control characteristics of the Belimo pressure independent characterized control valves PICCV for maximum control and efficiency). If the project involves the modification and/or expansion of an existing system with 3-way valves and constant flow pumping, then the system will remain constant flow unless otherwise directed by YISD.
 4. Air Separators and Water Filters: Chilled water systems shall be fitted with a Taco 4900 series air/dirt ASME separator or equal unit, properly sized for the system.
 5. Freeze Protection: Each chiller shall be provided with a low ambient cut-out control to lock out chiller operation when chilled water pumps are running for freeze protection.
 6. Equipment access and operational clearance: The mechanical room in new facilities shall be designed to provide the minimum manufacturer-required access to all equipment. When possible utilize mechanical room doorways for coil removal clearance, this will help to minimize the size of mechanical rooms.
 7. Chilled water system water volume: All chilled water designs for YISD shall be checked during the design phase to ensure that the total volume of water in the system is adequate to prevent short cycling of the chiller compressor(s). Each manufacturer has a published gallon capacity per ton of chiller capacity that allows the chiller to operate without short cycling, the volume is typically 3 gallons per ton of cooling, but the design professional shall verify the number based on the selected chiller.
 8. Chilled water systems shall be selected with consideration given to noise generation. Exterior units shall comply with City of El Paso sound ordinances. Interior installed units shall be selected, isolated, and attenuated to maintain required sound levels within administrative areas and classrooms.
 9. Approved Chiller manufacturers are Trane and Carrier only.
 10. Cooling Tower Heat exchanger must be stainless steel.
- C. Air Handling Systems: All mechanical cooling systems shall involve forced air circulation of a "low-pressure" type 0.5" to 0.8" external static pressure) for single zone/constant volume systems and "medium-pressure" type (1.0" to 2.0" external static pressure) for multiple zone/variable air volume (VAV) systems.
1. Variable Air Volume: Variable air volume heating/cooling systems are preferable, utilizing low-pressure, single-inlet variable air volume terminals at controlled spaces.
 2. Constant Volume: Air handling systems incorporating heat and cooling shall be arranged to prohibit simultaneous heating and cooling generation.

- D. Heating System, General: Heating coils utilizing hot water and with forced air circulation is the preferred approach in all facilities (either new or additions) where circumstances and budget permit.
 - 1. Heating systems for new facilities should be designed as hot water type.
 - a. Boilers: Heating water systems shall be provided with gas-fired, steel tube, high efficiency low-nox noncondensing type hot water heating boilers, piped in a “blending valve” arrangement to provide variable loop temperatures with constant boiler temperatures. The design professional shall coordinate with the selected boiler manufacturer to ensure that condensate drains are connected and that, if required, a condensate neutralization unit is identified for each boiler. Acceptable boiler manufacturers include Bryan, Rite, Parker, Cleaver Brooks, or equal. Rite Boilers shall never be used.
 - b. 2,000,000 BTUH or less: Systems of 2,000,000 BTUH gross output capacity or less shall utilize at least two boilers, each selected at 60% capacity.
 - c. Over 2,000,000 BTUH: Larger systems shall utilize multiple boilers, each rated at no more than 2,000,000 BTUH gross output capacity. Where two or more boilers are installed, each shall be sized so as to leave not less than two-thirds of the total system capacity in operation with any one boiler taken out of service.
- E. Hydronic Piping: All hydronic piping for chilled and heating water system in YISD facilities will be either black steel or copper. The use of Victaulic type fittings and pro-press type fittings is acceptable, specify welded or threaded fittings.
 - 1. The design professional shall indicate on the drawings or in detail format the location of thermometer wells, test ports, etc. The locations need to be documented so that the controls contractor can install thermo-well probes for water temperature, etc. More ports are better than fewer and they are relatively inexpensive to install when the piping is not full of water.
 - 2. Air Separators and Water Filters: Heating water systems shall be fitted with a Spirotherm or Taco 4900 series air/dirt ASME or equal, properly sized for the system.
- F. The following are not allowed:
 - 1. Single-Blower, Double-Duct systems.
 - 2. Any all-air system operating at more than 3-1/2” W.G. across the fan.
 - 3. Terminal Air Blender (TAB) systems, with electric-drive fans and/or heating coils at terminals.
 - 4. Variable Refrigerant Flow Systems.

23.08 Above Ceiling Work, General

- A. Equipment with electric motors, belts, bearings, or filters shall not be located above finished ceilings. Where equipment must be located above finished ceilings, such installations shall be restricted to those spaces having “lay-in” ceiling panels (or which have adequate hinged metallic ceiling access panels or other means of approved access to equipment for maintenance or removal), and locations permitting maintenance activities to be carried out during normal working hours without disruption of classes or other activities (such as above corridors or storage rooms rather than adjacent classrooms, etc.).

23.09 Above Roof Work

- A. Where “rooftop” or roof-mounted HVAC equipment is used, project design shall incorporate:
 - 1. 120-volt AC electrical outlet near equipment (50’ radius) for power tools. Circuit shall be protected with ground fault circuit breaker.
 - 2. Hose bibb within 200’ of every unit.

- B. Not less than 20" clearance under equipment to allow re-roofing without dismantling system. Wherever possible, however, roof-mounted equipment shall be provided with weatherproof mounting curbs flashed into roofing, with all roof penetrations within the curb.
- C. Installation of equipment must meet manufacturer's recommended clearances. All equipment panels must be accessible for repair and maintenance.
- D. Design shall be that areas where birds will roost or nest are not possible.
- E. The current International building code requires guardrails at the roofs edge if equipment is located within 10 feet of the edge of the building roof, all equipment shall be located to avoid the use of guard rails. If the equipment cannot be located to avoid the use of guard rails YISD will be notified prior to completion of the design so that assistance can be provided to find an acceptable solution.

23.10 Ground-Mounted Work

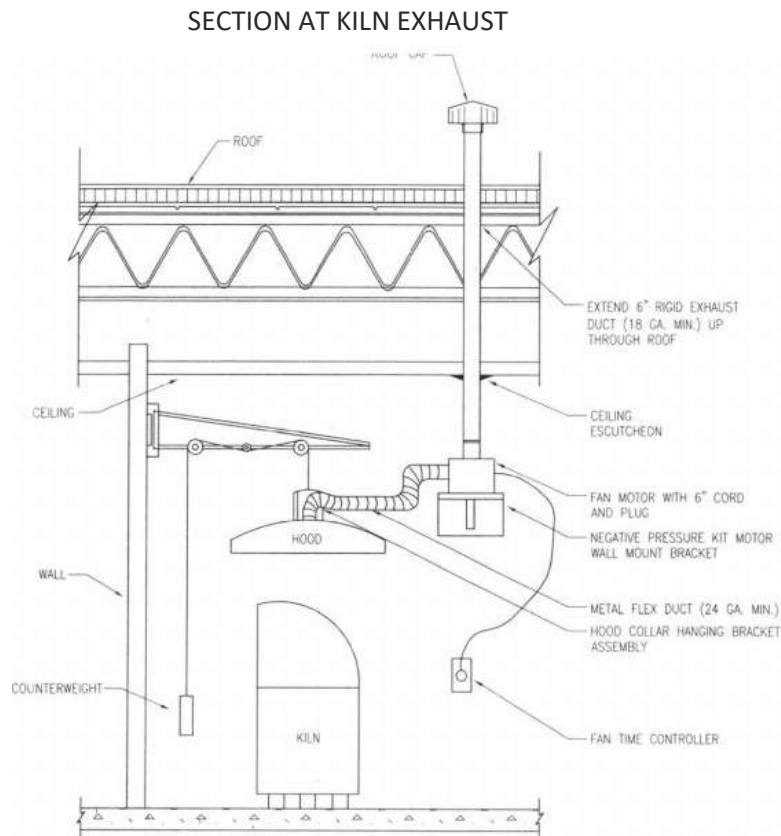
- A. Ground-mounted HVAC equipment not allowed unless it's a cooling tower and/or chiller system (shall be surrounded by a solid wall, securable with lockable gate or door, and properly sized and located). Equipment clearances shall be not less than those recommended by the manufacturer for service, ventilation, and/or removal, but in no case less than 36". An electrical outlet with ground fault circuit breaker protection shall be provided within 25', in line of sight. A hose bibb inside the enclosure and roof access ladders should be provided for each cooling tower. Chemical treatment storage should have protection from the elements in its own enclosure inside the cooling tower location.

23.11 Mechanical Equipment Spaces

- A. Physical Access: Mechanical equipment rooms shall be large enough to provide access to all equipment for maintenance and a means to remove and replace equipment. Special attention shall be given to provision of adequate access to bearings, drives, and filters (service and replacement), and to pulling of coils and blower shafts. The preferred room layout will allow any piece of equipment to be installed in such a manner that it can be removed from the building without major disassembly, removal of other equipment for access, or any physical damage to the building proper. When modular central station air handlers are needed to accommodate the facility design the air handler sections shall be sized to fit through the mechanical room doors
- B. Prohibited Arrangements: Machine, equipment, or air handling rooms shall not be used as return air plenums. Attics or above-ceiling spaces shall not be used to house HVAC equipment (other than air terminals, duct-mounted coils, etc.), unless adequate walkways are provided for maintenance personnel and vertical clearances between walkway and structure or other interferences are maintained at not less than 5'-0".
- C. Equipment Room Ventilation: All equipment rooms housing heat-generating equipment (boilers, compressors, etc.) shall be ventilated via outdoor air circulation with a minimum of 12 air changes per hour. Air shall be exhausted to outside at a minimum distance of 20' from any door, window, or fresh air intake.
- D. Space Usage: Combination machine rooms and custodian's closet or machine room/storage spaces are not acceptable. Access to machine and equipment room spaces shall be provided without going through assigned areas, such as a custodian's closet.

23.12 General Ventilation

- A. Storage Areas: All storage spaces shall be properly ventilated and where practical shall be served with building exhaust air. Conditioned air shall not be supplied to storage areas, except as specifically instructed in writing by YISD. Provide continuous ventilation of storage closets adjacent to labs where chemicals are stored or mixed.
- B. Service, Utility, and Athletic Areas: Kitchens, gymnasiums, activity rooms, dressing rooms, custodian closets, and toilet rooms shall be properly ventilated per the currently adopted version of the International Mechanical Code.
 - 1. Exhausts from adjacent toilet rooms shall be separated or acoustically isolated to prevent inter-room transmission of sound.
 - 2. Kitchen exhaust fans shall be electrically interlocked to be run automatically whenever the make-up air units are running and to be manually operated otherwise.
 - 3. The kitchen type I or type II hoods shall have an on/off switch on or near the hood. The design professional shall coordinate to ensure that all required motor starters have been identified to allow for multiple fan operation from a single on/off switch.
- C. All science classrooms shall have a smoke/fume purge system capable of an exhaust rate of 6 air changes per hour for the classroom. The system shall consist of a dedicated roof mounted exhaust fan ducted to a ceiling mounted grille in the science classroom. The grille is typically mounted on the other side of the room from the classroom door that acts as the air make-up for the exhaust system. A large red push button shall be located on the wall near the classroom door that will be used to engage/ disengage the purge system manually. Automatic controls of the system and connection to the building management system are not required.
- D. Science classroom support spaces that house chemicals or are used as preparations rooms where chemicals are used shall have continuous exhaust from the space and shall have a negative room pressure compared to the adjoining spaces.
- E. Kiln rooms, associated with art classrooms, require specialized ventilation systems. The detail below is the YISD standard for kiln rooms. Kiln and required ventilation system shall be coordinated during the design phase of project with approved drawings.



23.13 Air Intakes and Exhausts

- A. Outside air intakes and exhaust outlets shall be protected with rainproof louvers or other approved weather-protected systems, with bird screens. Intakes and exhausts shall be designed with approved means of protecting against accidental freeze-up of adjacent interior equipment or piping. Design to current codes to maintain distances between exhaust and air intake.

23.14 Piping for Heat-Transfer Coils

- A. Water Piping: Heating water, chilled water, or condenser water piping shall be schedule 40 black steel (American made) with welded fittings for sizes 2" and larger and type L hard copper with solder fittings for pipes smaller than 2". Piping shall be valved and arranged to facilitate system drainage and coil/equipment removal when maintenance is required. Horizontal piping shall be pitched for proper drainage. The use of Victaulic and Pro-Press type fittings is allowed.
- B. Refrigerant Piping: Refrigerant piping shall be dehydrated, refrigeration-grade type L copper, with long-radius wrought copper joints made up with "Sil-Fos" or equal brazing. Pipe sizing shall be carefully matched to the connected equipment and loads with proper provision for oil return in accordance with the equipment manufacturers installation instructions. Construction Documents shall require that the manufacturer of the refrigeration equipment be responsible for designating the size and arrangement of refrigerant piping serving the equipment furnished and that such recommendations be uniformly followed during installations.

- C. Gas Piping: Above-ground and roof-mounted gas piping shall be black schedule 40 steel (American Made), with welded fittings for sizes 2" and larger. Use black malleable iron with screwed fittings for pipes smaller than 2".
 - 1. Provide new gas shut-off valve at each location where a unit is replaced.
 - 2. Provide a rigid gas piping connection from the gas valve to each unit for new installations and remove any flexible gas pipe connections on replacement installations and replace with rigid gas piping.
 - 3. The use of flexible natural gas piping is not acceptable.
 - 4. The installed natural gas piping shall not block the filter access door or any other unit access door from fully opening.
 - 5. Gas piping routed on the roof shall be supported by a roller support similar to a Mapa Products adjustable height support. For multiple pipes or conduits, a strut support similar to a Mapa Products adjustable height support shall be used. The use of wood blocks or some sort of flimsy plastic support that will just tip over is not acceptable.
- D. Installation: All piping shall be properly sloped in accordance with ASHRAE recommendations, with provisions for drainage at all low points.
- E. Identification: All piping shall be labeled as to purpose and direction of flow, in accordance with YISD Paint Department Master Color Chart shown below.
 - 1. Concealed Piping: Piping that is concealed above a ceiling or in a vertical chase shall be labeled in accordance with the Master Color Chart and have a pre-printed label attached to the pipe at all access doors or every 20 feet that indicates the purpose (i.e. Chilled Water Return, Condensate, etc.) and the direction of flow.
 - 2. Exposed Piping Inside the Building: Piping exposed in mechanical, storage or other rooms inside the building will be labeled per the Master Color Chart if the pipe does not have insulation. If the pipe has insulation the pipe shall have a plastic pipe cover with the color impregnated into the plastic. All pipes, fittings and insulated equipment shall be covered with the plastic insulation cover. Once all pipes are either painted or have the plastic covers installed, a pre-printed label that indicates the purpose (i.e. Chilled Water Return, Condensate, etc.) and the direction of flow shall be affixed to the pipe.
 - 3. Exposed Piping Outside the Building: All piping outside the building shall be painted with a UV resistant paint to match the Master Color Chart. The pipe purpose (i.e. Chilled Water Return, Condensate, etc.) and direction of flow shall be stenciled on the pipe using a stencil pattern and black spray paint. The use of stickers or decals is not acceptable.
 - 4. Provide colored labeled ceiling tags to denote location of all valves and equipment within ceiling space.
- F. Valves and Trim:
 - 1. General: Shut-off valves shall be provided on each side of strainers in chilled, heating, or condenser water pipes and at the inlet and outlet of coils and pumps. Valved blow-down pipes to floor drains shall be provided at all strainers, and proper provisions shall be made for removal of strainer element without major piping disassembly.

MASTER COLOR CHART

A.	Domestic Cold Water	Safety Green
B.	Domestic Hot Water	Safety Orange
C.	Domestic Hot Water Return	Safety Orange
D.	Sanitary Sewer	Brown
E.	Roof Drain	White
F.	Chilled Water	Safety Blue
G.	Condenser Water	Light Gray
H.	Heating Water	Light Orange
I.	Natural Gas	Safety Yellow
J.	Fire Sprinkler	Safety Red

2. Air Removal: Automatic air vent valves shall be provided on all chilled and/or heating water piping where air pockets could form. Discharge pipes shall be provided from each automatic air vent valve to floor drains or other approved disposal points. It is not required to pipe vents located in reheat coils above ceilings to floor drains.
3. Measurement Devices: Pressure gauge cocks and thermometer wells shall be located to monitor leaving and entering water temperature from each water coil, heat exchange vessel, and elsewhere in the piping, as required, to monitor or evaluate performance of systems and components. 4"-diameter pressure gauges with gauge snubbers shall be provided at the inlet and outlet of each circulating pump. Adjustable-angle, separable-socket, direct-reading thermometers shall be provided at the inlet and outlet of each chiller, water-cooled condenser, hot water converter, and heating water boiler (after blending valve). Appropriate scale shall be selected to allow for proper reading.
4. Refrigeration Devices: DX units shall have accessible pump-down and charging valves in the liquid lines. The use of vibration isolators in refrigerant piping is not permitted.

23.15 Condensate Drainage

- A. Condensate drainage shall be provided in strict accordance with City of El Paso Plumbing and Mechanical Codes, including emergency drain pans, etc., where required. Emergency or overflow drain pans shall have a water sensing device in the pan wired to the unit shutdown terminals so that if water is detected the unit will turn off. Where applicable, condensate drain hubs shall be located higher than the rim of the lowest fixture in the particular sewer run. The use of condensate drain pumps in lieu of gravity drainage from HVAC equipment is not permitted. Condensate drains shall be type M copper, and insulated as per current energy code.

23.16 HVAC Equipment

- A. Roof-Mounted Equipment:
 1. Package HVAC Units: Factory-assembled, self-contained air conditioning units, comprising one or more scroll refrigeration compressors, air-cooled condensers, direct-expansion ("DX") evaporator coils, evaporator blowers, air filters, and all necessary and appropriate interconnecting piping, wiring, controls, insulation, refrigerant, etc., installed within a weather-proof housing that includes condenser coil hail guards and provided with a suitable insulated roof-mounting curb shall be the system of choice for most applications. Units shall also contain heating capability including gas-fired stainless-steel heat exchangers, controls, and accessories wherever natural gas is realistically available.
 2. Each rooftop unit shall be provided with 2" metal filter frames. Each filter frame shall be constructed of minimum 24-gauge galvanized steel with a black metal lath backing.

3. The filter frames shall be provided with non-woven polyester HDP1590 BD filter media as manufactured by Ahlstrom Air or equal. The media shall be nominal 2" in thickness and have an initial resistance of not more than 0.14" WG when tested at 350 FPM. The average dust weight arrestance shall be 85% or greater. A minimum of MERV 13 is required for all filters.
4. Where existing rooftop unit(s) are being replaced and the facility is not being re-roofed, an insulated adaptive roof curb shall be specified so the new unit can utilize the existing roof curb. If the project includes re-roofing the area where the rooftop units are being replaced, then a new insulated roof curb matching the rooftop unit shall be specified. Allowance shall be allocated to cover any replacement of associated duct work based on a per unit cost.
5. Sound transmission from rooftop units can create unacceptable levels of noise in a learning environment. All rooftop units shall have the following sound attenuating material installed in the roof curb. Where rooftop units are used for band halls, choir room or other sound sensitive area, the design professional shall specify a vibration isolation type roof curb similar to Vibro-Acoustics, type VCR.
6. Acceptable Manufacturers: Trane and Carrier.
7. No outside ducting shall be allowed.
8. Identification: Each rooftop unit shall have an identification tag indicating the unit number shown on the construction drawings, the classroom number that the unit serves and the circuit number serving the rooftop unit. The tag shall be plastic laminate, black background with 1.0" tall white letters for the unit number and 0.5" tall white letters tag shall be attached to the unit using sheet metal screws on each corner. If the unit number shown on the construction drawings conflicts with an existing unit number, the contractor shall be instructed to coordinate with YISD for a revised unit numbering scheme.

B. Boilers

1. General: Boilers shall be minimum 84% efficient. The boilers should have the following features: steel tube heat exchanger, firing rate modulation, electronic safety pilots, electric ignition, two low-water cut-offs, temperature and altitude gauge, fully automatic control system with Bacnet compatible interface and insulated metal jacket. If the project involves the modification to a steam boiler system or the replacement of a steam boiler, then the system shall remain a steam system with the boiler being of similar type to the existing.
2. Design Criteria: Boiler shall be selected to accommodate heating water systems designed for a maximum leaving water temperature of 180° F and temperature differential of approximately 20° F.
3. On projects where a boiler is used, the design professional shall request from YISD that a gas manifold pressure test be performed to ensure that adequate gas pressure is available to operate the boiler. It is also the design professional's responsibility to assess the existing gas service for remodel or expansion projects to ensure that added natural gas loads can be accommodated by the existing system.
4. Acceptable Manufacturers: Bryan, Cleaver Brooks, Parker, Raypak; Preferred for standardization.
5. Removal of any existing boilers or water heaters needs to be coordinated with YISD Maintenance Department to ensure proper documentation is submitted to the State.

C. Water Chilling Units:

1. General: Water chilling units shall be factory-assembled and tested equipment, with fully automatic operating, safety, and capacity controls. All control equipment shall be factory pre-wired in a lockable control panel and integral disconnect switch mounted on the unit. Chilled water temperature settings shall be made at the unit and compressor unloading control shall be microprocessor based as a part of the overall equipment control package. All units shall have condenser coil hail guards. Chiller will have capability of controlling chiller pump for normal operation and freeze protection.

2. Multiple Units: Multiple compressor units shall be provided with isolation valves and separate circuit breakers to facilitate removal and replacement.
3. Selection Criteria: Water chilling units shall be selected to produce their rated output at leaving chilled water temperatures of 45° F and at chilled water flow rates based on an approximate temperature differential of 10° F.
4. Acceptable Manufacturers: Trane and Carrier. Preferred for standardization.

D. Cooling Towers

1. General: Cooling towers, shall be selected to ensure adequate capacity under the design conditions stated in these design standards. Cooling towers shall be a closed-loop system, induced-draft type, with louvered side inlet(s) and vertical fan discharge, and shall be sized and designed to ensure a maximum drift of not more than 0.5% of the total water circulation.
2. Construction: Cooling tower casings and hot and cold water basins shall be stainless steel construction, hot water and cold water basins shall be stainless steel, inlet louvers, drift eliminators, and internal fill of fire-retardant PVC plastic material.
3. Accessories and Features: Flow control valves shall be provided where multiple hot water basins are used, and cold-water basins shall each be complete with depressed outlet sump having debris screen, overflow connection, electrical basin immersion heater, and automatic float-operated make-up water valve. Cooling tower fans shall be propeller type, gear driven by a TEFC motor (not located within the air stream) controlled by a variable frequency drive. Each fan shall have a protective discharge guard of non-corrosive materials, and the tower itself shall have OSHA-approved ladder and protective handrails around the upper perimeter. A basin filtration filter/ pump shall be provided for each cooling tower(s). The system shall be complete with sweeper piping in the cooling tower basin, interconnecting piping from the tower to the filter/pump and an interface to the building management control system.
4. Installation: Tower shall be provided with appropriate support steel grillage or concrete base, arranged so as to provide not less than 5' of positive suction head more than the minimum under which the condenser water pump can operate without cavitation. Tower locations shall be carefully coordinated with the project architect and YISD for consideration of aesthetics, performance, and maintenance. It shall be surrounded by a solid wall, securable with lockable gate or door, and properly sized and located. Equipment clearances shall be not less than those recommended by the manufacturer for service, ventilation, and/or removal, but in no case less than 36". An electrical outlet with ground fault circuit breaker protection shall be provided within 25', in line of sight. A hose bibb inside the enclosure and roof access ladders should be provided for each cooling tower. Chemical treatment storage should have protection from the elements in its own enclosure inside the cooling tower location.
5. Operation: Piping and controls shall be so arranged so that tower operation varies sequentially from full load and all water going through the tower, to modulating bypass of return condenser water direct to the cold-water basin, to temperature maintenance by means of the immersion heater.
6. Acceptable Manufacturer: Marley, Baltimore Air Coil, and Evapco.

E. Air-Cooled Condensers:

1. General: Condensers shall be factory-assembled units consisting of refrigerant coils, induced-draft fans, refrigerant piping, valves, controls, and/or receivers, mounted within a suitable casing or incorporated appropriately into HVAC equipment components. Coils shall be made of copper tubing and copper or aluminum fins, and fans shall be propeller types (with vertical discharge except for small package A/C units). All exposed condenser coil surfaces shall be provided with coil hail guards and all fans provided with fan guards. Fan motors shall be drip proof and suitable for operation in the low range of voltages for the system (i.e. 200 volt for 208, 208 volt for 230, 460 volt for 480). Fan motors with non-standard voltage/ phase

characteristics, such as 460/480 volt, single phase, or which utilize a single disconnect switch for multiple motors, are not acceptable.

2. Selection Criteria: Air-cooled condensers for refrigeration equipment shall be very conservatively selected. Each such condenser, whether an integral part of an HVAC equipment item (condensing unit, package A/C or HVAC unit, or package air-cooled chiller) or a separately mounted unit, shall be selected to operate in 102° F ambient air and to reject the heat of compression at that condition to support the full rated cooling output of the associated compressor and evaporator. Separately mounted condensers shall be selected for a maximum temperature differential between ambient air and condensing temperature of 15° F.
3. Installation: All air-cooled condensing equipment shall be installed in such a way as to provide not less than the manufacturer's recommended clearances for service and air circulation, but in no case less than 3'-0" horizontally from any side. Where enclosing walls inhibit the free flow of air for circulation to the equipment, the equipment shall be installed so that the discharge fan deck of the unit is level with the top of the enclosure.
4. Acceptable Manufacturers: Trane and Carrier. Preferred for standardization.

F. Air-Handling Units

1. General: Air handling units shall consist of factory-fabricated insulated steel casings housing heating coils and/or cooling coils, one or more blowers, air filters, damper assemblies as necessary to type of unit, insulated drain pan, and blower motor with drive assembly. Central station type chilled water air handlers shall be specified with plenum or plug type fans. Where air handling units are installed exposed to the weather, casings shall be specifically designed for weatherproof operation, and where installed on roofs, shall be provided with insulated roof-mounting curbs arranged for flashing into roof membranes and enclosing all ducts, pipe, and conduit penetrations associated with the unit.
2. Heating and Cooling Coils: Heating and cooling coils for HVAC equipment shall be constructed of copper tubes and copper or aluminum fins, with fins bonded to the tubes.
 - a. Test Pressures: Water coils shall be factory leak tested at not less than 200 psig and refrigerant coils for not less than 300 psig.
 - b. Capacity Ratings:
 - c. Selection Criteria: Cooling coils shall be selected for a face velocity over the active coil area of no more than 550' per minute. Heating coils shall be selected similarly for no more than 1,000' per minute. Except as otherwise specifically authorized by YISD, cooling coils shall be selected for suction temperatures or entering chilled water temperatures no lower than 42° -46°F, and heating coils for entering hot water no higher than 180° F.
 - d. Scheduled Requirements: Minimum acceptable capacities for cooling and heating coils shall be scheduled on the plans in terms of total heat and sensible heat transfer, coil CFM, coil air entering dry bulb and wet bulb temperatures, for refrigerant coils or flow rate and entering water temperature for water coils.
 - e. Certification: Specifications shall require coil manufacturer to certify coil performance at scheduled conditions per appropriate ARI procedures and to provide computer-generated verification of performance under specified conditions as a part of the submittal data for approval.
 - f. Fan Speed Control: Unless otherwise specifically authorized in writing by YISD, variable air volume (VAV) delivery from VAV air handling units shall be accomplished by means of variable speed or variable frequency drive motor controller. In all cases where a variable frequency drive is used for motor speed adjustment, the fan motor shall be premium efficiency type rated for use with a variable frequency drive. The motor shall also have a shaft ground ring to prevent potential shaft/drive degradation.

- g. Drives: Drive assemblies shall be adjustable pitch V-belt type for motors less than 10 horsepower and fixed sheave V-belt type for motors 10 horsepower and above, provided with protective guards where located outside housings, and where inside housings, shall require an additional 3.0% of the scheduled sensible cooling capacity to be added to the rated coil output for which selection is made.
- h. Each air handling unit shall be provided with 30% pre filters and a final 85% cartridge or bag filter.
- i. Acceptable Manufacturers: Trane and Carrier. Preferred for standardization and must match associated equipment.

G. Circulating Pumps:

- 1. General: Circulating pumps for heating, cooling, or condenser water systems shall be centrifugal type with bronze impellers, bronze or stainless-steel shafts, cast iron casings, bronze or stainless steel shaft sleeves and wearing rings, renewable bearings, and mechanical seals. Pumps with packing glands are not acceptable.
- 2. Pump Type: Pumps shall be end suction close coupled water quantities are below 1,100 gpm and total discharge head is at or below 85 feet of water. For flow rates above 1,000 gpm and discharge heads above 85 feet of water horizontal split case pumps shall be used.
- 3. Pump Selection: Impellers shall be smaller than the largest diameter routinely catalogued for the pump, and pump selections shall be such as to have not less than 10% head rise to shutoff and be "non-overloading" relative to driving motor size (within 110% of motor full load rating) at all points along the curve.
- 4. Pump Speeds: Pump speeds for condenser water and chilled water pumps shall not exceed 1800 rpm, and for heating water pumps, shall not exceed 3600 rpm.
- 5. Acceptable Manufacturers: TACO, Armstrong, and Peerless. Preferred for standardization.

H. Air Terminals

- 1. Variable Air Volume: Terminals shall be single-inlet modulating air flow type with internal acoustic lining, direct digital controller (DDC) operated volume control valve (butterfly damper not acceptable), and adjustable minimum supply setting down to approximately 10% of full CFM at the point of delivery. "Dump type" or "bypass" VAV terminals are not acceptable for general use but may be approved for special local application in establishing sub-controlled areas within those served by constant volume systems. Under no circumstances will motive power for the operator or control device be derived from supply duct system air pressure.

23.17 Ductwork

A. Ductwork Construction

- 1. All ductwork for YISD facilities shall be galvanized sheet metal, constructed and supported in accordance with SMACNA standards. Rectangular ducts shall be connected using a Ductmate type flange and clip system with rubber airtight gasket. Round ductwork shall be galvanized sheet metal, spiral type, with tapered end fitting.

B. Ductwork Fittings

- 1. All ductwork fittings, round or rectangular, shall be shop fabricated from galvanized steel in accordance with SMACNA standards. The fittings shall have connection systems that match the straight duct sections as indicated in section 1.17, A, 1 above. Rectangular mitered elbows shall have single width turning vanes. Where possible radius elbows should be used for rectangular ductwork.

C. Spiral/Oval Duct and Fittings

1. Spiral wound round and oval duct shall be made of galvanized steel. Spiral wound duct shall be manufactured in accordance with the latest editions of SMACNA, ASHRAE and SPIDA Standards.
2. All round and/or flat oval spiral duct and fittings shall be manufactured by a company whose primary business is the manufacture of spiral duct and fittings.
3. All spiral duct and fittings shall be manufactured from G-60 galvanized steel meeting ASTM A924 and A653 requirements.
4. Branch connections shall be made with 90° conical and 45° straight taps as shown on the drawings. All branch connections shall be made as a separate fitting. Factory or field installation of taps into spiral duct shall not be allowed without written approval of the engineer.
5. 90° and 45° elbows in diameters 3" round through 12" round shall be stamped or pleated elbows. All other elbows shall be of the gored type. Where it is necessary to use two-piece mitered elbows. All field joints for round duct up to and including 36" diameter and oval duct up to and including 41" major axis shall be made with a 2" slip-fit or slip coupling. Diameters 38" round and larger shall be provided with AccuFlange, or equal, flanged connections. AccuFlange, or equal, flanged connections may also be used in lieu of slip connections on smaller sizes.
6. Access doors shall be supplied by the duct manufacturer at all fire and/or smoke dampers.
7. All exposed duct shall be double wall, acoustically insulated round/oval duct shall be supplied. Double wall duct shall be constructed of an outer shell, a 1" thick layer of fiberglass insulation and an inner metal liner. Insulation shall have a thermal conductivity "K" factor of .26 BTU/hr/sq. ft./°F or less. The inner metal liner for all spiral and longitudinal seam duct shall be perforated metal. All fittings from fan discharge to a point where 35 lineal feet of spiral duct has been used shall have a perforated metal liner. All other fittings shall have a solid metal liner, which may be one even gauge lighter than that shown for perforated liners.
8. All Balancing dampers shall be easily accessible. Access panels shall be installed when they are above a hard ceiling.
9. Spiral duct shall be as manufactured by Sisneros Brothers, Spiral pipe of Texas, United McGill, Duct Direct or approved equal.

D. Ductwork Insulation

1. Rectangular ductwork shall be internally insulated (lined), at a minimum, for the first 10 feet of ductwork starting at the air handler/rooftop unit to minimize noise for both the supply and return ductwork. The sound sensitive spaces within a facility, such as auditoriums, libraries, band/music classrooms, etc., the entire length of both the supply and return ductwork shall be internally insulated. The internal insulation shall have an anti-microbial air side surface and shall have a manufacturer documented acoustical reduction characteristic, similar to a Johns-Manville Permacoat Linacoustic insulation. The minimum thickness shall comply with the requirements of the currently adopted version of the International Energy Conservation Code.
2. Concealed ductwork shall be insulated with foil backed duct wrap batt insulation similar to Johns-Manville Micro-Lite. The minimum thickness shall comply with the requirements of the currently adopted version of the International Energy Conservation Code. The installation of the duct wrap insulation shall be in accordance with the manufacturer's requirements to form a vapor tight barrier.

E. Testing of Medium Pressure Ductwork: (Includes from fan discharge through to the discharge of terminal units.)

1. All medium pressure ducts shall be pressure tested according to SMACNA Chapter 10 test procedures. Design pressure for testing ductwork shall be three inches (3") of water. Total allowable leakage shall not exceed 1% of the total system design air flow rate. When partial sections of the duct system are tested, the summation of the leakage for all Sections shall not exceed the total allowable leakage.

2. The entire system of medium pressure ductwork shall be tested, including the VAV/Constant Volume Terminal Units (i.e. The ductwork shall be capped immediately prior to the Terminal Units, and tested as described above). After testing has proven that the ductwork is installed and performs as specified, the terminal units shall be connected to the ductwork and the connections sealed with extra care. The contractor shall inform the owner's representative when the joints may be visually inspected for voids, splits, or improper sealing of the joints. If any leakage in the terminal unit connections/joints after the systems have been put into service, the leaks shall be repaired by: 1) complete removal of the sealing materials, 2) thorough cleaning of the joint surfaces, and 3) installation of multiple layers of sealing materials.

23.18 Energy Management Design Criteria

A. District-wide EMS Requirements

1. All new facilities, additions to facilities and where identified by YISD removal and replacement of existing antiquated control systems shall include appropriate provisions for interface with the YISD district wide Energy Management System (EMS). Precision Controls (Automated Logic shall be used for EMS controls).
2. EMS Interface Requirements: Interface shall be provided for all HVAC equipment installed at each project, for lighting control where control is required by code, YISD, or other equipment/system monitoring integrated with that EMS system. To include HVAC installed in MDF/IDFs and temperature controls for kitchen Freezers and walk-in Coolers. Data drops shall be included in all Special Systems room to address the EMS needs.
3. Contractor-Furnished Equipment: Controls Contractor shall provide complete and operable direct digital control systems as outlined in the YISD specification for EMS systems. All YISD systems shall have an Internet/Web interface.
4. Construction Documents: Project Construction Drawings shall include control diagrams and sequence of operation for each piece of equipment or group of equipment acting as a system. It is not acceptable to submit the specification only on a YISD project. All control diagrams and sequence of operations will be on the drawings. Examples of control diagrams are provided for reference later in this document (refer to Appendix-A). The examples are not all-inclusive; so, if there is a system type not shown here then a diagram will need to be developed. The controls specification shall support the intent of the control diagrams and sequence of operation and will provided the technical requirements associated with the EMS system. The specification shall define the contractor responsibilities and equipment requirements including termination of all wiring at numbered terminal strips. It should also include the use of lockable junction boxes, coordination with YISD staff on controller locations and identification of submittal requirements. EMS System Power: The construction documents will show a dedicated 120 volt circuit in each mechanical room or in locations where EMS controllers might be located. The terminating J-box should be clearly identified as being provided for EMS system power and that it is the control contractor's responsibility to extend power from the j-box location to the actual controller location. It is relatively inexpensive to provide the circuits as part of the initial design of the project; so if there is a question on number of circuits and location coordinate with the YISD for assistance.
5. Component Power: The design professional shall coordinate the EMS system components on the project that require line voltage power (120 volt or higher) such as fire-stat, smoke detectors, motor actuators, etc. to ensure that power for those devices, if scheduled or specified to be line voltage, is shown on the construction documents.
6. IP/Address & connection points shall be coordinated with YISD IT department.
7. Training shall be a minimum of 36 hours.
8. All major projects shall include a new laptop with most current software to be provided to YISD EMS department.

9. All VRF systems shall be BACNET compatible and be able to pass all points. EMS contractor to provide spare parts on all major projects.
10. EMS contractor to provide spare parts on all major projects. At a minimum provide 10 controllers and 10 thermostats.
11. For this project and Projects in which the area is to be renovated and an existing Building Automation System (BAS) exists, the new space temperature controls and equipment shall be of the same manufacturer as the existing BAS and shall be incorporated into the existing BAS seamlessly without any type of integration.
12. All operator interface connected to a controller shall allow the operator to interface with each internetwork as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

23.19 Test and Balance Contractor

- A. Test and Balance Contractor shall be NEBB or TABB certified and contracted directly by the Contractor.

END OF DIVISION 23

Division 26 – Electrical

26.01 General Provisions

- A. All new and remodeled facilities for YISD shall be provided with full and complete electrical, lighting, and related support systems as required for practical operation and in conformance with all applicable regulations, codes, and ordinances.
- B. A lightning protection system is not required on YISD projects.
- C. All outlet covers/wall plates shall be 302 stainless steel.

26.02 Service Characteristics

- A. The electrical service characteristics for each project shall be determined specifically for the site involved, as approved by YISD.
- B. Facilities: The electrical service characteristics shall be 480Y/277 volt, three phase, four wire on all new projects (subject to confirmation by El Paso Electric). The primary service voltage shall be selected for economy of wiring based on anticipated loads and voltages of equipment being served.
- C. Existing Facilities: Existing electrical service characteristics shall be maintained, when feasible, for all additions/renovations.
- D. Building utilization voltages shall be as follows:
 - 1. 480 or 208 volt, three phase, for motors 3/4 horsepower and larger.
 - 2. 120 volt, single phase, for motors 1/2 horsepower and smaller.
 - 3. 120 or 277 volt, single phase, for fluorescent lighting.
 - 4. 120 volt, single phase, for LED or incandescent (only with written approval) lighting.
 - 5. 277 volt, single phase, for LED or high intensity discharge lighting (only with written approval).
 - 6. 208 volt, single phase, for special purpose outlets.
 - 7. All equipment shall be 120 or 208 volt, single or three phase, for kitchen equipment, as designated by the kitchen consultant. Provide a 120/208-volt, 400 AMP service as a minimum.
 - 8. 208 volt, three phase for electric heating elements 3kW and larger.
 - 9. 120 volt, single phase, for electric heating elements smaller than 3kW.
 - 10. 208Y/120 volt, three phase, four wire for general purpose use.

26.03 Service Outages

- A. Construction Documents shall require that any and all service outages required for the project shall be coordinated with YISD prior to the scheduled shutdown. A written request shall be submitted 7 days in advance of the scheduled outage. The contractor shall include a schedule of his work and an estimate of the time required to accomplish the work. All service outages shall be coordinated such that they shall occur at times other than school hours, and the system shall be re-energized prior to the start of the next scheduled school day.

26.04 Electrical Distribution Systems

- A. General: The type and location of the power company service transformer (i.e. pole- vs. pad-mounted) shall be determined for each specific site based on input from power company. Pad-mounted transformers are preferred and metering provisions as required by El Paso Electric Company (EPEC) shall be provided. Service charges from the EPEC shall be directed to YISD and not included in construction contracts.
- B. Existing Service: If an existing power company service originates from a vault, below or on grade, additional loads shall be served from the existing vault if allowed by EPEC. Service shall be changed to pad-mount transformer above grade if performing major service renovations or required by EPEC. Pad-mount transformers are preferred over pole-mount transformers. If a new power source is required, justification shall be made for any deviation from the existing design scheme. The Architect/Engineer shall coordinate all requirements with YISD.
- C. New Service: New electrical service to any facility shall be run underground in type EC (encased burial) PVC conduit. Install in accordance with the manufacturer's recommendations and provide 25% spare conduit capacity.
- D. Provide concrete-filled steel pipe bollards around all transformer and service equipment as required by El Paso Electric Company.
- E. Dry type transformers with appropriate NEMA enclosures shall be used for 120/208 volt loads.
 - 1. All transformers to be floor mounted with housekeeping pads.
 - 2. Provide K-rated type transformers where the usage warrants.
- F. Power branch circuits must be kept separate from lighting. Branch circuits to each classroom must be kept separate, and there must be a minimum of two receptacle branch circuits provided for each classroom. Common raceways may be used for power circuits, and common raceways may be used for lighting circuits. Combined circuits shall not have common neutrals. Where multiple neutrals occur in a raceway, provide color coding or tracer stripping. Neutral conductors are to be extended to light switches. HVAC equipment circuits shall be separate from all others. Computer lab shall have minimum seven 20-amp circuits. (Maximum four (4) computers per 20-amp circuit).
- G. The term "clean power" where used for technology equipment means that the source is derived from a dry-type transformer operating within normal commercial power tolerances having less than 5% total harmonic distortion (THD) on the secondary bus unless another THD figure is required for the equipment.
- H. Classroom Spare circuits: At each classroom, provide two spare 120V, 20A circuits with individual neutrals in a surface mounted junction box with blank cover plate above the lay-in ceiling for future use. Install box on building structure centered in room about 7 feet from the back of the room. Terminate conductors with insulated wire-nuts and label wires with panel board and circuit numbers.
- I. Phase fail protection for motors is required and shall be coordinated with YISD as to the location and size of motors.

26.05 Panelboards

- A. Busses in all panelboards of any type shall be copper. Aluminum will not be acceptable for any current-carrying purpose. All terminations shall be rated for a minimum of 75°C. Acceptable manufacturers are Square 'D', Siemens, and Cutler Hammer (Eaton).

- B. Main Panelboards and Switchgear: Main distribution boards and switchgear shall be fusible switch-type construction, except that molded-case "bolt-on" type circuit breakers may be used for projects where the available interrupting capacity is less than 35,000 AIC.
 - 1. Provide surge protection devices (SPD) at main service entry point (SPD devices shall be installed at these locations).
 - 2. SPD protection shall provide protection from transients on phase conductors, neutral conductors, and ground surges.
 - 3. Overcurrent protection devices shall have definite coordinated time current curves to isolate faults within the distribution system down to the branch circuit. A fault on one branch circuit must be isolated to the individual branch circuit.
- C. Distribution Panelboards: Distribution boards shall have current-limiting "Fusetron" or approved equal dual-element fuses, except that molded-case circuit breakers may be used for projects where the available interrupting capacity is less than 35,000 AIC. 200% neutral bus bars shall be provided for panels with harmonic loads created by non-linear loads such as switching power supplies, electronic ballasts, and other similar non-linear loads. Provide 200% neutral conductor back to source of distribution.
- D. Branch Circuit Panelboards: Lighting and appliance branch circuit panelboards shall be constructed in accordance with recommended industry practices and procedures for circuit breaker panelboard construction. Circuit breakers shall be "bolt-on" type circuit breakers. 200% neutral busbars shall be provided for panels with harmonic loads created by non-linear loads such as switching power supplies, electronic ballasts, and other similar non-linear loads. Provide 200% neutral conductor back to source of distribution.
- E. Load Balance: All panelboard circuits shall be balanced on all phases within 10%.
- F. Panelboard Locations: Branch circuit panelboards shall be located in equipment rooms/spaces designated for such equipment. Electrical rooms shall be minimum size of 6 ft. wide X 8 ft. long. Location and size of electrical rooms shall be coordinated with Architect and Owner's design team. Panelboards may not be located in corridors, toilets, and other student areas. Electrical spaces shall be designed to allow for access, maintenance and replacement of equipment, and future panel space. On recess mounted electrical panels provide at least three 3/4" conduits extend to above ceiling space.
- G. Directories: All panelboard directories shall be typed and mounted on the inside of panelboard doors behind clear plastic sheets. Spares shall be written in pencil. Each directory entry needs to designate the type of load and location of load; i.e. 'Lights, Room 201', Receptacles, Room 203'. Room numbers are to be final numbers used on room nameplates and not numbers shown on construction drawings. Circuit breakers must have circuit numbers next to breaker to correspond to numbering on type directory. All outlets and switches and 4" square boxes in the ceiling be marked with corresponding panel and circuit.
- H. Protection: Electrical equipment/apparatus shall not be permitted on the job site until it can be fully protected from weather, moisture, physical damage, etc.
- I. Design Capacity: Additional capacity in service feeders and main switchgear shall be included for 20% future expansion of all projects.
- J. Provide a minimum of 9 spare circuit breakers in each power branch circuit panel board and six spare circuit breakers in each lighting circuit panel board. Any panel installed shall have a minimum of 42-poles.

- K. Do not install panelboards in closets with sinks. Panelboards may be installed in kitchen areas, provided they are in closets or in a separate area away from moisture.
- L. Provide plastic engraved nameplates for all panelboards and switchgear. Nameplate to be white with black lettering. Nameplate to list panelboard name, voltage & phase, and source panel as follows:

Panelboards: Panel KP
277/480V, 3PH, 4W
CCT: ACM-3

26.06 Lighting

- A. General: In each application, the type of lighting best suited for the task shall be installed, with proper consideration being given to the efficiency of the source so that an overall energy-efficient system is provided that is compliant with the current energy code.
 - 1. Interior: Interior exit lights shall be LED and designed to provide not less than one foot-candle on the floor surfaces, served by a battery for not less than 1-1/2 hours duration independent of the normal service. Also, in restrooms with no windows, LED type battery backup lights shall be installed with 1-1/2 hours burn time rating. Emergency lighting integral with lighting fixtures is preferred.
- B. Exterior: Outside security lighting shall be LED type, Dark Sky complaint with full cut-off and provide an average minimum of five foot-candle outside on walls, walks, parking lots, and dumpster areas, located where requested by YISD. Comply with exterior egress illumination outside of building to either a public way or a distance away from building that is considered safe as required by AHJ for project.
- C. Illumination Levels:
 - 1. Illumination levels shall be per IES recommendations or the following table unless limited by current energy codes.
 - 2.

Room Type	Maintained Illumination in F.C.
Classrooms	30
Art Classrooms	50
Drafting Classrooms	50
Science Labs	50
Corridors	15
Music Rooms	50
Offices	30
Cafeteria, Library, Computer Rooms	30
Kitchen	50
Gymnasiums (Basketball)	80
Gymnasiums (Recreational)	50
Locker Rooms	30
Communications Closets (MC & IC)	50

- D. Switching, General. Multi-level switching shall be provided in all classroom and office areas. All switching shall be in accordance with the current energy code requirements. Where LCD projectors are used in classrooms or special applications, control of lights shall be considered in the design.
- E. Egress Lighting: Egress lighting in general shall be LED.
- F. Installation, General: Light fixtures shall be suspended from structure and not from the ceiling system. Light fixtures shall be located in such a way as to reduce vandalism. Where 277-volt lighting branch circuits supply classroom lighting, the branch circuits must not supply more than three adjacent classrooms. Where 120-volt lighting branch circuits supply classroom lighting, the branch circuits must not supply more than two adjacent classrooms.
- G. Lamps, General:
 - 1. Incandescent: No incandescent lamps
 - 2. Fluorescent: Fluorescent lamps shall not be used.
 - 3. Ballasts: All LED ballasts shall be electronic type.
 - 4. Color of LED sources shall be 4000k cool white.
 - 5. LED Drivers: All LED drivers shall be high efficiency type with 0-10V dimming as standard.
- H. General Lighting Criteria:
 - 1. Exterior Lighting:
 - a. Recessed wall packs are prohibited; only surface-mounted lights allowed, except soffit lighting, which should be limited to exit locations and may be used for wall and limited site illumination as approved by YISD.
 - b. Only LED lights permitted
 - c. Poles are to be of steel construction, bolted to the concrete base.
 - d. Do not allow light to bleed into neighboring properties.
 - e. All exterior lighting to be controlled by a time controller with electronic time clock and photocell for photocell – ON, time clock – OFF operation.
 - f. All exterior lighting shall be integrated with YISD Energy Management Systems.
 - g. All parking lots shall be designed to ensure all areas have a minimum 15 FC coverage.
 - 2. Interior Lighting: Refer to energy code for compliance.
 - a. Primary interior lighting is two-lamp LED recessed 4000k cool white.
 - b. All high bay fixtures to be T5 LED and wire guards. Provide safety chains at all high bay fixtures in high bay areas (gymnasiums, gymnasiums). Wire guards should be designed to ensure they do not fall off when impacted by projectiles.
 - c. Provide dual switching over seating in gyms; in gymnasiums provide dimming.
 - d. At gymnasiums, provide suspended border light bar and star par spotlight in front of the stage with portable dimmer and LED fixtures above the stage. For theatrical efforts, task lights shall be LED.
 - e. Only LED-style exit lights with battery back-up are acceptable. In gyms provide high impact resistant type fixtures.
 - f. Preferred method of emergency lighting is wall-mounted or ceiling-mounted, LED type supplementary fixtures with integral battery. Wall mounted fixtures to be 10' – 0" minimum above floor and to include lexan clear vandal resistant guards. Do not wire normal lighting to emergency circuit.
 - g. Provide surface-mounted, exterior-type LED lighting over outdoor can washing areas with a minimum of 30 FC.
 - h. Provide lighting in all elevator pits and in crawl spaces.
 - i. In gymnasiums, lighting over seating area shall be LED type.
 - j. In existing building, all incandescent fixtures to be replaced shall be replaced with LED fixtures.

- k. Light fixtures in stairwells shall be easily accessible for maintenance. It is preferred that wall-mounted lights be installed above the landings in stairwells.
- l. Time clocks that control interior lighting will shall have an override switch for manual control in the event of clock failure. This switch shall be installed adjacent to the time clock and shall integrate with YISD approved Energy Management Systems.

26.07 Switches and Outlets

- A. Switches, General: Lighting for corridors, student toilets, and public spaces shall be switched from locations designated by the PM. Provide night light from point of main building entry to specified closets to allow for after- hours lighted areas. All switches shall be 125/277V, 20A, specification grade, 'Leviton' or approved equal. Key switches shall be grounding type, specification grade, corbin lock type, Pass & Seymour PS20AC series or approved equal. All switches and keyed switches shall have a 302 stainless steel device cover plate.
- B. Receptacles, General: Receptacles shall be 20A, 125V, three-wire grounding type, specification grade, "Pass and Seymour," "Leviton," or approved equal. All receptacle faceplates shall be 302 stainless steel device cover plate.
- C. Mounting Heights: Mounting height of switches shall comply with all state and local requirements regarding barrier free access. Mounting height of receptacles shall be 18" above the finished floor or 6" above the countertop. Switches shall be 48" above the finished floor.
- D. All switch and convenience outlet plates are to have 302 stainless steel device cover plates.
- E. Provide a minimum of four electrical outlets on two separate circuits on all classrooms. Specialty rooms to be coordinated and approved by YISD.
- F. Provide three-way switching in all kitchens. Switching scheme shall comply with the requirements of the current energy code.
- G. Provide at least three dedicated 120-volt circuits and one dedicated 120/208-volt, four-wire circuit in each communication closet. Provide a dedicated receptacle for EMS system control panels. Provide power to the UPS's as required by Division 27 Technical Design Standards.
- H. Ventilation fans in restrooms will be controlled by the EMS system.
- I. All switches in stairwells, hallways, collaboration areas, and assembly areas shall have tamper resistant covers.
- J. Prohibited Installation:
 - 1. No switches or receptacles shall be mounted in marker boards or tack boards.
 - 2. No receptacles or switches shall be mounted in exterior locations, except within equipment yards and at roof-mounted HVAC equipment locations. Outdoor weatherproof covers for receptacle outlets shall be in-use type with metal covers.
 - 3. Electrical outlets in floors where water can be spilled are prohibited except in serving line at kitchens.

26.08 Conduit and Raceway

- A. Installation, General: No conduit shall be run within 10" of the roof deck inside the building. Conduit shall be suspended from structural members, and not from ceiling systems or roof deck. Conduits shall be located only in places approved for their use by the NEC. Circuits for lighting shall be provided with separate conduit runs from those for receptacles. Do not install conduits on the roof. Use appropriate fastening devices to mount conduits and boxes (Toggle bolts on plaster and sheetrock walls, etc.).
- B. Materials: Conduit system shall be metallic throughout, UL labeled, and all steel shall be hot-dip galvanized. Fittings shall be of similar construction. All wiring shall be in EMT conduit. Flex metal conduit is permitted for future loops not to exceed 10'-0". In new construction no conduit shall be installed on the roof; all conduits shall be hung from structure. Use set screw fittings inside the building. On existing buildings conduit may be installed on roof using rooftop blocks, as manufactured by B-Line, Dura-Blok or approved equal. Conduit on roof shall be rigid steel conduit (RSC) or intermediate conduit (IMC).
- C. Underground: All underground primary electrical feeders shall be in run in PVC conduit and concrete encased. At least one spare conduit shall be provided in each case for service entrance conduits. Conduit risers shall be rigid steel tape wrapped.
- D. Final Connections: All connections to mechanical equipment shall be made with flexible metal conduit. Flexible metal conduit used in damp or wet locations shall be PVC coated (Sealtight).
- E. Box Color Coding: Conduit outlet boxes shall be identified by the wiring system served with outlet box exterior to be spray painted as follows:
 - 1. Fire Alarm System – red
 - 2. Public Address System – blue
 - 3. Intrusion Alarm System – yellow
 - 4. Data System – green (Please refer to Division 27)
- F. Box Circuit Identification: Branch circuit numbers are to be written with black ink markers on outlet box covers for circuits terminating at boxes.

26.09 Conductors

- A. General: All conductors shall be copper, including service wiring. With the exception of low voltage control wiring, all conductors shall be stranded, not solid wire. THHN or THWN insulation on all wiring. No exception.
- B. Control Wiring: All control wiring shall be 24 or 120 volt (maximum) as appropriate to the use. All control wiring shall be run in conduit. "HVAC Control Wiring" as associated with the automatic control system or YISD district-wide EMS shall be approved by YISD.
- C. Grounding: The electrical system shall comply with NEC rules for grounding. All panelboards/distribution boards shall be provided with a separate grounding bar. A separate green ground conductor shall be run in each conduit. A UFER ground shall be used as the system grounding electrode for all new construction. Electrical systems installed in additions to existing structures shall be grounded to the same grounding electrode as the existing system. Provide grounding for telephone service.

- D. Provide consistent color coding for all three-phase circuits as follows:

120/208 volt:	277/480 volt:
Phase A - Black	Phase A - Brown
Phase B – Red	Phase B - Orange
Phase C – Blue	Phase C - Yellow
Neutral – White	Neutral - Grey
Ground – Green	Ground - Green

26.10 Clock and Tone Systems

- A. Refer to Division 27 Technical Design Standards

26.11 Communications Systems

- A. Refer to Division 27 Technical Design Standards

26.12 Fire Alarm and Smoke Detection Systems

- A. Refer to Division 28 Technical Design Standards

END OF DIVISION 26

Division 27 – Communications

27.01 Intercommunications and Program System Design

- A. All new facilities, new additions to existing facilities and remodeled facilities shall be provisioned with an Intercommunications and Program System as determined by the Ysleta Independent School District (YISD). The primary function of these systems is to coordinate activities, facilitate staff communications and provide mass communications for the campus population for routine programming and safety and security information.

27.02 Standards

- A. Every aspect of the Intercommunications and Program System shall be designed to adhere to all industry standard installation practices, manufacturers' recommendations, and state and local codes, standards, and regulations.
- B. Federal, state, and local codes, rules, regulations, and ordinances governing the work are to be included in the specifications. Should items noted in the drawings or specifications create an installation that is in violation of codes, rules, regulations, or ordinances, promptly call them to the attention YISD's representative.

27.03 Related Work Specified in Other Divisions

- A. See Division 26 for all specifications governing the performance of work associated with the installation of electrical power, raceway, system junction and pull boxes and device rough-in boxes for all work shown in the Intercommunications and Program System drawings.
- B. Refer to Division 27 Telecommunications for the approved and latest YISD Cabling Standards for telecommunications cabling and other related technology cabling standards.

27.04 Intercommunications and Program System Description

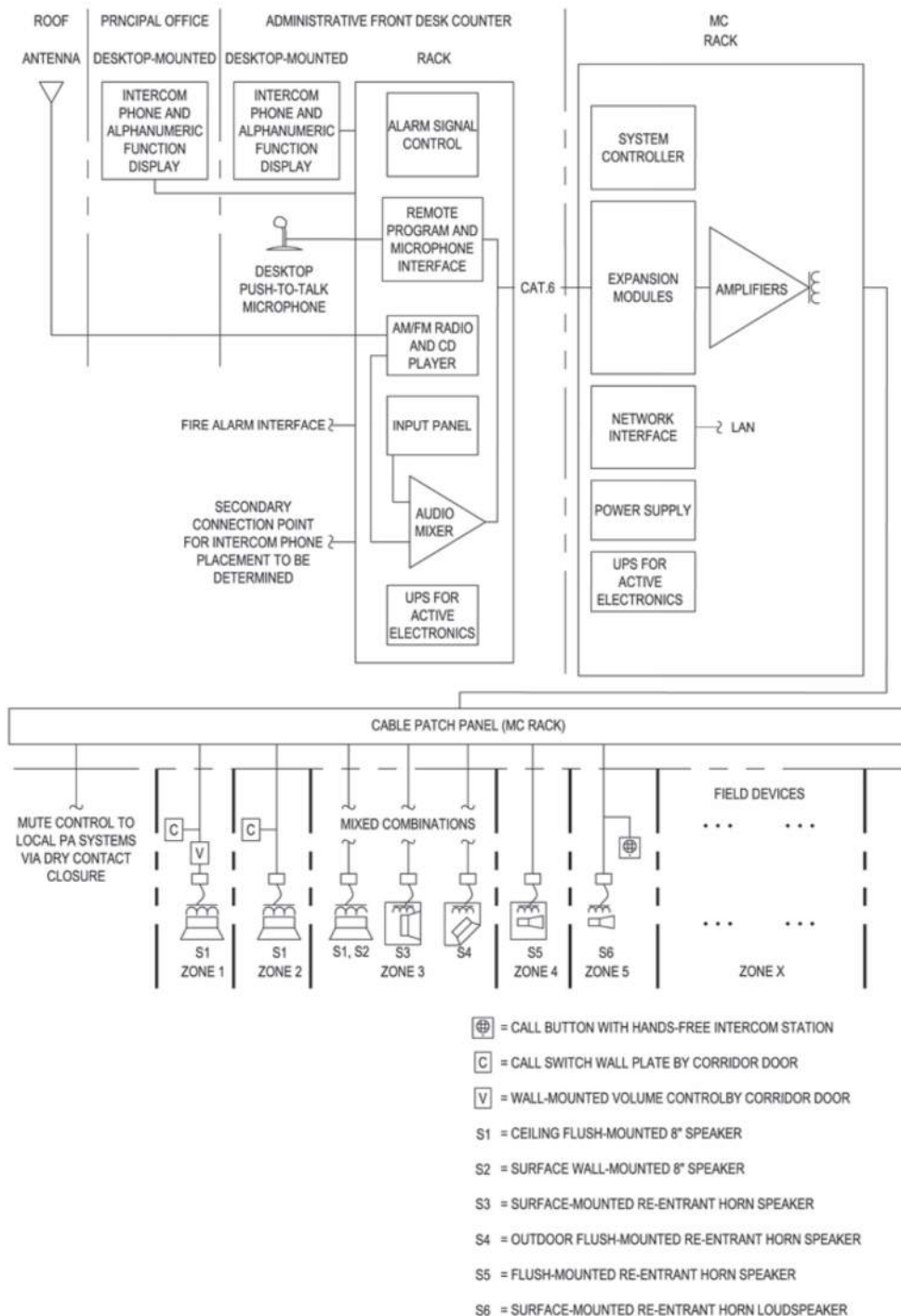
- A. Provide a complete turnkey zoned two-way voice Intercom paging system for routine and emergency announcements and delivery of other audio programming.
- B. Provide a complete turnkey Network Time Protocol synchronized master clock system with correctable secondary clock instruments located throughout the facility and interfaced to the Intercom paging system for time base audible signaling.
- C. Provisioning shall be per the following matrix guide:

INTERCOMMUNICATIONS AND PROGRAM SYSTEM REQUIREMENTS

	2 WAY COMM.	CALL BUTTON	CEILING SPEAKER	CLOCK INSTRU MENT	DESK MIC	FLUSH MOUNT HORN SPEAKER	HAND FREE CALL STATION	MASTER CONTROL POINT	VOLUME CONTROL	WALL SPEAKER	HORN SPEAKER
ADMIN OFFICE	*	*	*						*		
AUDITORIUM			*								
BACK ENTRANCE						*					
BATHROOM			*								
BREAK ROOM	*	*	*								
BUS LOADING AREA						*					
CAFETERIA			*	*							
CLASSROOM	*	*	*								
CORRIDOR			*	*						*	
ELEVATOR			*								
EMERGENCY EXIT											
ENTRANCE VESTIBULE						*					
GYM	*			*			*				*
KITCHEN	*	*	*	*							
LAB			*								
LIBRARY	*	*	*	*							
LOBBY			*	*						*	
LOCKER ROOM			*								
MACHINE ROOM											
MAIN ENTRANCE											
OFFICE	*	*	*								
PLAY GROUND											*
PORTABLE BUILDING	*	*	*								
PRINCIPLE OFFICE	*	*	*					*	*		
RECEPTION FRONT DESK			*	*	*			*			
ROOF MACHINE EQ.											
SIDE ENTRANCE											
STAIRWELL			*								
STORAGE											
TELECOM ROOM											
VESTIBULE			*								
WORK ROOM	*	*	*								

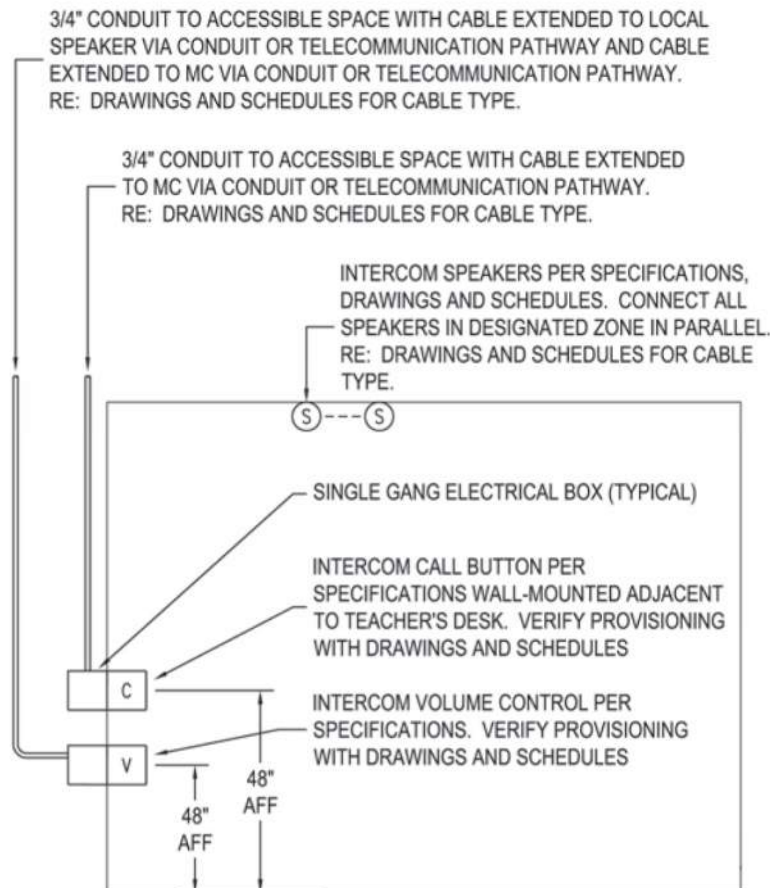
27.05 Paging Intercom System

A. Paging Intercom System Block Diagram:



B. Paging Intercom System Infrastructure Elevation:

PAGING INTERCOM SYSTEM INFRASTRUCTURE ELEVATION

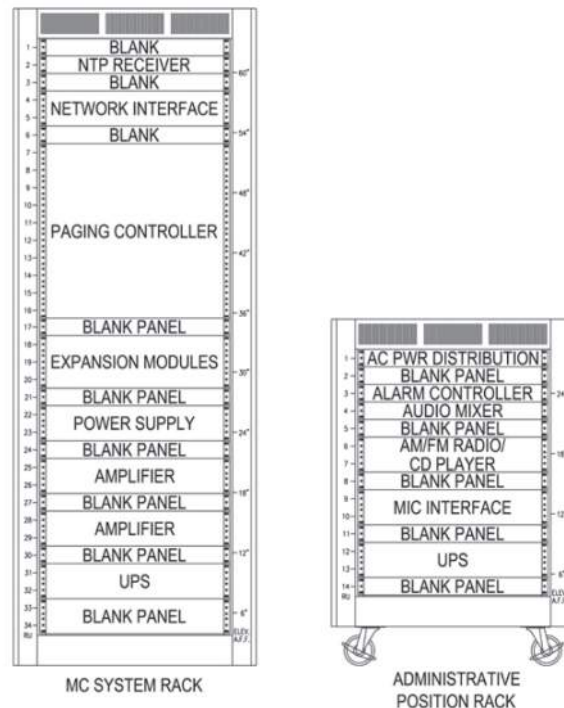


- C. Master intercom phone with alphanumeric function display control point to have the capability to selectively communicate to each zone, group of zones or all call.
- D. Call button to signal the administrative office for communication connection request and activate message received assurance indicator.
- E. Areas equipped with local volume controls to have an emergency page override circuit.
- F. Provide secondary connection position (TBS) for Master intercom phone with alphanumeric function display control point. Emergency situations may require temporarily relocating this control point.
- G. Intercom/paging system to have muting control for local sound system(s) during emergency paging.
- H. System to accept fire alarm system interface signal for Intercom/paging system facility wide mute during alarms.

- I. System to provide the minimum audio performance in these designated areas:
 - 1. Administrative areas - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 90 dB SPL capability.
 - 2. Public corridors and dining room - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 105 dB SPL capability.
 - 3. Restrooms - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 90 dB SPL capability.
 - 4. Classrooms - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 100 dB SPL capability.
 - 5. Kitchen - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 100 dB SPL capability.
 - 6. Gym - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 105 dB SPL capability.
 - 7. Auditorium - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 105 dB SPL capability.
 - 8. Major facility exterior entrance/exit doors and bus and parent drop off and pickup area - Frequency response coverage of the occupied area of plus or minus 6 dB in the 200 to 5,000 Hz frequency range with minimum 105 dB SPL capability.
- J. Provide a vandal resistant protective wire cage around each speaker in the gymnasium(s).
- K. Speakers in wet areas to have moisture resistant features.
- L. Provide transient and surge protection on both ends of the cabling run for any component exposed to the exterior.
- M. Administrative control equipment rack position to be incorporated into the reception front desk millwork for convenient access by the staff. Control equipment rack to include:
 - 1. Alarm signal control panel with minimum 6 each user preprogrammed messages.
 - 2. AM/FM/CD player.
 - 3. MP3 input.
 - 4. Auxiliary line level 3.5mm mini jack input.
 - 5. Microphone input.
 - 6. Desktop microphone with push to talk switch and necessary connections for emergency all call announcements.
- N. System head end equipment to be located in the MC and HC communications equipment room and rack mounted.

O. System head end and administrative control equipment rack elevations:

PAGING INTERCOM SYSTEM EQUIPMENT RACKS ELEVATION



27.06 Master Clock System

- A. Rauland-Borg Telecenter ICS Series or approved equal system shall have eight (8) zone circuits and shall be used bell circuit programming. No secondary clocks will be required.

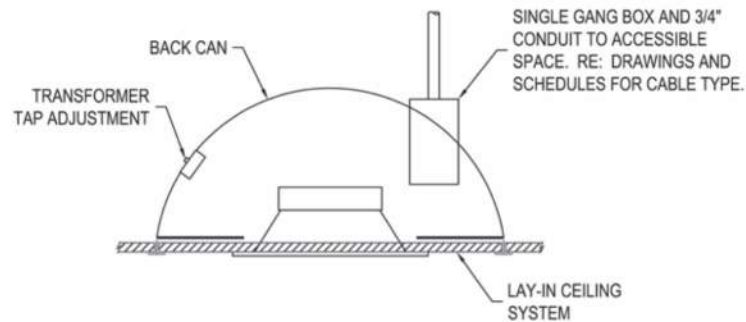
27.07 Products

- A. Component Technical Requirements
 1. Intercommunications and Program System to be a Rauland-Borg Telecenter ICS Series. The following microprocessor-based systems will be considered: Dukane MCS250T Telaplex System and Telecor II System.
 2. Desktop telephone style master station with corded handset.
 3. Desk top push to talk microphone for emergency and routine announcements to selected areas.
 - a. Manufacturer: Shure model 522 or equivalent.
 4. UPS
 - a. Battery backup to provide continuous operation during power failure for 30 minutes at half load.
 5. Equipment Rack
 - a. Locking front and rear doors.
 - b. Forced ventilation system.
 - c. Manufacturer: Mid Atlantic or equivalent.
 6. Call Button
 - a. Single gang stainless steel face plate with push-button switch and engraved labeling.
 - b. Includes assurance feedback light.

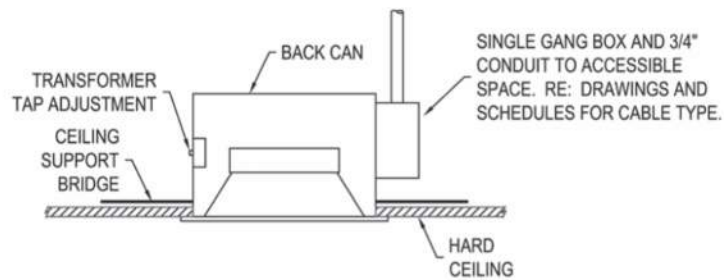
7. Volume Control

- a. Single gang stainless steel face plate with rotary volume control.
- b. Equipped with priority bypass relay.

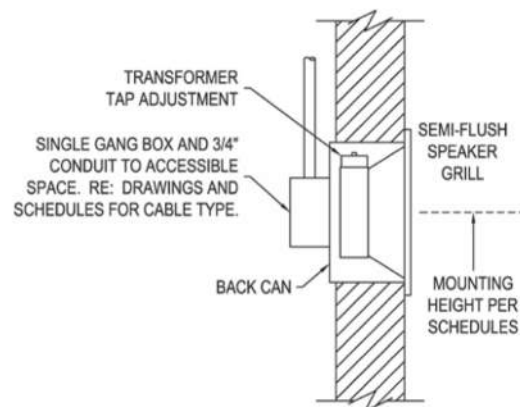
S1 - LAY-IN CEILING-MOUNTED SPEAKER DETAIL



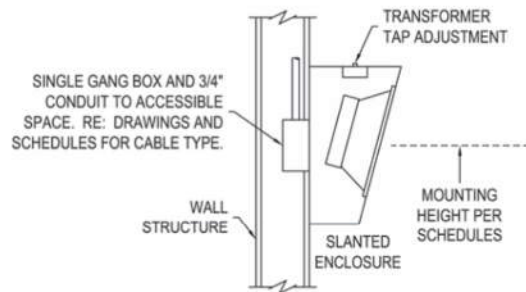
S2 - HARD CEILING-MOUNTED SPEAKER DETAIL



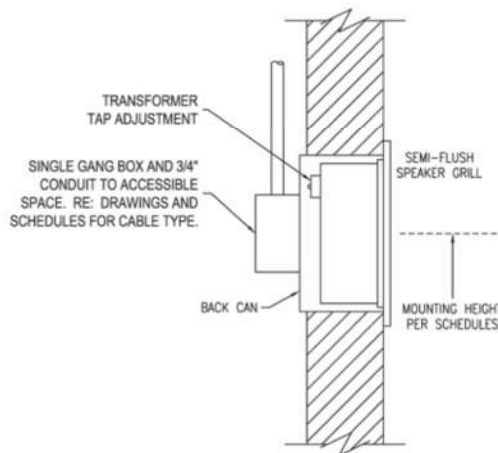
S3 - FLUSH WALL-MOUNTED SPEAKER DETAIL



S4 - WALL-MOUNTED SPEAKER DETAIL



S5 - EXTERIOR FLUSH-MOUNTED RE-ENTRANT HORN SPEAKER DETAIL



8. 6 Channel Audio Microphone/Line Mixer
 - a. Manufacture: ART MX622 or equivalent.

B. Wire and Cable

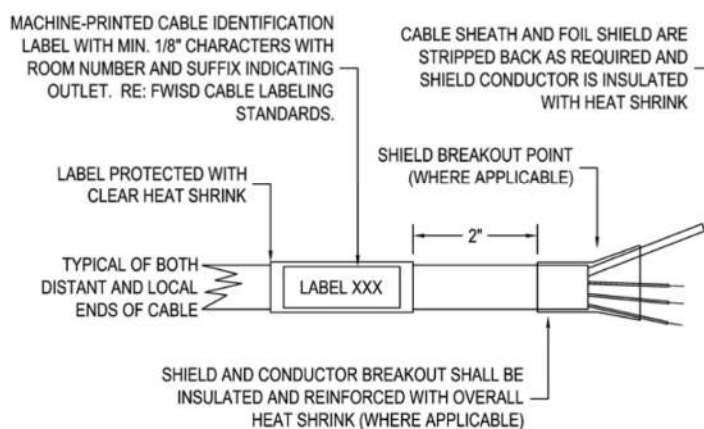
1. Plenum rated cable shall be used in all return air plenum spaces and where required by code.
2. Minimum wire types and sizes:
 - a. Low Voltage Power Cable - 18 AWG, twisted, stranded CL2.
 - b. Call Button Cable - 22 AWG, twisted, stranded pair CL2.
 - c. Talkback Intercom Speaker Cable - 22 AWG shielded, twisted, stranded pair CL2.
 - d. Non-Intercom Speaker Cable - 20 AWG twisted, stranded pair CL2.
 - e. Horn Speaker Cable - 16 AWG twisted, stranded pair CL2.
 - f. UTP - CAT6.
 - g. Control Point Cable - 18 AWG twisted, stranded CL2.

27.08 Execution

A. General Requirements

1. Provide surge and transient protection on both ends of cabling exposed to lightning.
2. The Contractor shall be responsible for proper electrical grounds.
3. The Contractor shall be responsible for to furnishing any special installation equipment or tools necessary to properly complete the installation.
4. J-hook to J-hook cable run spans not to exceed 50 inches.
5. Intercommunication and Programming System wiring pathway not to be shared with other systems or electrical power.
6. Label all termination devices, panels and enclosures.
7. Place machine printed identification numbers on each end of all conductors using sleeve type heat shrink markers.
8. Mark all spare conductors.
9. Cable end preparation and labeling:

SHIELDED AND NON-SHIELDED CABLE END PREP. AND LABELING DETAIL



B. Training

1. Provide operator/user training.
 - a. Training to minimally consist of 4 each 1/2-hour sessions.
 - b. Provide and review a custom quick reference guide for the inexperienced operator.
2. Provide technical operation and maintenance training.
 - a. Training to minimally consist of 2 each 1-hour sessions.
 - b. Technical explanation sufficiently thorough that staff personnel shall be able to analyze malfunctions and make substitutions or bypasses necessary to maintain system operation except for the malfunctioning equipment or circuits.
 - c. Provide printed reference material for each trainee that documents and explains in technical terms:
 - i. System block diagram with technical features.
 - ii. Review of as-built drawings.
 - iii. Provide a hands-on training with Q & A session.

C. Substantial Completion

1. Work must meet the following requirements to qualify for the Owner's consideration of Substantial Completion:
2. ICS devices wiring and components shall be installed and tested.
3. All training complete.
4. YISD may utilize the system for its designed intent.

5. Contractor will provide a list of remaining work items and approximate completion date.
6. Contractor will certify in writing that all remaining work is minor in nature and will be completed in less than 30 days.

D. Testing Requirements

1. The Contractor shall perform sample tests in the presence of the Intercommunication and Programming System Consultant and YISD. Performing the testing procedures specified herein assures that the Intercommunication and Programming System cabling and devices meet the performance characteristics specified. All testing shall comply with EIA/TIA Standards and that of the equipment manufacturers. If testing indicates that the performance characteristics are not met, the test shall be failed test and any other test that may be affected by the modification and/or repair shall be rerun and verified.
2. The Contractor shall provide test equipment required to test and to certify the 100% operational condition of all materials and equipment.
3. The Contractor shall prepare and submit all test procedures and data forms for the pre-installation, post installation and subsystem test to YISD. The test procedures shall have YISD approval before the Contractor performs tests.

- E. Portable Classroom Buildings: The design team is to coordinate with YISD on the communications requirements for portable classroom buildings if necessary.

Division 27 – TECHNOLOGY

27.09 Intercommunications and Program System Design

- A. All new facilities, new additions to existing facilities and remodeled facilities shall be provisioned with an Intercommunications and Program System as determined by the Ysleta Independent School District (YISD). The primary function of these systems is to coordinate activities, facilitate staff communications and provide mass communications for the campus population for routine programming and safety and security information.

27.10 Standards

- A. These are minimum standards which were selected from the most current ANSI/TIA/EIA 568, 569, 606, and 607 standards. The Telecommunications Industry Association and the Electronic Industries Alliance initially developed these standards with the support of the American Institute of Architects (AIA) and the Construction Specifications Institute (CSI). These are minimum requirements, which may be subject to change and/or additions. For more specific information, please refer to the ANSI/TIA/EIA 568 and 569 standards.
- B. Federal, state, and local codes, rules, regulations, and ordinances governing the work are to be included in the specifications. Should items noted in the drawings or specifications create an installation that is in violation of codes, rules, regulations, or ordinances, promptly call them to the attention YISD's representative.

27.11 Related Work Specified in Other Divisions

- A. See Division 26 for all specifications governing the performance of work associated with the installation of electrical power, raceway, system junction and pull boxes and device rough-in boxes for all work shown in the Intercommunications and Program System drawings.
- B. Refer to the latest YISD Cabling Standards, section 27.23, for telecommunications cabling and other related technology cabling standards.

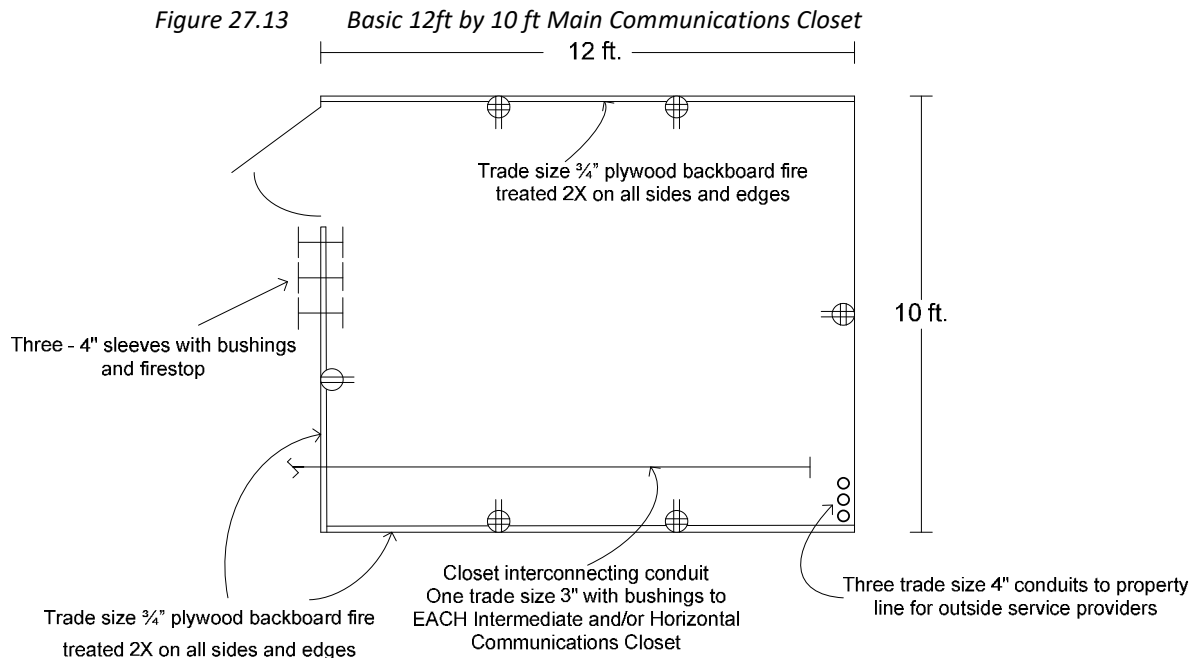
27.12 Communications Closet – General Description

- A. A minimum of one communications closet should be provided for each floor of an area being served, unless otherwise specified by the designated District Technology Representative.
- B. The communications closet needs to be dedicated to communication functions and associated support facilities. It should not be shared with electrical installations other than those needed for communications.
- C. Equipment not related to the support of the Communications Closet such as piping, duct work, and distribution of building power must not be located in this closet.
- D. Any services not related to the Communications Closet should not pass through this closet and should not be located in the ceiling space above it.

- E. The communications closet needs to be located as close as possible to the center of the area being served.
- F. Communication closets should be located away from sources of electromagnetic interference; at least 10 ft. from transformers. Avoid building communication closets to adjacent rooms which may be housing electrical power supply transformers, motors, generators, x-ray equipment, etc.
- G. Communication closets should not be designed to be directly below/under bathrooms or any other rooms requiring water lines or roof drains.

27.13 Main Communications Closet

- A. In many instances throughout the District, the Main Communications Closet also doubles as the Entrance Facility for all communication providers at a campus or a building. To determine proper entrance pathways and entrance points consult with the District Technology Representative before any decisions are made.
- B. Shall be dedicated to telecommunications and data functions only.
- C. Equipment not related to the support of the Communications Closet such as piping, duct work, and distribution of building power must not be located in this closet.
- D. Any services not related to the Communications Closet should not pass through this closet and should not be located in the ceiling space above it.
- E. Should be located as close to the center of the building structure as possible.
- F. Size of the Main Communications Closet.
 - 1. The size of the area that is going to be served will determine the size of the communications closet. For most installations a minimum 10 foot by 12 foot room is required, however in some particular instances, this size may change. Confer with the District Technology Representative to determine the size for this closet.
 - 2. The figure below is a basic layout for a 12 ft. by 10 ft. Main Communications Closet. Confer with the District Technology Representative for location of light switch, light, thermostat, sprinkler head, etc.



27.14 Construction of the Main Communication's Closet

- A. All walls shall be covered with rigidly fixed 3/4 inch A-C plywood, preferably void free.
- B. The plywood will be securely mounted to the wall, at least 8 feet in height and capable of supporting attached equipment and/or racks.
- C. The plywood sheets shall be fire rated or covered with 2 coats of fire-retardant paint on all sides (including edges).
- D. Lighting in the closet should be a minimum of 500 lx (50 foot-candles) measured 3 feet above the finished floor.
- E. The door to the closet should be 36 inches wide and 80 inches high, hinged to open outward, and fitted with a lock that is keyed to the District's TIS communications closet key.
- F. A minimum of six (6) dedicated 120V, non-switched, ac quad electrical outlet receptacles are required.
- G. Each outlet should be on a separate branch circuit, rated at 20A, and connected to a 20A branch circuit. Confer with the District Technology Representative for location of these circuits.
- H. Convenience outlets around the perimeter walls should also be provided. Confer with the District Technology Representative for location of these circuits.
- I. Continuous cooling, 24 hours per day, 365 days per year, shall be provided via a split system a/c unit. If an internal system is provided, it should be mounted above the door area, with all water and condensation lines outside of the room.
- J. Floor, walls, and the ceiling should be sealed to reduce dust.

- K. Access to the facilities grounding system with a minimum 6-gauge stranded conductor must be provided.
- L. Sprinkler heads shall not be installed in the middle of the room or above any potential location where an equipment rack may be installed. Confer with the District Technology Representative for location of sprinkler heads in this communication room.

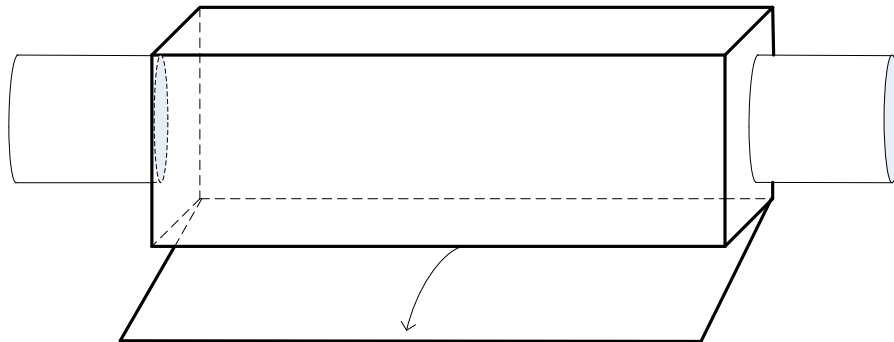
27.15 Service Providers

- A. A minimum of three (3) underground 4-inch EMT conduits are required for access from the property line to the Main Communications Closet. No flex conduit is permitted.
- B. Confer with the District Technology Representative to determine the termination points for the conduits in the Main Communications Closet and the property line.
- C. Pull boxes are required every 200 feet and/or where there are two (2) 90-degree bends, or equivalent.
- D. Pull boxes or hand holes for outside of buildings should be a minimum Quazite Catalog 1730 type box or equivalent and should be set on a bed of gravel for drainage. Due to the (3) 4-inch EMT conduits, a larger box may be required. If the box(es) are located on any roadway or driveway, the cover must be rated to meet these traffic conditions. Refer to figure 27.21.5.
- E. Conduits for outside pull boxes or hand holes must enter from the bottom at a 45-degree angle. Refer to figure 27.21.5.
- F. Conduits must have an insulated bushing at each end.
- G. A pull string is required in each conduit.
- H. The bend radius of a conduit must be at least 10 times the internal diameter of the conduit.

27.16 Closet Connectivity

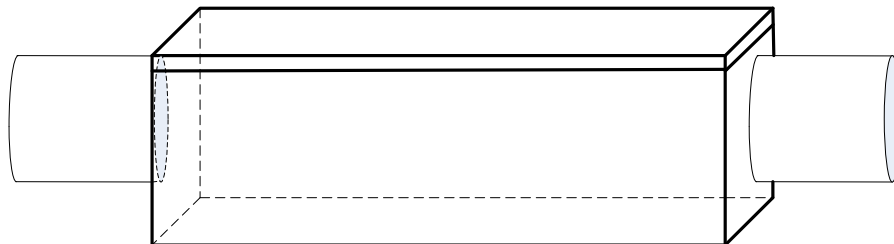
- A. Connectivity from the Main Communications Closet to all Horizontal and/or Intermediate Communications Closets shall comply with the requirements listed herein. See Conduit for Backbone Pathways, section 27.21, for additional information.
- B. At least one (1) 3-inch conduit is required for each Horizontal or Intermediate Closet from the Main Communications Closet. No flex conduit is permitted.
- C. The conduits must have bushings at each end.
- D. A pull string is required in each conduit.
- E. Pull boxes are required every 100 feet and/or where there are two (2) 90-degree bends, or equivalent.
- F. The bend radius of a conduit must be at least 10 times the internal diameter of the conduit.
- G. Pull boxes shall not be used in lieu of a bend. Conduits should enter the pull box from opposite ends of each other. See figure below.

Figure 27.16.G Pull box entry and exit points



- H. Pull boxes in ceiling spaces should be 36-inch gutter boxes which must conform to local regulatory, code and standards requirements; open downward, and should be no more than 24 inches above the finished ceiling. Boxes are to be color coded with green spray paint. Refer to figure 27.16.G.
- I. The conduits should enter the communication closets higher than the ceiling of the area it is going to service.
- J. Pull boxes for outside areas should be a minimum of 36-inch gutter boxes of metal construction, NEMA 4X rated, open from the top or from the side if the top area is obstructed. Boxes are to be color coded with green spray paint. NEMA 3R boxes not acceptable.

Figure 27.16.J Outside NEMA 4X rated pull box.



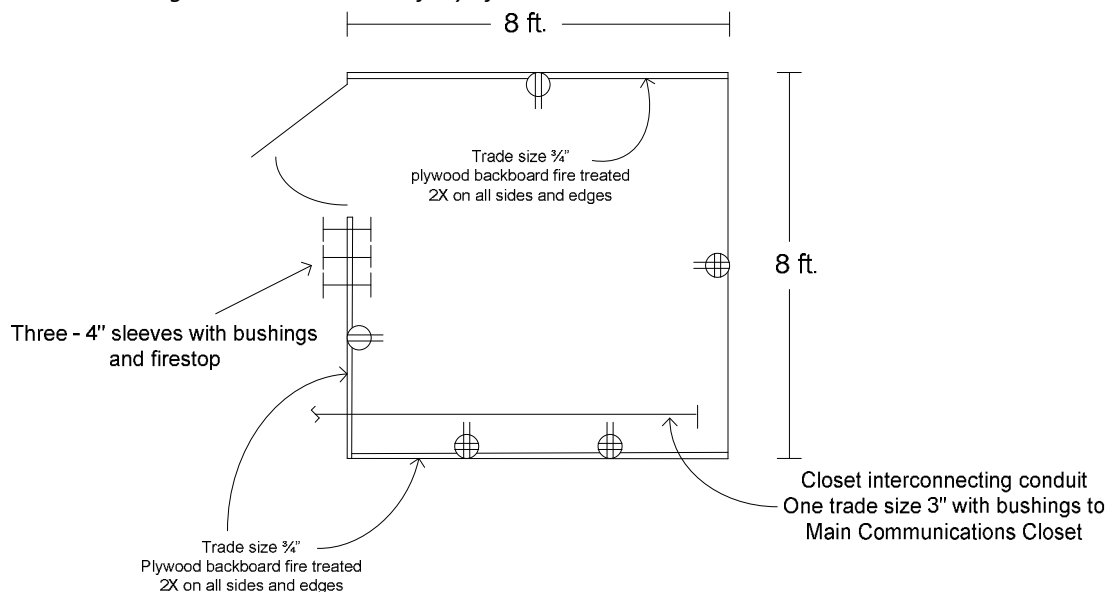
- K. Access to the serving area.
 1. Three 4-inch sleeves with bushings leading out of the closet to the area that needs to be service are required.
 2. An additional two 2-inch sleeves with bushings leading out of the closet to the area that needs to be serviced are required for the PA system wiring. These 2 sleeves need to be above the door.
 3. Sleeves should enter the closet higher than the ceiling of the area that it is going to service.

27.17 Horizontal and/or Intermediate Communications Closets

- A. Closets shall be dedicated to telecommunications and data functions only.
- B. Equipment not related to the support of the Communications Closet such as piping, duct work, and distribution of building power must not be located in this closet.

- C. Any services not related to the Communications Closet should not pass through this closet and shall not be located in the ceiling space above it.
- D. Size of Horizontal and/or Intermediate Communications Closets.
 - 1. The size of the area that is going to be served will determine the size of the communications closet. For most installations a minimum 8 foot by 8-foot room is required, however in some particular instances, this size may change. Confer with the District Technology Representative to determine the serving size for this closet.
 - 2. The figure below is a basic layout for an 8 ft. by 8 ft. Intermediate and/or Horizontal Communications Closet. Confer with the District Technology Representative for location of light switch, light, thermostat, sprinkler head, etc.

Figure 27.17.D2 Basic 8ft by 8ft Communications Closet



27.18 Construction of the Horizontal and/or Intermediate Communication's Closet

- A. All walls shall be covered with rigidly fixed 3/4 inch A-C plywood, preferably void free.
- B. The plywood shall be securely mounted to the wall at least 8 feet in height and capable of supporting attached equipment and/or racks.
- C. The plywood sheets shall be fire rated or covered with 2 coats of fire-retardant paint on all sides (including edges).
- D. Lighting in the closet should be a minimum of 500 lx (50 foot-candles) measured 3 feet above the finished floor.
- E. The door to the closet should be 36 inches wide and 80 inches high, hinged to open outward, and fitted with a lock.
- F. A minimum of six dedicated 120V, non-switched, ac quad electrical outlet receptacles is required.

- G. Each outlet should be on a separate branch circuit, rated at 20A, and connected to a 20A branch circuit. Confer with the District Technology Representative for location of these circuits.
- H. Convenience outlets around the perimeter walls should also be provided. Confer with the District Technology Representative for location of these circuits.
- I. Continuous cooling, 24 hours per day, 365 days per year, shall be provided via a split system a/c unit. If an internal system is provided, it should be mounted above the door area, with all water and condensation lines outside of the room.
- J. Floor, walls, and the ceiling should be sealed to reduce dust.
- K. Access to the facilities grounding system with a minimum 6-gauge stranded conductor must be provided.
- L. Sprinkler and drain lines shall not be installed within communication room where an equipment rack may be installed. Heads shall be located on perimeter wall.

27.19 Connectivity to the Main Communication's Closet

- A. At least one (1) 3-inch conduit is required from each Horizontal or Intermediate Closet to the Main Communications Closet. No flex conduit is permitted.
- B. Pull boxes are required every 100 feet and/or where there are two (2) 90-degree bends, or equivalent.
- C. Pull boxes must not be used in lieu of a bend. Conduits should enter the pull box from opposite ends of each other. Refer to figure 27.17.G.
- D. The conduit must have bushings at each end.
- E. The bend radius of the conduit must be at least 10 times the internal diameter of the conduit.
- F. A pull string is required in the conduit.
- G. The conduit should enter the closet higher than the ceiling (12 to 24 inches) of the area it is going to service.
- H. Access to the serving area.
 - 1. Three 4-inch sleeves with bushings leading out of the closet to the area that needs to be serviced are required.
 - 2. Sleeves should enter the closet higher than the ceiling of the area that it is going to service.

27.20 Conduit for Horizontal Pathways – Communication Closets to Work Areas

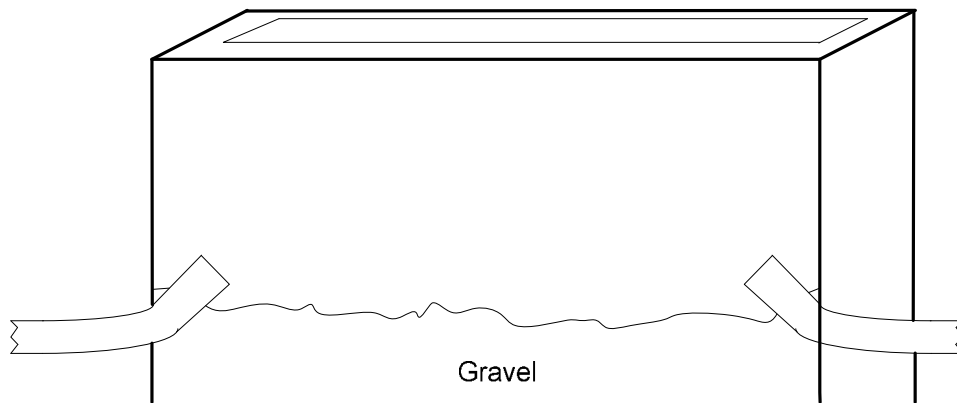
- A. All horizontal cabling should be run in an appropriate pathway as defined in the ANSI/TIA/EIA-569-B standards.
- B. Conduit sizing – a dedicated one-inch conduit is requested for every workstation (voice, data and/or video) stubbed out at 12 to 18 inches above a readily accessible ceiling space. The one-inch conduit will be routed to the nearest readily accessible ceiling space of no higher than 12 feet above the finished floor. This one-inch conduit will also be routed to the closest pathway that is going to be used for cabling to any communications closet. No flex conduit is permitted.

- C. Conduits must have an insulated bushing at one end and terminate into a single gang or larger outlet box as required at the workstation end. If a larger outlet box is required, it must have a single gang adapter included.
- D. The bend radius of a conduit must be at least 6 times the internal diameter of the conduit.
- E. A pull string is required in each conduit.
- F. Cable paths must avoid interfering with the serviceability of all existing facilities.
- G. Pull Boxes for Horizontal Pathways - Confer with the District Technology Representative for proper sizes.
 - 1. Pull boxes are required every 100 feet and/or where there are two (2) 90-degree bends, or equivalent. Boxes are to be color coded with green spray paint.
 - 2. Pull boxes must not be used in lieu of a bend. Conduits should enter the pull box from opposite ends of each other. Refer to figure 27.17.G.

27.21 Conduit for Backbone Pathways – Main to Intermediate / Horizontal Closets

- A. All backbone cabling should be run in an appropriate pathway as defined in the ANSI/TIA/EIA-569-B standards.
- B. At least one (1) 3-inch conduit is required for each Horizontal or Intermediate Closet to the Main Communications closet. No flex conduit is permitted.
- C. Conduits must have an insulated bushing at each end.
- D. The bend radius of a conduit must be at least 10 times the internal diameter of the conduit.
- E. Pull Boxes - Confer with the District Technology Representative for proper sizes.
 - 1. Pull boxes are required every 100 feet and/or where there are two (2) 90-degree bends, or equivalent. Boxes are to be color coded with green spray paint.
 - 2. Pull boxes for inside of a building should be 36-inch gutter boxes which must conform to local regulatory, code and standards requirements.
 - 3. Pull boxes or hand holes for outside of buildings should be a minimum Quazite Catalog 1730 type box or equivalent and should be set on a bed of gravel for drainage. If they are located on any roadway or driveway, the cover must be rated to meet these conditions.
 - 4. Pull boxes must not be used in lieu of a bend. Conduits should enter the pull box from opposite ends of each other. Refer to figure 27.16.G.
 - 5. Conduits for outside pull boxes or hand holes must enter from the bottom at a 45-degree angle. Conduits shall be provided with PVC end bells where conduits enter pull boxes.

Figure 27.21.5 Outside pull box, minimum Quazite Catalog 1730 type, equivalent or larger.



- 6. A pull string is required in each conduit.
- F. Where a penetration into an existing building is required, in order to extend the data communications pathway in or out of that building, a Smart LB will be used. Information on Smart LB's can be found at www.smartlb.com.
- G. Conduit sizing – a dedicated three-inch conduit is requested from each Horizontal or Intermediate Closet to the Main Communications Closet. No flex conduit is permitted.
- H. Cable paths must avoid interfering with the serviceability of all existing facilities.

27.22 Grounding Requirements

- A. All communication rooms shall be collectively served by a comprehensive telecommunications grounding and bonding system as called for in the following codes and guidelines:
 - 1. National Electrical Code® (NEC 800-30, NEC 800-40)
 - 2. ANSI Joint Standard J-STD-607-A
 - 3. ANSI/TIA 607-B Commercial Building Grounding and Bonding Requirements for Telecommunications
 - 4. ANSI/NECA/BICSI-568, manufacturer's grounding requirements
 - 5. IEEE Emerald Book — Recommended Practice for Powering and Grounding Electronic Equipment
 - a. AT&T Technical Papers
 - b. ATT-TP-76200 Network Equipment and Power Grounding, Environmental, and Physical Design Requirements
 - c. ATT-TP-76416 Grounding and Bonding Requirements for Network Facilities
 - d. ATT-TP-76416-001 Grounding and Bonding Requirements for Network Facilities — Design Fundamentals.
- B. Main building ground-to-Telecommunications Main Ground Busbar (TMGB) will be provided by the Division 26 Electrical contractor and installed by a certified electrician.
- C. Equipment rooms (MC and ICs) shall be provisioned with telecommunications ground bus bars (TMGB and TGBs) and with a minimum of #6 AWG stranded grounding conductor connected to the main electrical ground system. A larger grounding conductor may be required as determined by distance from building main ground to TMGB and TGBs.

- D. The Contractor shall provide and install a comprehensive grounding system by bonding and grounding equipment racks, housings, messenger cables, ladder rack, and raceways.
 1. Equipment Enclosures: Connect cabinets, racks, and frames to single-point ground which is connected to building ground system via #6 AWG green insulated copper grounding conductor.
 2. Ladder Racking: All In-room ladder racking should be attached to the telecommunications grounding bus bars and to each other with #6 AWG stranded conductors. Furthermore, each section of ladder rack shall be bonded back to the Telecommunications Main Grounding Busbar (TMGB) in the MDF or Telecommunications Grounding Busbar (TGB) in ICs.
 3. Cable Tray: The originating section of Major Cable Tray Pathway and in-closet Ladder Racking shall be bonded back to the TMGB or TGB in the MC or ICs. Subsequent sections of cable tray shall be bonded and grounded by the contractor installing these elements.
 4. Backbone cable system shall have the Telecommunications Bonding Backbone (TBB) cables running with / parallel to the telecommunications cables to be used to ground all ICs' TGBs to the MC's TMGB.
 5. The Contractor shall insure all grounding connections result in a minimum impedance value.
 - a. The Contractor shall remove any paint, film, or other non-conductive material prior to securing the ground lug.
 - b. Contractor should use washers designed to penetrate paint / anodizing in locations where access to surfaces in order to remove paint is prohibitive.

27.23 Cabling General Guidelines

- A. The cables are to be furnished and installed by YISD's cabling contractor. Cabling information herein is for A/E team reference only.
- B. The District's existing cabling infrastructure is by and large Siemon. All new systems and additions to existing systems shall be Siemon (no substitute) certified installers and designers on staff. The vendor must submit current Siemon designer and installer certifications with the proposal. Specifically, respondents will be asked to price the following services to include all labor, parts, and materials.
 1. An ideal structured campus-wide cabling system will be capable of carrying video and voice traffic as well as traditional data to all campus areas.
 2. A wire management to ensure a comprehensive, neat and thorough installation. Provide documented test results based on current TIA/EIA standards. All locations shall be labeled in accordance with industry standards. Provide AS BUILT schematics and cut sheets on all work performed.
 3. Install data drops as required, including the installation of swing-out 19" racks (2 to 7 feet tall enclosed or open) in District computer labs or other high data density facilities the District may require.
 4. Build MC and IC facilities according to ANSI/TIA/EIA specifications as needed.

27.24 Miscellaneous Definitions

- A. MC- Main Communications Closet: The site at each campus where the Service Provider demarcs, where the District's main network switches reside, where the telephone system is located, and where all external voice, data, and video connections reside. This site will have at least one 7' 19" rack, holding all communications gear. Also, in this room there is the Service Provider's termination equipment, and 110 block terminations as needed by the campus. All new MC's will be built according to the most current ANSI/TIA/EIA-569 and district standards.
- B. IC - Intermediate Communications Closet: A site at each campus to distribute signal to locations beyond the 100 meter Category 5e and 6 distance limitation from the MC. The IC includes ¾" fire-rated plywood backboard, wall mount racks for Cat 5e, and 6 termination, wall mount fiber station and tie cable

terminations, wall mount copper station and tie cable terminations, wall mount 19" racks for communication gear (switches), or at least one 7' x 19" rack to hold all of the above mentioned items. All new IC's will be built according to the most current ANSI/TIA/EIA-569 and district standards.

- C. Underground Connection: Cable pathway consisting of 3 or 4 inch PVC conduit buried to depths as required by building code. These connections are to be terminated in the communication closets.
- D. Lightning Suppression: Work done under this contract which involves communications between two buildings shall have the copper connections protected against electrical potential differences which could damage communications equipment.
- E. Tie cables within a building: The copper and fiber connections between MC and IC. This includes 12 strands 50 micron multimode fiber with LC connectors terminated in a fiber patch panel, and 100 pair of twisted pair cable for voice, terminated on a 110 block.

27.25 Cabling Criteria

- A. The infrastructure will support voice, data and video communication for the purpose of supporting instructional and administrative functions, now and in the future.
- B. All cabling shall be a Siemon Structured Cabling System, with a minimum 20-year parts and performance warranty. All copper cable is to be Category 6 for data drops, and Category 5e for voice drops. Fiber backbones will consist of 12 strand 50 micron, for MC to IC connectivity, and will be terminated with LC connectors in order to connect the appropriate cabling closets.
- C. All pathway, bonding and grounding, coring, fire-stop material, old cable removal (if required), patch cables for both the patch panel and the desktop end (fiber and copper), as built drawings, test results and cut sheets are to be included in the price for each individual project.
- D. All mentioned Manufacturer requirements, Industry ANSI/TIA/EIA, codes and standards that are mentioned throughout this document will be strictly enforced to govern all work performed.
- E. The District follows the 568B standard for termination of Category 5e and Category 6 data communications cable. All new data communications cable installed must be a minimum of category 6 and be certified as such by testing with electronic scanners. All data communications cable 568B compliance certifications must be delivered to the District prior to completion of the installation. All fiber optic cable installed must also be tested for 568B compliance with standards and certification of such compliance must be reported to the District prior to the completion of the project. Delivery of certifications must be on electronic media, in Microsoft Excel format.

27.26 Contractor Responsibilities

- A. A contractor with a certified BICSI RCDD or equivalent on staff is preferable but not necessarily required to design and supervise all aspects of the Structured Cabling System installed in the Ysleta Independent School District. Those Contractors bidding on this contract, with an on staff BICSI RCDD or equivalent, must present Certifications for the on staff RCDD or equivalent with the submission of the contractor bid response. The contractor is required to furnish all labor, supervision, tooling, materials and miscellaneous mounting hardware and consumables for the cabling system installed. The contractor will perform all terminations and connections.
- B. The contractor shall maintain current status as a Siemon Certified Installer which includes both Design and Installation (D&I) certificates, including all training requirements, for the duration of the project.

- C. All technicians installing the YISD Structured Cabling System must maintain current status as a Siemon cable installer for the duration of the project. Documentation must be submitted to the YISD for each contractor technician before contractor is allowed to begin work.
- D. The Contractor will provide a Customer Reference List of Structured Cabling Systems, installed by their company, equal or greater than the size and scope of the Ysleta Independent School District.
- E. Any products damaged or not meeting recommended installation parameters during installation shall be replaced by the contractor prior to final acceptance at no cost to the YISD.
- F. All cables shall be tested in accordance with this document, the manufacturer's ND&I Contract agreement, and best industry practices. If any of these are in conflict, the Contractor shall be responsible to bring any discrepancies to the attention of the project team for clarification and/or resolution.
- G. All wiring in the ceiling shall be bundled appropriately and labeled to ensure maintainability and serviceability. Said bundles are to be securely attached to the roof support structure and shall not be attached to any other wire, pipe, HVAC fixture, ceiling supports, lighting supports, etc. Cable paths must avoid interfering with the serviceability of all existing facilities above the ceiling. In the ceiling, all fiber optic cable must be run inside conduit (flexible or rigid) and must be labeled "Warning - Fiber Optic Cable".

27.27 Warranties and other Contractor Requirements

- A. The contractor shall be certified as a "Siemon Certified Installer" contractor and shall make all terminations.
- B. The cabling system shall be backed by a minimum 20-year Performance Warranty. The performance warranty shall be facilitated by the Contractor and be established between the manufacturer and the YISD. The Contractor shall staff each installation crew with the appropriate number of trained personnel, in accordance with their manufacturer's ND&I contract agreement, to support the Performance Warranty requirements.
- C. After installation, the Contractor shall submit all documentation to support the warranty requirements in accordance with the warranty requirements and apply for said warranty on behalf of the District. The warranty will cover the components and labor associated with the repair/replacement of any defective link within the warranty period, when the defect is a valid warranty claim.

27.28 Installation and Structured Cabling System Warranty

- A. The contractor shall provide a company Structured Cabling System warranty covering the Installed cabling system against defects in workmanship, components, and performance, and follow-up support after project completion for a period of one (1) year. The Contractor shall facilitate the minimum 20-year Performance Warranty between the manufacturer and the District. The Performance Warranty shall warrant all portions, labor and components, of the cabling system. Copper links shall be warranted aligned with the link performance minimum expected results defined in TIA/EIA-568-C. Fiber optic links shall be warranted aligned with the TIA/EIA-526 link and segment performance minimum expected results. This warranty shall be provided at no additional cost to the YISD.
- B. The use of Panduit™, Wiremold™, or other surface mount cable channel in any classroom, hallway, or other public area is expressly prohibited without prior authorization from the District.

27.29 Documentation

- A. While conformance with ANSI/TIA/EIA 606 is mandated, the district has a structured wiring documentation specification in place; all additional wiring installed must be labeled appropriately. Labeling designations can be obtained from the Network Services Group of the Division of Technology. It is strongly recommended that any wiring installation be coordinated with Network Services Group and the Facilities Departments.

27.30 Working in the campuses

- A. Unless prior arrangements have been made with campus and District personnel, any wiring work must be performed during non-school hours. Most campus' classes are scheduled between 7:00 a.m. and 4:00 p.m. Therefore, as a general rule, all wiring work must be done at night, on weekends, or during school holidays.
- B. Unless other arrangements are made in advance, all classrooms, hallways, and other public areas must be restored to their normal appearance at the end of each work shift. Ceiling tiles must be replaced, wall plates must be installed, and the area must be clean in preparation for the next school day. No wiring ends, supply leftovers, or any other residue is to be left at the campus. Communication closets can be left in the "work in progress" stages so long as it does not interfere with the serviceability of the network and communications equipment in these rooms.
- C. At the completion of the wiring project, all ceiling tiles must be securely in place, all access points must be covered and be cosmetically and structurally complementary of the existing building. All supplies, equipment, and tools are to be removed from the building.

27.31 Firewalls

- A. It is the responsibility of the wiring installer to ensure that any firewall penetrations are properly sealed and conform to building codes regulating firewalls and the sealing of firewall penetrations.

27.32 Installation Requirements

- A. Installation of an MC: The MC will be furnished and installed as per the ANSI/TIA/EIA Specifications and will contain a minimum of the following:
 1. 4' x 8' x .75" Virgin Plywood backboard that has been fire retardant treated at least 3 times with an approved treatment and firmly attached to the walls throughout the entire room.
 2. One (1) or two (2) - 7' x 19" communications racks firmly anchored to the floor and securely mounted with ladder tray to the 3/4" plywood on the wall.
 3. Ceiling interface with ladder tray to give a good aesthetic appearance and protection of cabling for 7' x 19" communications rack into the ceiling space for a complete cabling pathway for distribution.
 4. Ladder tray/stabilizer firmly attached to wall and proceeding up wall into ceiling and 'water fall' exits into the vertical wire managers for a complete cabling pathway for distribution.
 5. Grounding and bonding to existing TMGB, or the installation of a new TIA/EIA 607 Grounding and Bonding System.
 6. 48 Port Modular Patch Panels labeled for Data.
 7. 110 punch down blocks labeled for Voice.
 8. 36 duplex LC fiber jumpers Rack Mount Interconnect Center (RIC), Siemon FCP3-DWR with LC loads.
 9. (1) 2-RMU Horizontal Wire Manager for every 48 port patch panel.

10. (2) Double-sided full vertical wire managers per rack for floor mounted racks.
 11. One LC to LC 3 meter 50 micron multi-mode fiber patch cable for each fiber pair.
 12. A one (1) and a three (3) meter category 6 data patch cable for each data drop; black in color.
- B. Installation of an IC: The Intermediate Cross Connect (IC) must be listed as (IC - ____). This I.C. must be furnished and installed as per the ANSI/TIA/EIA Specifications and must contain the following:
1. 4' x 8' x .75" Virgin Plywood backboard that has been fire retardant treated at least 3 times with an approved treatment and firmly attached to the walls throughout the entire room.
 2. One (1) or two (2) - 7' x 19" communications racks firmly anchored to the floor and securely mounted with ladder tray to the 3/4" plywood on the wall.
 3. Ceiling interface with ladder tray to give a good aesthetic appearance and protection of cabling for 7' x 19" communications rack into the ceiling space for a complete cabling pathway for distribution.
 4. Ladder tray/stabilizer firmly attached to wall and proceeding up wall into ceiling and 'water fall' exits into the vertical wire managers for a complete cabling pathway for distribution.
 5. Grounding and bonding to existing TMGB, or the installation of a new TIA/EIA 607 Grounding and Bonding System.
 6. 48 Port Modular Patch Panels labeled for Data.
 7. 110 punch down blocks labeled for Voice.
 8. 36 duplex LC Fiber jumpers Rack Mount Interconnect Center (RIC), Siemon FCP3-DWR with LC loads.
 9. (1) 2-RMU Horizontal Wire Manager for every 48 port patch panel.
 10. (2) Double-sided full vertical wire managers per rack for floor mounted racks.
 11. One LC to LC 3 meter 50 micron multi-mode fiber patch cable for each fiber pair.
 12. A one (1) and a three (3) meter category 6 data patch cable for each data drop; black in color.
- C. Installation of a Dual Drop: Network cabling which consists of a voice connection consisting of one category 5e cable and an RJ45 port, and a data connection consisting of one category 6 cable and an RJ45 port. Generally, administration workstations will be provided with a dual drop. Each dual drop location will be serviced by the following cables: one (1) each category 5e and category 6, 4-pair cables. The number of locations will vary per administrative site and will be determined by YISD prior to installation.

1. The following is the dual drop termination scheme (at the user end) for each cable:

<u>CABLE</u>	<u>TERMINATION</u>
Cat 6 Data	RJ45 Cat 6 - 568B Insert
Cat 5e Voice	RJ45 Cat 5e - 568B Insert

2. All terminations will reside on a single gang simplex Siemon information faceplate.
3. The following is the dual drop termination scheme (in the telecommunications closet)

<u>CABLE</u>	<u>TERMINATION</u>
Cat 6 Data	Rack mounted, 48-port Cat 6 high density Patch Panel
Cat 5e Voice	A T & T Wall mounted 110 Block with C-4's

- D. Installation of a Single Data Drop: A data drop consists of a single category 6 twisted pair drop, terminated at the user end with a RJ45 category 6 - 568B insert in a faceplate (there may be multiple inserts on the faceplate). The telecommunications closet end is to be terminated on a rack mounted, 48 port category 6 RJ45 568B patch panel.
- E. Installation of a Single Voice Drop: A voice drop consists of a single category 5e twisted pair drop, terminated at the user end with a RJ45 category 5e - 568B insert in a faceplate (there may be multiple inserts on the faceplate). The telecommunications closet end is to be terminated on an AT & T wall mounted 110 Block with C-4's.
- F. Installation of a Classroom Drop: Network cabling which provides a voice connection consisting of one category 5e cable and an RJ45 port, two (2) data connections consisting of two (2) category 6 cables and two (2) RJ45 ports. Each teacher's station at a classroom location will be serviced by a classroom drop, unless otherwise requested by the District.

1. The following is the termination scheme (at the user end) for each cable within the classroom cable.

CABLE

TERMINATION

2 Cat 6 Data

RJ45 Cat 6 - 568B Inserts

Cat 5e Voice

RJ45 Cat 5e - 568B Insert

2. All terminations will reside on a single gang simplex Siemon information faceplate.
3. The following is the termination scheme for classroom cabling (in the telecommunications closet)

CABLE

TERMINATION

Cat 6 Data

Rack mounted, 48-port Cat 6
RJ45 568B high density patch panel

Cat 5e or 6 Voice

A T & T wall mounted 110
Block with C-4's

- G. Installation of a Composite Drop: Network cabling which provides a voice connection consisting of one category 5e cable and an RJ45 port, two (2) data connections consisting of two (2) category 6 cables and two (2) RJ45 ports, and one video connection consisting of either one category 6 cable and an RJ45 port, or an RG6 coaxial cable with type F female coupling connector. The video connection in the classroom may not wind up being terminated in the same faceplate as the voice and data drops. It may be requested in a different location in the classroom. Each teacher's station at a classroom location may be required to be serviced by a composite cable, unless otherwise requested by the District.

1. The following is the termination scheme (at the user end) for each cable within the composite cable:

<u>CABLE</u>	<u>TERMINATION</u>
2 Cat 6 Data	RJ45 Cat 6 - 568B Inserts
Cat 5e Voice	RJ45 Cat 5e - 568B Insert
Cat 6 Video	RJ45 Cat 6 - 568B Insert
or	
RG6 Coaxial for Video	Type F female coupling

2. All terminations will reside on a single gang simplex Siemon information faceplate, unless the video drop is request in a different location of the room.
3. The following is the termination scheme for composite cable (in the telecommunications closet)

<u>CABLE</u>	<u>TERMINATION</u>
Cat 6 Data	Rack mounted, 48-port Cat 6 RJ45 568B high density patch panel
Cat 6 Video	Rack mounted, 48-port Cat 6 RJ45 568B high density patch panel
or	
RG6 coaxial for Video	Rack mounted panel for Type F female couplings
Cat 5e Voice	A T & T wall mounted 110 Block with C-4's

- H. Installation of a Single RG6 Coaxial Video Drop: A coaxial video drop consists of a single RG6 coaxial cable terminated at the users end on a Type F female coupling in a single gang simplex faceplate and at the communications closet also on a Type F female coupling on a rack mounted panel.
- I. Installation of a Wireless Access Point Cable Drop: A wireless access point drop will require for the AP end to be on a surface mounted jack RJ45 Cat 6 - 568B insert secured to a 12" x 12" - 3/4" thick board that has been fire retardant treated at least 3 times with an approved treatment. The board will be secured either to the wall or red iron above the ceiling space, as per the District's request. The communications closet termination will be on a rack mounted, 48-port, Cat 6, RJ45 568B high density patch panel.

Division 27 – INTEGRATED ELECTRONIC COMMUNICATIONS

27.33 General

- A. This section includes a fully operational IP platform for a district-wide internal and school Critical Communications Solution, incorporating school safety notifications and general communications including but not limited to the following:
1. The platform shall provide complete internal communications and employ state of the art IP Technology including the minimum functions listed.
 - a. Two-way internal intercommunications between staff locations and classrooms. (For Two-Way Systems)
 - b. Scheduled bell events.
 - c. Emergency announcements that will override any pre-programmed audio, assuring that all Emergency/Lockdown etc., are heard at each and every speaker location.
 - d. Capability of prerecording emergency announcements that can be activated by a Soft Key on an administrative console, panic button, dial string, or Web UI.
 - e. Atomic Time Synchronization with Class Change Tones utilizing multiple, programmable schedules for each zone.
 - f. District-wide, Emergency, Group, All School and Zone live voice paging.
 - g. District-wide, Emergency, Group, All School and Zone paging for pre-recorded audio – tones, music and voice.
 - h. Web-based user interface.
 - i. The system shall support a minimum of 1000 level priorities which shall be user-definable, allowing each end point to place a minimum of 5 different priority calls at the same time. (For Two-Way Systems)
 - j. Any authorized administrator shall be able to call from outside the school into any classroom, zone, or entire school directly via the School District supplied SIP enabled Telephone Network. This shall allow remote monitoring, call-in annunciation (For Two-Way Systems), and two-way conversation from outside the facility (For Two-Way Systems) as well as paging into the system. (Compliance with NEMA Standard SB-40 for emergency communications in K-12 Schools).
 - k. Authorized system users shall be able to create a minimum of 100 automated sequences with voice instructions, tones, emails, and relay activations and replay them.
 - l. Automated message strings shall be manually initiated from a single-button access on the console, on a SIP connected telephone, a panic button, from the web-based user interface or via interface with third party systems.
 - m. Paging features shall be accessible from any system console or SIP connected telephone for each campus. For Two-Way Systems, two-way intercom shall be accessible from any system console or SIP connected telephone for each campus.
 - n. The platform shall synchronize its system time to the network timeserver or a web-based time server.
 - o. Each single campus installation shall be locally survivable for intercom, paging, bells, and emergencies such as lockdown, even when the district connection is unavailable.
 - p. This specification establishes a minimum level of quality, features, and performance for individual components as well as the integrated system

27.34 Submittals

- A. Product data for each component
- B. Shop Drawings: Prior to proceeding with the work: Provide detailed equipment assemblies and indicate dimensions, weights, required clearances, method of field assembly, components, location of each field connection, and a complete schedule of all equipment and materials with associated manufacturer's cuts sheets which are to be used.
 - 1. Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer-installed and field-installed wiring. Identify terminals to facilitate installation, operation, and maintenance. Include a single-line diagram showing cabling interconnection of components and levels throughout system and impedances.
 - 2. Artwork drawings and lists indicating proposed nameplate nomenclature and arrangements for control panels and plug panels prior to fabrication reflecting equipment used.
 - 3. Each drawing shall have a descriptive title and all sub-parts of each drawing shall be labeled. All drawings shall have the name and locations of the project, Systems Contractor's name in the title block.
 - 4. Details and descriptions of any other aspect of the system, which must differ from the contract documents due to field conditions or equipment, furnished.
- C. FCC Approval: The system shall be approved for direct interconnection to the telephone utility under Part 68 of FCC rules and regulations. Systems, which are not FCC approved or utilize an intermediary device for connection, will not be considered. Provide the FCC registration number of the system being proposed as part of the submittal process.
- D. Product Certificates: Signed by manufacturers certifying that products furnished comply with specified requirements.
- E. Installer Certificates: Signed by manufacturers certifying that Installers comply with specified requirements.
- F. Manufacturer Certificates: Signed by manufacturers certifying that they comply with specified requirements.
- G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Include record of final matching transformer-tap settings, signal ground-resistance measurement, Speaker line impedance certified by Installer. Reports must be submitted prior to final acceptance.
- H. Record Drawings: Prior to final acceptance, provide three (3) complete sets of drawings indicating all cable numbers and construction details in accordance with the actual system installation. Revise all shop drawings to represent actual installation conditions. These Record Drawings will be used during "Final Acceptance Testing".
- I. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary

27.35 Quality Assurance

- A. Installer Qualifications: An experienced Installer who is an authorized representative of equipment manufacturer for both installation and maintenance of equipment required for this Section. Provide the following within thirty (90) days after notification to proceed:
 1. Provide a list of installations that the Installer has specifically installed for verification by the Owner. Random installations from other vendors and/or Installers shall not be accepted. The Installer, not its employees, must meet these qualifications.
 2. The Installer shall be bondable.
 3. The Installer shall demonstrate to the satisfaction of the Owner or his representative that he has:
 - a. Adequate plant and equipment to pursue the work properly and expeditiously.
 - b. Adequate staff and technical experience to implement the work.
 - c. Suitable financial status to meet the obligations of the work.
 - d. Technically capable and factory trained service personnel at a local service facility to provide routine and emergency service for all products used in this project
- B. Because the life expectancy of this type of communications structure normally exceeds 10 years, the owner expects continuity from the service provider. The installing/servicing company must be an authorized provider of the manufacturer's product for it least (10) years.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- D. Comply with NFPA 70
- E. Comply with NEMA Standard SB-40 for Emergency Communications in K-12 schools.
- F. Comply with UL 60950

27.36 In-Service Training

- The vendor shall provide and implement a complete and comprehensive staff training program for all administrators, facility staff members, and teachers. This mandatory training program will provide school staff a complete understanding of how to utilize and properly operate all functions.
- The training program shall be implemented by a staff member/trainer employed by the vendor. The trainer must be factory certified to provide training on their product.
- All staff development training is to be coordinated through the owner's designated representative. As training sessions are completed, the trainer will provide the school's administrative staff and school district's staff a document listing all of the staff and faculty members who attended, received, and completed the training program

27.37 Warranty

- A. Provide a manufacturer's five-year warranty of the school communications network equipment against defects in material and workmanship. This warranty will cover all electronic system components. Additional warranties cover clocks, speakers, and call in switches. If any defects are found within the warranty period, the defective equipment shall be replaced at no cost (equipment only); a one-year warranty shall be provided for labor.

- B. A copy of the manufacturer's standard statement of warranty proving all equipment provided for the school communications network is covered with the required five-year warranty shall be included with the project submittal. This statement of warranty shall be provided on the manufacturer's stationary. The standard five-year warranty is an important element in establishing a standard in quality. Manufacturers who circumvent the five-year warranty by offering special "extended warranties" that are not part of their normal published warranty will not be accepted

27.38 Manufacturers

- A. Manufacturers: Subject to compliance with requirements, provide the following system:
 - 1. Telecenter U manufactured by Rauland-Borg Corp (No Approved Equal)
 - a. Only Authorized Rauland-Borg Distributor contact

27.39 Product System Requirements

- A. The platform shall utilize state of the art IP Technology for Call-in Notification, School Safety Paging and Evacuation tones, Atomic Time Synchronization, Class Change Tones utilizing multiple, programmable schedules for each zone, Two-way hands-free Internal Communications and Paging, and Program Distribution. The system shall be easy to learn and operate. All standard programming shall be web based and user friendly to allow the system administrator the ability to easily program system features.
- B. Provide complete and satisfactorily operating district/school communications and district/school safety as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
- C. The platform shall be a single electronic system consisting of a minimum of 10 audio channels for each campus, (classroom) IP Speaker Modules and call switches (Two-Way system), IP Zone Modules connecting corridor speakers, inside and outside horns, IP Administrative Consoles, SIP enabled PBX integration and district-wide integration for paging, emergency notifications, calendar scheduling and configuration.
- D. Each Classroom shall be provided with a Speaker and the cabling infrastructure for a minimum of 1 call switch with its own annunciation path and priority.
- E. If Provided, call-ins may automatically annunciate (display of priority and location) to administrative consoles, SIP enabled phones, and outside phones.
- F. If Provided, call-ins shall be programmed to automatically change priority and annunciation route based on age of call-in and original priority.
- G. If Provided, call-ins may have priority (and annunciation route) changed by user action from a console or SIP enabled phone.
- H. If Provided, call-in annunciation route shall include playing pre-recorded audio over speakers, sending a pre-configured email, and activating relays.
- I. The platform shall lend itself to expansion by simple addition of hardware modules.
- J. The platform shall connect directly to an existing, standard protocol WAN/LAN network, without the

need for a separate server at each school location. Configuration, including bell schedules, calendars, and emergency sequences can be remotely created, changed, stored and downloaded to the system by an authorized user from a web-based user interface.

- K. The platform shall provide the ability to initiate school safety paging announcements, evacuation tones and take cover tones from any telephone or connected web browser within the facility or outside the facility to any other location within the facility or district.
- L. The platform shall provide the ability to selectively communicate or monitor individual classrooms in emergency situations from any telephone within the facility or outside the facility to any other location within the facility; all communication within the classroom shall be hands-free and will not require any interaction by the classroom user.
- M. The platform shall provide classroom users the ability to confirm that they have safely secured their classrooms during lockdown with a single button press. The front office administrator will receive confirmation that the classroom is safely secured via an administrative console. The front office administrator shall be able to initiate two-way communication, without a pre-announcement tone, to the classroom during an emergency via the administrative console.
- N. Availability of IP Addressable and POE powered Speaker Modules for individual rooms shall be system programmable and may be assigned any two, three, four, five or six digit number as well as name and description. Any extension may be reassigned at any time (Two-Way System).
- O. IP-enabled two-way voice communication shall be available from any provided telephone or administrative console through any speaker in a campus. This shall allow hands free communication to any classroom or any individual loudspeaker unit. A programmable pre-announce tone shall sound immediately before the intercom path is opened and a supervisory tone shall continue to sound at regular intervals when speaker monitoring is active, complying fully with all privacy legislation. Preannounce tone and supervisory tones shall be disabled during designated emergencies automatically.
- P. The platform shall allow users to configure multiple schedules per school, with a minimum of 500 unique events per schedule, and automatic Daylight Savings time correction. Schedules can be programmed to occur once, daily, weekly, monthly, or in any combination of the preceding recurrences. Each school may have a minimum of 20 unique bell schedules, with a minimum of 5 active schedules on any given day for each campus. User shall be able to select from 25 standard included tones as well additional user created and uploaded audio files for class change signaling and messaging. In addition, scheduled events shall include relay actions, email notifications, and paging exclusions as system configuration changes. The platform shall allow control of the bell schedules via the district WAN/LAN without the need for a separate server at each school location. Bell schedules can be remotely created, changed, stored and assigned to calendar days for the local school by an authorized user from a web-based user interface.
- Q. The platform shall be able to integrate with an existing PA system or operate as a fully independent IP solution. The platform shall be able to function in combination of said configurations and allow for seamless communication within a school or district-wide, regardless of the type of configuration used. The platform shall be scalable, with the ability to easily add, install, and configure additional equipment to a system.
- R. The platform allows for customization of preprogrammed sequences, used for emergencies, events, and everyday communications. Preprogrammed sequences can be activated from the push of a relay button, soft key of an administrative console, a dial string of a SIP phone, or a web browser configured to the district network. Sequences can be initiated automatically as part of a schedule or on the fly. Preprogrammed sequences can be customized to utilize any combination of audio tones, emails, relays,

tone exclusions, swings, delays, duples, SIP phone notifications, and program distribution. Audio tones can include customized audio files and voice messages, recorded in any language. Uploaded audio tones and messages can be preprogrammed to announce repeatedly or individually, as part of a scheduled sequence or on the fly. Each school in a district can have its own customized sequences, and can be activated individually, in groups, or district-wide.

27.40 Equipment and Material

A. Server Software

1. Provides district-wide paging, bell event scheduling, emergency notification and configuration for entire district.
2. Ability to configure system and initiate system features, per school and district-wide via web-based user interface.
3. The software has the ability to sync system time to the Atomic Clock Signal or to the school's or district's network time server.
4. The software will provide a web browser to deliver district-wide emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The software must be capable of automatically notifying district personnel via the WAN/LAN of an alarm condition.
5. The software can automatically broadcast emergency instructions via associated system hardware throughout an entire district when an alarm (e.g. lockdown, lockout, security, fire) is initiated via the web-based user interface. The emergency instructions are preprogrammed and require no user intervention. Bell tones are able to be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
6. The software allows for user-uploaded pre-recorded messages and tones. Software supports the upload of MP3 and WAV file types. User-uploaded pre-recorded messages and tones can be part of emergencies, sequences, and bell schedules.
7. The software can be installed in cloud, virtual or physical server environments.
8. The web-based user interface supports secure HTTP browsing.
9. The software supports encryption to ensure secure access.
10. The system shall monitor itself if devices go offline and system actions are not received. Specified users shall receive email notifications when devices go offline. The software shall be able to keep a log and report on system activity within a school or all schools district-wide for a minimum of one year. These reports can be exported to excel spreadsheets.
11. The software will support a minimum of 20 bell schedules per school, with 5 schedules assignable to a specific school day. Bell schedules can be programmed to announce tones, activate relays, send emails, activate program distribution, and notify SIP phones.
12. The system allows programmable end points to be automatically included or excluded for live paging, bell tones, or prerecorded audio, depending on the time or day or day of the week. These inclusions/exclusions can be applied manually or automatically depending on their schedule.
13. The software can automatically send an email, as part of a programmed sequence of events, to district administrators alerting them of an emergency within the district.
14. The software provides the ability to view schools that are in an emergency status, using any web browser on the district's network. The software shall identify the name of the school in an emergency as well the type of emergency that school is in.
15. The system has a minimum of 5 customizable emergencies, one of them being an All-Clear – with the ability to return the system from an emergency to normal status. Each emergency shall have a minimum of 500 unique events.

B. Campus Controller

1. Provides call routing for paging and intercom for a single facility.
2. System shall connect to the district provided Telephone Network via a SIP connection.
3. Support a flexible numbering plan allowing two, three, four, five, or six-digit extensions (Two-Way System).
4. SIP interface to a district provided Telephone Network shall be capable of allowing connected phones to display classroom call-ins, answer internal intercom call-ins, make pages and change priorities of call-ins in progress.
5. Direct dialing, two-way amplified voice intercom between any provided telephone or admin console and speaker without the use of a press to talk or talk listen switch.
6. If installed the ability to upgrade priority level from individual call switch.
7. The ability to answer intercom call-ins registered at administrative consoles and pre-selected telephone. (Two-Way System).
8. The ability to automatically escalate incoming call-ins to an alternate telephone or group of telephones if they remain unanswered for a predetermined amount of time. (Two-Way System).
9. The ability to manually upgrade an intercom call-in to an alternate telephone or group of telephones. (Two-Way System).
10. The ability for classrooms to “check-in” via push button when they have successfully secured their location during emergency. (Two-Way System).
11. Administrative console shall display locations that have not checked in to confirm their secured location and provide hands-free audio monitoring and communication to unsecured locations. (Two-Way System).
12. The controller shall not need direct connection to any classroom via home run or distributed wiring. It shall communicate solely through the IP network.
13. Single button access from any console on the system to distribute emergency announcements within the facility to all or select locations equipped with speakers. Emergency announcements originating from any assigned administrative console shall have priority over all regular system functions.
14. Ability for administrative consoles and connected phones to selectively monitor audio at any two-way speaker during an emergency. (Two-Way System).
15. Stores a minimum of 48 hours’ worth of Bell Event Schedules, all emergency notification sequences as well as facility wide configuration.
16. System has the ability to sync system time to the Atomic Clock Signal or to the school’s or districts network time server.
17. System’s SIP Interface shall provide:
 - a. Audio paging access from any telephone to any single intercom speaker (Two-Way System)., zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire facility.
 - b. Ability to answer a call-in directed to that SIP extension. (Two-Way System).
 - c. Ability to upgrade a call-in directed to that SIP extension. (Two-Way System).
 - d. Single button access from any telephone on the system to initiate alarm signals within the facility to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative telephone shall have priority over all regular system functions.
 - e. Ability to initiate a school-wide emergency including lockdown and evacuate sequences.
 - f. SIP device shall display call-in information from call in switch. Information will include a minimum of Classroom Name, Number, and Priority Level. (Two-Way System).
18. The system will have the ability to utilize a web browser and a USB microphone connected to the PC to deliver district-wide live emergency paging, pre-recorded messages and tones from any authorized computer in the facility or the district. The system must be capable of automatically notifying district personnel via the WAN of an alarm condition.

19. The system can automatically broadcast emergency instructions throughout an entire campus when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. Bell tones are able to be halted during an emergency. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.

C. IP Addressable Modules:

1. System shall provide multiple IP Addressable Modules for intercom, paging and relay activation.
 - a. All Modules are POE 802.3af compliant
 - b. All Modules support DHCP.
 - c. All Modules connect to network with a single RJ45 connector
2. IP Addressable Speaker Module
 - a. Shall interface to school's data network, a classroom speaker, and multiple call switches.
 - b. A minimum of 5 levels of call-in can be placed from an IP Speaker Module. The call-ins are routed to administrative consoles and select SIP connected telephones and can only be cleared from the system once answered. If a call-in is not answered within a preprogrammed time the call-in may reroute to other telephones, consoles, and speakers. (Two-Way System).
 - c. An option for Privacy call in switches is supported. When the Privacy switch is activated it prevents administrative or classroom telephones from monitoring the specific classroom/location intercom speaker. (Two-Way System).
 - d. The ability to belong to one or more of a minimum of 100 independent zones for zone paging, program/music distribution zones and class change tone zones; this assignment is a programmable function, changeable by time of day.
 - e. Each IP Speaker Module's location shall be programmed in software to belong to any combination of software zones. IP Speaker Modules shall be designed to mount near ceiling and wall speakers and in the plenum space. (Two-Way System).
 - f. Intercom and paging volume adjustable from Software interface.
3. IP Addressable Zone Paging Module
 - a. Zone Paging Module shall connect multiple speakers for district all page, all page, zone paging, bells, audio events and, emergency notification.
 - b. Zone Paging Modules shall be rack and wall mountable.
 - c. Zone Paging Modules shall be able to belong to one or more of 100 independent zones for live paging, bells, pre-recorded audio and emergency notification.
4. IP Addressable Aux I/O Module
 - a. Aux I/O Module shall have two input contacts and two output contacts.
 - b. Input and output contacts are individually addressable.
 - c. Aux I/O Module shall be wall and rack mountable.
 - d. User can program relays to be activated manually, through an event/bell schedule, or during emergency notification.
 - e. Aux I/O Module can perform school lockdown from a single press of a panic button.

D. IP Addressable Analog Gateway (Two-Way System).

1. IP Addressable Gateway provides integration with existing analog wiring infrastructure – consisting of shielded two-pair classroom field wiring. The Gateway provides the ability to reuse speaker wiring, speakers, and punch blocks to integrate analog infrastructure with IP platform.
2. Each Gateway will have 5 watts of power per port and 25 watts total per device.
3. Supports 24 classrooms that utilize 25 Volt speakers and all current Telecenter call switches for front office notification.
4. Supports minimum of 5 call switch priorities per classroom, capable of lockdown check-in functionality, while reusing existing shielded two-pair classroom field wiring.
5. Classroom intercom volume adjustable from Software interface.

6. Classroom paging volume adjustable from Software interface.
 7. Configured to the school network and can be used in conjunction with IP Addressable Modules.
- E. IP Addressable Administrative Console
1. A full color screen with 64 soft keys, 3 line select, volume control, push to talk, speakerphone mode and left/right and up/down scrolling.
 2. Audio paging access from any Console to any single intercom speaker, zone (group) of intercom/paging speakers, or all speakers/paging horns throughout the entire school.
 3. Programmable soft key access from any console on the system to initiate alarm signals within the school to all or select locations equipped with speakers. A minimum of 25 separate distinct alarm signals shall be provided. Alarm signals originating from any assigned administrative console shall have priority over all regular system functions.
 4. Programmable soft key access from any console to automatically broadcast page emergency instructions throughout an entire school when an alarm (e.g. lockdown, lockout, security, fire) is tripped or manually activated. The emergency instructions are preprogrammed and require no user intervention. The system provides redundant alarm annunciation over intercom/paging speakers and is not meant to replace primary fire alarm or security systems.
 5. Ability to perform intercom to any single IP Addressable Speaker Module. (Two-Way System).
 6. Ability to display 3 call-ins at a time on the screen while other call-ins are annunciating and the ability to scroll to view all call-ins. (Two-Way System).
 7. Ability to upgrade a call-in via soft key. (Two-Way System).
 8. Programmable soft key access from any console for activating relays, campus wide.
 9. Ability to maintain, along with controller and other IP Modules system functions, including intercom, bells and paging for the local campus in the event of district-wide connection loss.
 10. Classrooms that have not 'checked-in' during an emergency are listed on the Administrative Console's screen. (Two-Way System).
 11. The time duration of an emergency is shown on the screen of the administrative console. The check-in timer is shown on the screen of the administrative console. (Two-Way System).
- F. Audio Paging/Program Amplifiers
1. Power amplifier(s) shall be provided to provide a minimum of 2 watts of power to all paging speakers, and 15 watts of power to all paging horns.
 2. The maximum load on the paging/program amplifiers shall be 80% of the rated maximum output of the amplifiers.
- G. Normal/Emergency Call Switch Rauland Dual Level Call In Switch (Two-Way System).
1. Normal/Emergency Call Switches indicated on the drawings shall provide the following functions and features:
 - a. One (1) "Normal" call switch that shall activate a distinctive "NORMAL" level call from single button activation. The button shall be clearly marked "NORMAL" and will route the call-in to any one or more Administrative Consoles and/or Marquee Displays for quick and easy response from an Administrative Console.
 - b. One (1) "Emergency" call switch that shall activate a distinctive "EMERGENCY" level call from single button activation. The button shall be red in color and shall be clearly marked "EMERGENCY" and will route the call-in to any one or more Administrative Consoles and/or Displays for quick and easy response from an Administrative Consoles.
- H. Equipment Racks (Wall Mounted in IT rooms, Locations verified by YISD IT)
1. All equipment racks shall be Chatsworth 11754-X19 or approved equal.
 2. Equipment rack(s) shall be located in climate-controlled areas/rooms as shown on drawings.
 3. All head-end, distribution, and source equipment, including data and power, shall be located in racks configured as approved by the Engineer.

4. Rack mounted equipment shall be accessible from front and rear.

I. Wireless Clock System

1. Provide complete and satisfactorily operating NTP Synchronized Wireless Clock System with analog and/or digital secondary clocks as described herein, using materials and equipment of types, sizes, ratings, and performances as indicated.
2. (NTP) Network Time Protocol is a network standard protocol that assures accurate synchronization to the millisecond of computer clock times in a network of computers. Based on UTC, NTP synchronizes client workstation clocks to the U.S. Naval Observatory Master Clocks in Washington, DC and Colorado Springs, CO. Running as a continuous background client program on a computer, NTP sends periodic time requests to servers, obtaining server time stamps and using them to adjust computer clocks.
3. The system shall be easy to learn and operate. All standard system programming shall be user friendly to allow the system administrator the ability to easily program system features.
4. Use materials and equipment that comply with referenced standards and manufacturers' standard design and construction, in accordance with published product information.
5. Coordinate the features of all materials and equipment so they form an integrated system, with components and interconnections matched for optimum performance of specified functions.
6. The NTP Synchronized Wireless System consists of a master transmitter located on the inside of the building, and a NTP receiver connected to a time server. Wireless analog and digital clocks are synchronized to the NTP time. System shall synchronize all clocks to each other. System shall utilize NTP technology to provide atomic time to components.
7. System shall not require hard wiring for its components except for AC Power. Analog Clocks may be battery operated for full portability if required.
8. Analog Clocks shall synchronize to +/- 1 second of the transmitter displayed time.
9. Clocks shall automatically adjust for Daylight Saving per settings on the transmitter
10. The system shall have an internal clock that is continually updated by the NTP receiver. If a NTP failure were to occur, the clocks would continue to be synchronized to the internal clock and would not deviate from each other. Once NTP time is restored, all clocks would once again be synchronized to the NTP time.
11. The system must have a failsafe design so that if a power interruption were to occur, the clocks will continue to operate. If a sync signal is not received by the analog clocks for 48 hours, the second hand will double pulse to indicate this condition. Upon restoration of power, the transmitter will once again communicate with the clocks and normal operation will resume.
12. Battery Powered Analog Clocks shall require 2 "D" cell batteries.
13. System shall be 100% programmable from the front operational panel with lights that indicate power status and NTP reception. Panel programming will also include Time Zone, Frequency, 12- or 24-hour operation and DST on/off.
14. The wireless backbone must support expansion of the system to include wireless alphanumeric displays for emergency crisis communications for district-wide communications.
15. The system may be modified to use GPS instead of NTP as the time source without the need to replace the transmitter. A GPS receiver would need to be added with access to the outside of the building.
16. The system shall lend itself to expansion by simple addition of wireless secondary clocks and their required power source.

J. Interior Ceiling Speakers (Lay-in Ceilings)

1. Provide Ceiling Speaker Assembly consisting of 8 Ohm, 8" speaker mounted 2 foot by 1 foot, lay-in baffle, with an integrated back box that covers the full area of the baffle.
2. The speaker shall include provisions to allow attachment of a safety cable if required.

K. Interior Ceiling Speakers (Hard Ceilings)

1. Provide Ceiling Speaker Assembly consisting of 8 Ohm, 8" speaker mounted on a baffle, with an integrated back box that covers the full area of the baffle.
2. Provide square white surface enclosures for open ceiling areas.

L. Wall/Ceiling Mounted Horns for Outside and High Noise Areas

1. Provide double re-entrant type horn loudspeakers with integral driver. The horn loudspeaker shall be impervious to weather and vandalism. Horn shall be constructed of heavy-duty ABS plastic. Horn loudspeaker drivers shall be rated at 15 watts with a frequency response of 480 Hz to 14 KHz. Sensitivity shall be 106 dB 1 watt, 1 meter. Transformer assembly shall be dual voltage multi-tap type suitable for 25 or 70-volt installations. Dispersion pattern shall be 180 degrees conical. The horn loudspeaker shall be constructed of treated heavy gauge aluminum, with all exposed parts potted and a sealed driver. Wiring terminal shall be fully enclosed. The speaker flange and mounting surface shall have a cork-rubber gasket. The horn loudspeakers finish shall be gray baked on enamel.
2. The recessed back box shall be of heavy gauge cold-rolled steel, spot welded for stability with a rust-retardant gray primer finish. Acoustically treat the interior to eliminate mechanical resonance. The back box shall be 10-3/4"x10-3/4"x6" deep.
3. The baffle shall be vandal proof, the faceplate constructed of 14-gauge carbon steel with a minimum tensile strength of 55,000 PSI. A lattice grid sub-plate shall deny access to the horn but be acoustically transparent for sound projection. Provide tamper proof, stainless steel mounting hardware. The baffle shall have a mar/scratch baked epoxy rust inhibitive finish.

M. Uninterruptible Power Supplies (UPS) As Required By and Provided By the Owner

1. UPS equipment provided for this system will include Power Conditioning to smooth current and voltage fluctuations.
2. UPS equipment will be sized in accordance with the system manufacturer's recommendations.
3. Provide an individual UPS for EACH SYSTEM CONTROLLER (Gateway) furnished with the system.
4. Provide additional UPS(s) for protection of all other equipment furnished with the system and housed in the equipment racks.
5. All UPS equipment shall be rack mounted.

N. Equipment and Materials

1. WIRELESS TRANSMITTER

- a. FCC Part 90 Approved, 467.2125-467.4375 MHz frequency range
- b. Radio Technology (Narrowband FM, 12.5 KHz bandwidth)
- c. 10 selectively available channels
- d. 5 watt transmitter
- e. Daylight Savings Time pre-programmed
- f. Time Zone Pre-set
- g. Non-Volatile Memory
- h. LCD Display for time, date, year, power, time zone and signal reception
- i. Operating Range (32 degrees F to 158 degrees F)
- j. Rack or Shelf Mount
- k. Power Supply Input: 120-volt AC, Output: 12-volt DC, 3 Amps
- l. 7" Rear Mounted Antenna
- m. Dimensions: 12"L x 6"W x 1.75"H Weight: 2 lbs.
- n. NTP Receiver
- o. Optional External Antenna for use in large campus applications. Minimum of 2 mile radius

2. SECONDARY 13" ANALOG CLOCK

- a. 13" Analog Clock (Battery Powered using 2"D" Cell batteries).
- b. Maintenance Free.
- c. Five year manufacturer's warranty.
- d. Microprocessor based with built-in wireless receiver
- e. Heavy Duty Construction
- f. Durable ABS Casing
- g. Clock numbering graphics shall be Standard Arabic Format (12HR-60 Minute)
- h. Face of clock is white
- i. Hour and Minute hands shall be black, second hand is red
- j. The clock lens shall use a shatterproof polycarbonate material with no visible molding marks. Glass and/or visible molding marks are unacceptable.
- k. The clock shall have a low-profile, semi-flush design
- l. Wire Guard Model in areas where protection is required as indicated on drawings or by owner.

3. SECONDARY DUAL FACE 13" ANALOG CLOCK

- a. 13" Analog Clock (Battery Powered using 2 "D" Cell batteries per face)
- b. Wall or Ceiling Mount shall be determined by drawings or owner
- c. Maintenance Free.
- d. Five year manufacturer's warranty
- e. Microprocessor based with built-in wireless receiver
- f. Heavy Duty Construction
- g. Durable ABS Casing
- h. Clock numbering graphics shall be Standard Arabic Format (12HR-60 Minute)
- i. Face of clock is white
- j. Hour and Minute hands shall be black, second hand is red
- k. The clock lens shall use a shatterproof polycarbonate material with no visible molding marks. Glass and/or visible molding marks are unacceptable.

4. SECONDARY 16" ANALOG CLOCK

- a. 16" Analog Clock (Battery Powered using 2"D" Cell batteries).
- b. Maintenance Free.
- c. Five year manufacturer's warranty.
- d. Microprocessor based with built-in wireless receiver
- e. Heavy Duty Construction
- f. Durable ABS Casing
- g. Clock numbering graphics shall be Standard Arabic Format (12HR-60 Minute)
- h. Face of clock is white
- i. Hour and Minute hands shall be black, second hand is red
- j. The clock lens shall use a shatterproof polycarbonate material with no visible molding marks. Glass and/or visible molding marks are unacceptable.
- k. Wire Guard in areas where protection is required as indicated on drawings or by owner.
- l. The clock shall have a low-profile, semi-flush design

5. SECONDARY 2.5" DIGITAL CLOCK

- a. 2.5" Digital Clock (AC Powered 24V or 120V)
- b. 4 Digit (Hours/Minutes)
- c. Built-in Countdown/Count-up Timer
- d. Maintenance Free
- e. Five-year manufacturer's warranty
- f. Microprocessor based with built-in wireless receiver
- g. Heavy Duty Construction
- h. 12/24 Hour Display Format
- i. Clear Anti-Glare LED Display

- j. Adjustable Brightness
 - k. AM/PM Indicator
 - l. Wire Guard in areas where protection is required as indicated on drawings or by owner
 - m. Bright Red or White LED Digit
6. SECONDARY 4" DIGITAL CLOCK
- a. 4" Digital Clock (AC Powered 24V or 120V)
 - b. 4 Digit (Hours/Minutes)
 - c. Built-in Countdown/Count-up Timer
 - d. Maintenance Free
 - e. Five year manufacturer's warranty
 - f. Microprocessor based with built-in wireless receiver
 - g. Heavy Duty Construction
 - h. 12/24 Hour Display Format
 - i. Clear Anti-Glare LED Display
 - j. Adjustable Brightness
 - k. AM/PM Indicator
 - l. Wire Guard Model in areas where protection is required as indicated on drawings or by owner.
 - m. Bright Red or White LED Digit
7. SECONDARY 2.5" DUAL SIDED DIGITAL CLOCK
- a. 2.5" Digital Clock (AC Powered 24V or 120V)
 - b. 4 Digit (Hours/Minutes)
 - c. Built-in Countdown/Count-up Timer
 - d. Maintenance Free
 - e. Five year manufacturer's warranty
 - f. Microprocessor based with built-in wireless receiver
 - g. Heavy Duty Construction
 - h. 12/24 Hour Display Format
 - i. Clear Anti-Glare LED Display
 - j. Adjustable Brightness
 - k. AM/PM Indicator
 - l. Bright Red or White LED Digit
8. SECONDARY 4" DUAL SIDED DIGITAL CLOCK
- a. 4" Digital Clock (AC Powered 24V or 120V)
 - b. 4 Digit (Hours/Minutes)
 - c. Built-in Countdown/Count-up Timer
 - d. Maintenance Free
 - e. Five year manufacturer's warranty
 - f. Microprocessor based with built-in wireless receiver
 - g. Heavy Duty Construction
 - h. 12/24 Hour Display Format
 - i. Clear Anti-Glare LED Display
 - j. Adjustable Brightness
 - k. AM/PM Indicator
 - l. Bright Red or White LED Dig

27.41 Execution

A. EXAMINATION

1. Examine conditions, with the Installer present, for compliance with requirements and other conditions affecting the performance of the School Communications and School Safety Network.
2. Do not proceed until unsatisfactory conditions have been corrected.

B. INSTALLATION

1. General: Install system in accordance with NFPA 70 and other applicable codes. Install equipment in accordance with manufacturer's written instructions.
2. Furnish and install all material, devices, components and equipment for a complete operational system.
3. Impedance and Level Matching: Carefully match input and output impedance's and signal levels at signal interfaces. Provide matching networks where required.
4. Control Circuit Wiring: Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
5. All housings are to be located as indicated.
6. The Vendor shall provide necessary transient protection on the AC power feed, all copper station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.
7. Wiring within Enclosures: Provide adequate length of conductors. Bundle, lace, and train the conductors to terminal points with no excess.
8. Provide physical isolation from speaker microphone, telephone, line level wiring, and power wiring. Run in separate raceways, or where exposed or in same enclosure, provide 12 inch minimum separation between conductors to speaker microphones, telephone wiring and adjacent parallel power. Provide physical separation as recommended by equipment manufacturer for other system conductors.
9. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams Per YISD labeling requirements.
10. Cabling: To be CM, CMP, or underground rated as required by code for use. 25V cable to be 2PR/1PR shielded 22ga. and 70.7V cable to be 1PR 18 ga.
11. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.

C. GROUNDING

1. Provide equipment grounding connections for Integrated Electronic Communications Network systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5 ohm ground at main equipment location. Measure, record, and report ground resistance.
3. Provide all necessary transient protection on the AC power feed and on all copper station lines leaving or entering the building. Note in system drawings, the type and location of these protection devices as well as all wiring information.

D. FIELD QUALITY CONTROL

1. Inspection: Make observations to verify that units and controls are properly labeled and interconnecting wires and terminals are identified. Provide a list of final tap settings of paging speaker line matching transformers.
2. Testing: Rectify deficiencies indicated by tests and completely re-test work affected by such deficiencies at Contractor's expense. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

E. FINAL ACCEPTANCE TESTING

1. The Final Acceptance Testing shall be provided to the Owner or the Owners designated representative only. Final acceptance testing to any other trade or service provider for the project will not comply with the requirements of this section.
2. The Vendor will provide a Final Acceptance Test record document signed by both the contractor and the Owner or designated Owner's Representative establishing the "In Warranty" date. The warranty period will not commence until the Final Acceptance Test is completed.
3. Be prepared to verify the performance of any portion of the installation by demonstration, listening and viewing test, and instrumented measurements. Make additional adjustments within the scope of work and which are deemed necessary by the Owner because of the acceptance test.

F. COMMISSIONING

1. The contractor shall train the Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance of the system. This training will be in accordance with the training as outlined in Section 1.6 of these specifications. In addition to the Training Materials provided, the contractor will also furnish Operators Manuals and Users Guides at the time of this training.
2. Schedule training with Owner through the owner's representative, with at least seven days advance notice.

G. OCCUPANCY ADJUSTMENTS

1. The contractor shall provide Occupancy Adjustments in accordance with Section 1.6 of these specifications. A response scenario amenable to both the owner and the contractor will be established and followed.

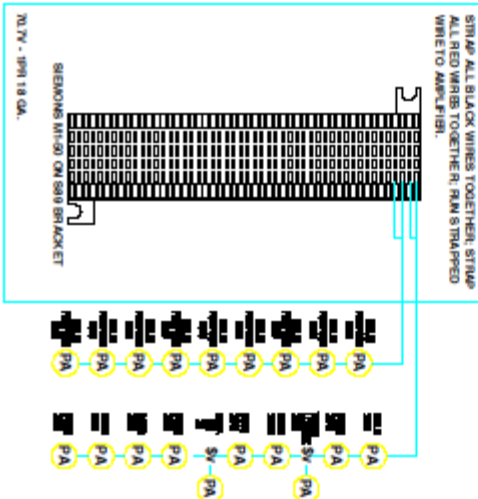
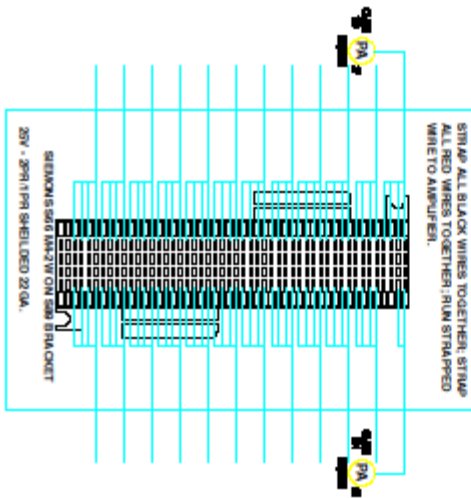
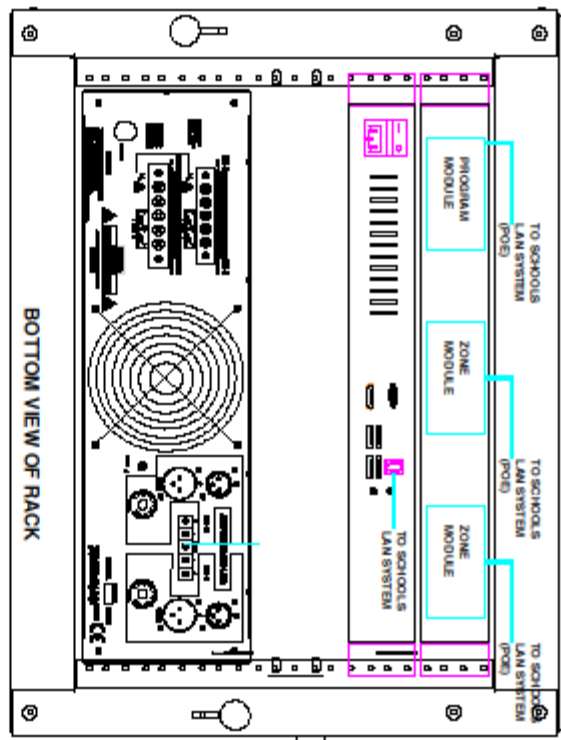
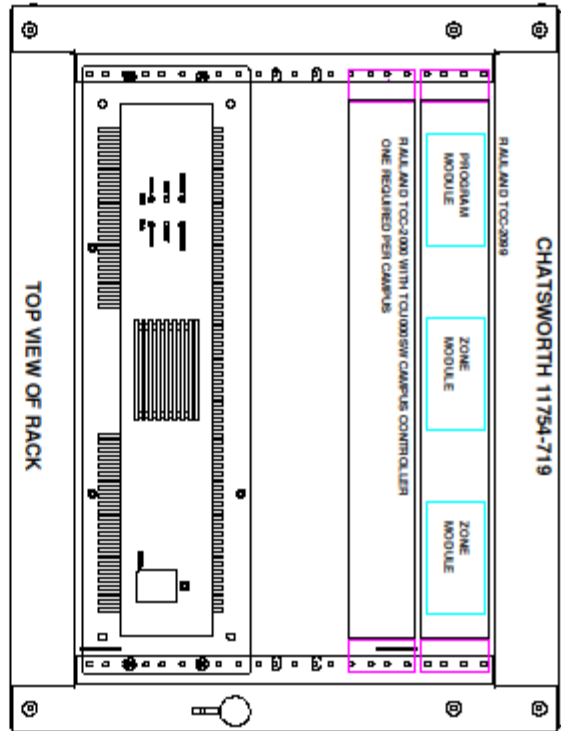
H. CLEANING AND PROTECTION

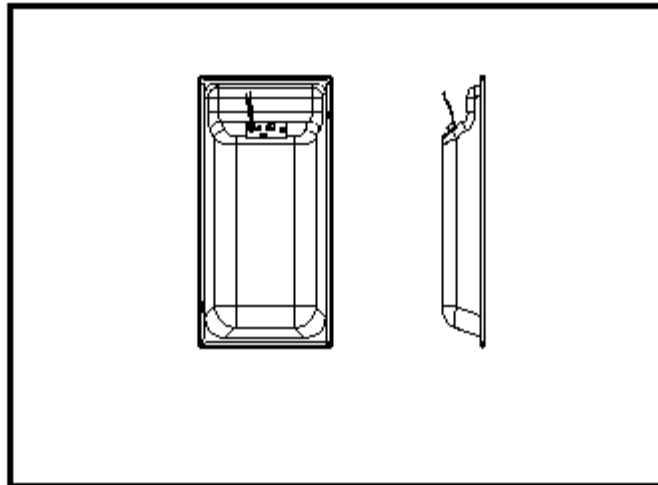
1. Prior to final acceptance, the contractor shall vacuum and clean all system components and protect them from damage and deterioration. All blank spaces in equipment cabinets will be covered with blank panels. Top and side panels, and all cabinet doors will be installed. All general areas within and around all equipment rack/cabinets in the facility will be swept, vacuumed, and cleaned up. No cabinets will be left unlocked and all cabinet keys will be turned over to the owner or designated owner's representative.

I. SPEAKER AND HEAD END DETAILS

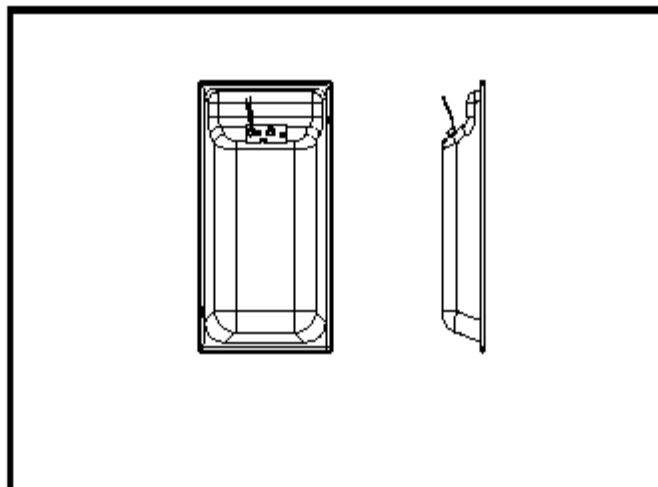
1. The following details are to show the type of speaker for a specific area and the Head End Equipment Rack with field termination punch blocks.

EQUIPMENT RACK AND HEAD END PUNCH BLOCKS

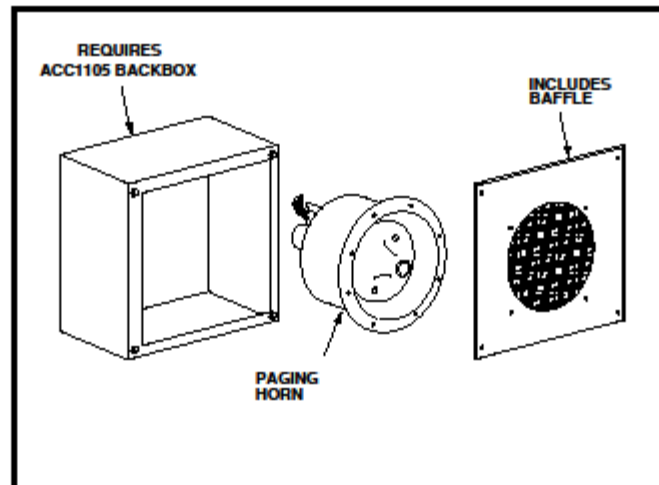




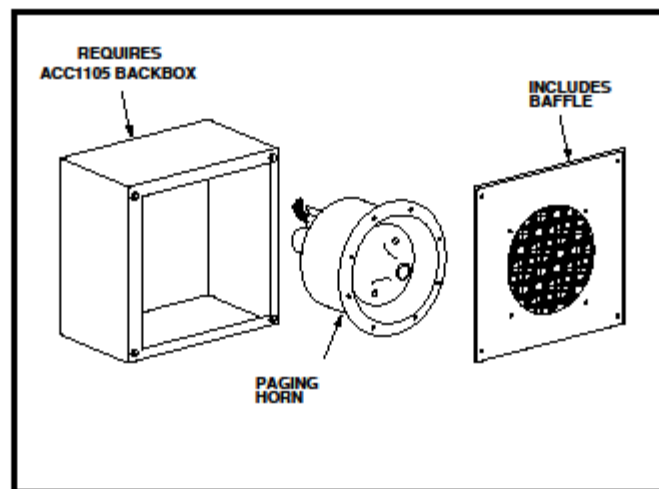
**QUAM SYSTEM 5 1'x2' LAY-IN CEILING MOUNT
SPEAKER.
CLASSROOMS (TAP SETTING .63W @ 25V)**



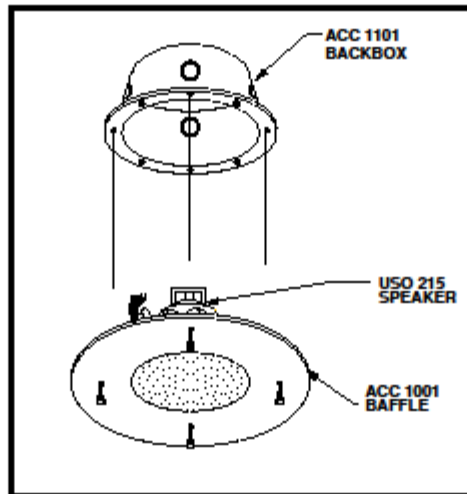
**QUAM SYSTEM 5 1'x2' LAY-IN CEILING MOUNT
SPEAKER.
*MULTI-PURPOSE, CORRIDORS, COMMON AREAS
(TAP SETTING 1.25w @ 70V)
*OFFICES, CONFERENCE ROOMS AND LOUNGES
(TAP SETTING .63w @ 70V)**



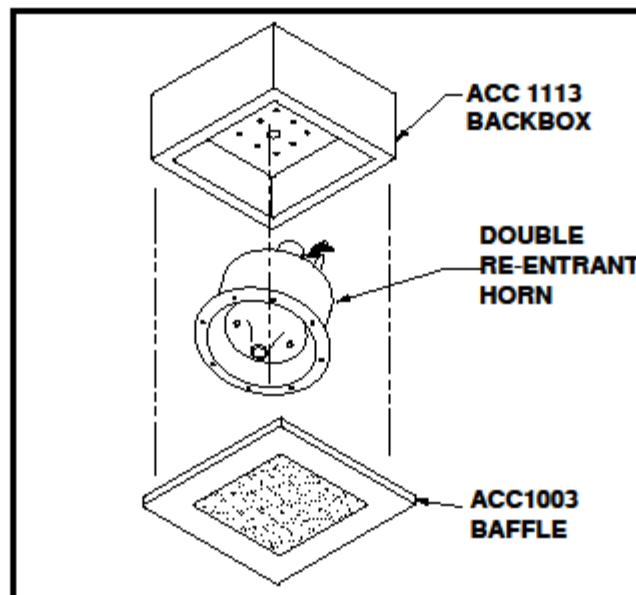
**OUTSIDE
RAULAND ACC-1411 FLUSH MOUNT. INCLUDES
PAGING HORN AND BAFFLE. REQUIRES ACC-1105
BACKBOX.
(TAP SETTING 5w @ 70V)**



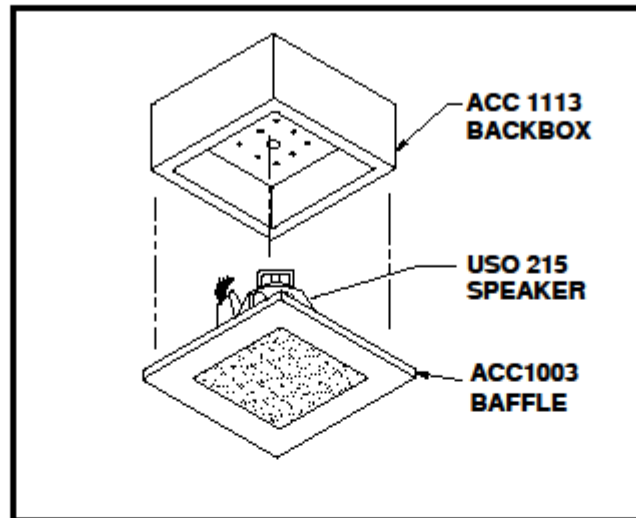
**INSIDE WALL MOUNT HIGH NOISE AREA
RAULAND ACC-1411 FLUSH MOUNT. INCLUDES
PAGING HORN AND BAFFLE. REQUIRES ACC-1105
BACKBOX.
(TAP SETTING 2.5w @ 70V)**



HARD CEILING
RAULAND USO215 SPEAKER WITH 1101BACK CAN,
ACC 1104 T-SUPPORT & ACC 1001 CEILING BAFFLE.
(TAP SETTING .63w OR 1.25w @ 70V)



CEILING MOUNT HIGH NOISE
SQUARE; WHITE; SURFACE MOUNT
RAULAND ACC 1003 VANDAL PROOF CEILING BAFFLE &
USO215 SPEAKER WITH 1113 SURFACE BACKBOX
DETAIL
(TAP SETTING 2.5w @ 70V)



**SQUARE; WHITE; SURFACE MOUNT
RAULAND ACC 1003 VANDAL PROOF CEILING BAFFLE
& USO215 SPEAKER WITH 1113 SURFACE BACKBOX
DETAIL
(TAP SETTING .63w @ 70V)**

END OF DIVISION 27

Division 28 – Fire Alarm

28.01 Fire Alarm Design

- A. All new facilities, new additions to existing facilities and remodeled facilities shall be provided with an addressable fire alarm system as required by International Fire Code, latest enforced edition.

28.02 References

- A. National Fire Protection Association (NFPA):
 - 1. NFPA 70 – National Electrical Code, latest enforced edition.
 - 2. NFPA 72 – National Fire Alarm Code, latest enforced edition.
 - 3. NFPA 101 – Life Safety Code, latest enforced edition.
- B. Accessibility Codes:
 - 1. American's with Disabilities Act (ADA)
 - 2. Texas Accessibility Standards (TAS)
- C. YISD Education Specifications
- D. YISD Technical Design Standards

28.03 Fire Alarm Panel

- A. The fire alarm control panel – nonproprietary preferred. A remote annunciator is to be installed at front door vestibule and fire alarm control panel in designated area by YISD.

28.04 Installation

- A. Plenum rated wiring without conduit to be used except at locations where subject to damage. Conduit risers to be included at manual pull stations and audio/visual devices.
- B. Tamper resistant covers with localized audible alarm shall be installed at all manual pull stations except the station next to main fire alarm control panel.
- C. A smoke detector shall be installed at all locations where field power supply units are installed including the main fire alarm control panel.
- D. Horn/strobe units or horn/speaker units in gymnasiums are to be provided with vandal guards.
- E. The audio/visual conductors to be color coded green and the power wires to be 14 AWG.
- F. The fire alarm control panel to report to YISD Central Office Command Center digital receiver by way of digital transmitter with dedicated telephone lines.
- G. Smoke detectors to be photoelectric type. Duct smoke detectors are to include a remote test switch installed in proximity of the duct smoke detector. Location to be coordinated with YISD.

- H. Circuit breakers for fire alarm control panel and field power supply units are to be identified (panel and circuit number) at panel & supply units. The circuit breakers at source panelboards to have handles painted 'red'.
- I. All classrooms and other areas (i.e. band rooms, orchestra rooms, practice rooms, etc.) which are designed to be soundproof shall have all the necessary devices to ensure all students and staff are alerted to the fire alarm.
- J. Exterior areas such as courtyards, play fields, playgrounds, etc. shall have horn/speaker devices.

Division 28 – Security

28.05 Security System Infrastructure Design

- A. General
 - 1. All new facilities, new additions to existing facilities and remodeled facilities shall be provided with security infrastructure as determined by the Ysleta Independent School District (YISD). The infrastructure and installation requirements listed in this guide must be in full compliance in order for the YISD to successfully complete the electronic security system's final installation and commissioning in a timely and efficient manner.
 - 2. All exterior doors, toilet room doors, custodial closets and other doors required by codes shall receive closers with top plate reinforcement. All doors shall be furnished with stops (floor mounted preferred). All exterior doors shall have rubber silencers and/or weather stripping. The preferred hardware finish at new facilities shall be BHMA-626 Satin Chrome (US26D).
 - 3. Include Ysleta ISD in the Door Hardware and Security System Provisioning specifying and submittal review process for approval.

28.06 Standards

- A. Every aspect of the security system infrastructure shall be designed to adhere to all industry standard installation practices, Manufacturers' recommendations, and state and local codes, standards and regulations.
- B. Federal, state, and local codes, rules, regulations and ordinances governing the work are to be included in the specifications. Should items noted in the drawings or specifications create an installation that is in violation of codes, rules, regulations, or ordinances, promptly call them to the attention of YISD's representative.
- C. Architect/Engineer must coordinate the security system infrastructure design to ensure compliance with applicable life safety codes and requirements. This includes, but is not limited to, the fire alarm interface for fail safe/secure door-locking mechanisms.

28.07 Security System Provisioning

- A. Credential Access Controlled Door Infrastructure
 - 1. Furnish and install the infrastructure for Main Cross Connect (MC) and Horizontal Cross Connect (HC) communication equipment room doors.
 - 2. Furnish and install the infrastructure for designated exterior entrance doors.

3. Furnish and install the infrastructure per the following:
 - a. Provide cabling and pathway between designated access control security doors and the demarc termination enclosures located in the MC and HC communication equipment rooms.
 - b. Terminate the cable at the door end with a multi-pin connector block in the adjacent wiring collector J-box.
 - c. Coordinate the conduit system installation associated with the credential reader and the electrified door hardware with Division 08 and Division 26.
 - d. Provide battery backup power for the electrified locks and future credential reader. Locks to be electric strike and not the magnetic locks. Coordinate the lock power requirements with Division 08.
 - e. Special power supplies for electrified locks with high current or other unique requirements shall be furnished and installed by Division 08 with connections to the security system for lock/ unlock control.
 - f. Provide a door position switch(es) as required and coordinate door and frame for factory prep with Division 08.
 - g. Configure all monitoring switches for normally closed contact configuration.
 - h. Provide end of line (EOL) supervision module for 4 state line supervision for all door position and request to exit (REX) switches at the distant end. Coordinate resistance value with YISD.
 - i. Provide transient and surge protection on both ends of the cabling run for any electric security component exposed to the exterior.

B. Electrified Locking Door Control Infrastructure

1. Furnish and install the remote-control infrastructure for designated electrified locking doors.
2. Furnish and install the infrastructure per the following:
 - a. Provide cabling and pathway between designated access control security doors and the demarc termination enclosures located in the MC and HC communication equipment rooms.
 - b. Terminate the cable at the door end with a multi pin connector block in the adjacent wiring collector J-box.
 - c. Coordinate the conduit system installation associated with the electrified door hardware with Division 08 and Division 26.
 - d. Provide battery backup power for the electrified locks. Coordinate the lock power requirements with Division 08.
 - e. Special power supplies for electrified locks with high current or other unique requirements shall be furnished and installed by Division 08 with connections to the security system for lock/unlock control.
 - f. Provide a door position switch(s) as required and coordinate door and frame for factory prep with Division 08.
 - g. Configure all monitoring switches for normally closed contact configuration.
 - h. Provide end of line (EOL) supervision module for 4 state line supervision for all door position and request to exit (REX) switches at the distant end. Coordinate resistance value with YISD.
 - i. Provide transient and surge protection on both ends of the cabling run for any electric security component exposed to the exterior.

C. Intrusion Detection Infrastructure

1. Monitor all designated exterior doors for open/closed position.
2. Monitor designated areas with motion detectors for activity.
3. Furnish and install the infrastructure per the following:

- a. Provide cabling and pathway between detection sensor(s), and the demarcation termination enclosures located in the MC and HC communication equipment rooms.
- b. Configure each detection sensor as an independent zone.
- c. Coordinate any associated conduit system installation with Division 26.
- d. Provide battery backup power for detection sensors requiring power.
- e. Provide a door position switch(s) as required and coordinate door and frame for factory prep with Division 08.
- f. Provide end of line (EOL) supervision module for 4 state line supervision for all detection sensors at distant end. Coordinate resistance value with YISD.
- g. Configure all monitoring switches for normally closed contact configuration.
- h. Provide transient and surge protection on both ends of the cabling run for any electric security component exposed to the exterior.

D. Duress Button (Panic Button)

- 1. Furnish and install the duress button per the following:
 - a. Provide cabling and pathway between duress button and the demarcation termination enclosures located in the MC and HO communication equipment rooms.
 - b. Configure each duress button as an independent zone.
 - c. Coordinate any associated conduit system installation with Division 26.
 - d. Provide end of line (EOL) supervision module for 4 state fine supervision for duress button(s) at distant end. Coordinate resistance value with YISD.
 - e. Configure duress button for normally closed contact configuration.
 - f. Location of duress buttons shall be coordinated with YISD during the design phase.

E. Video Surveillance Infrastructure and Cameras to be Furnished and Installed by YISD under separate contract.

- 1. Furnish and install the infrastructure and the YISD furnished (OFE) camera per the following:
 - a. OFE cameras are network-based IP and PoE technology type.
 - b. Provide cabling and pathway between the video surveillance cameras and the video surveillance camera data patch panel located in the MC and HC communication equipment rooms.
 - c. Provide and connect CAT 6, purple patch cables from the video surveillance camera data patch panel to the YISD-furnished PoE switch. Patch cables will be integrated into the current cable management system of the network hardware rack.
 - d. Maximum cable length to be 100 meters. Cameras located beyond the 100-meter limitation will require additional support equipment.
 - e. Provide transient and surge protection on both ends of the cabling run for any electric security component exposed to the exterior.
 - f. Coordinate any associated conduit system installation with Division 26. Conduit sleeves to be furnished and installed for all exterior cameras with pull strings. Location of cameras to be provided A/E team during construction document design phase.
 - g. Mount position and focus the OFE cameras per the Manufacturers' recommendations in coordination with the YISD.
 - h. Provide documentation of testing and full operation of each camera.
 - i. Prior to camera installation, Contractor will schedule with Owner's representatives, a walk-through of the scheduled camera locations for exact equipment and position selection. Contractor will provide a technician with ladder, proposed camera with lens assortment and 20-inch monitor with appropriate power to test and adjust camera/lens combination for optimum view. Final camera position and lens schedule shall be submitted for the Security Consultant's approval and sign-off.

SECURITY SYSTEM REQUIREMENTS (Suggested guidelines)

SECURITY SYSTEM REQUIREMENTS (SUGGESTED GUIDELINES)							
LOCATION	CREDENTIAL CONTROLLED ACCESS	DURESS BUTTON	ELECTRIC LOCKING	INTRUSION SYSTEM	MONITORED DOOR	MOTION DETECTOR	VIDEO CAMERA
ADMIN OFFICE							
AUDITORIUM							
BACK ENTRANCE	*		*		*		*
BATHROOM							
BREAK ROOM							
BUS LOADING AREA			*				
CAFETERIA			*				*
CLASSROOM WITH ACCESSIBLE WINDOWS						*	
CORRIDOR						*	
ELEVATOR							*
EMERGENCY EXIT					*		*
ENTRANCE VESTIBULE							*
EXTERIOR DOOR	*				*		*
GYM						*	*
KITCHEN	*					*	
LAB						*	
LIBRARY						*	
LOBBY						*	*
LOCKER ROOM							
MACHINE ROOM							
MAIN ENTRANCE	*		*		*		*
OFFICE						*	
PLAY GROUND							*
PORTABLE BUILDING							
PRINCIPAL OFFICE		*				*	
RECEPTION FRONT DESK		*					*
ROOF MACHINE EQ.							
SIDE ENTRANCE					*		*
STAIRWELL					*		*
STORAGE							
COMM. ROOM	*		*		*		*
VESTIBULE							
WORK ROOM							

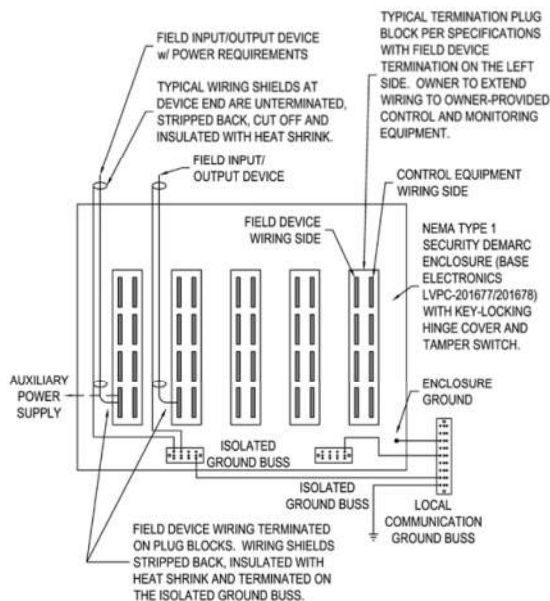
28.08 Security System Addition Provisioning in Existing Facilities

- A. Architect/Engineer to verify the presence, extent, capacity and condition of all legacy security systems.
- B. Architect/Engineer in deliberation with YISD, to determine if legacy security system expansion, complete retrofit or separate parallel legacy and new system is the best design course of action. Decision to be based on performance, long term support and cost.
- C. In the event of a system retrofit, all existing or abandoned cable shall be removed.

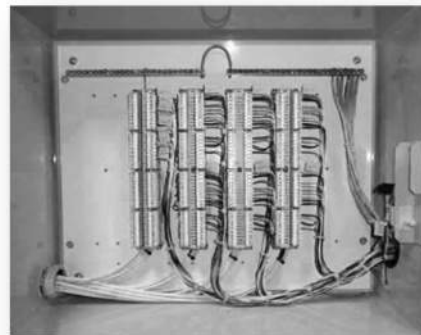
28.09 Products

1. Security Components Details
2. Security Wiring Demarc Enclosure
3. Intrusion alarm system to be an addressable DSC unit or approved equal. All intrusion detection devices are to be addressable type.

SECURITY TERMIN. DEMARC ENCLOSURE TERMIN. + GROUNDING PRACTICE



SECURITY DEMARC ENCLOSURE



4. Security Wiring Collector J-Box Electrical SECURITY DEMARC ENCLOSURE Junction Box (Adjacent Security Doors)
5. Provide NEMA 1 enclosure with continuous hinged latching door.
6. Battery Backup Auxiliary Device Power Supply and Fused Power Distribution (see Security Wall Elevation Details)
7. Provision battery backup capacity for 4 hours of operation
8. Altronix model AL series or YISD approved equal.
9. Circuit breakers handles for power supply units are to be color coded red and power supply circuit numbers to be included on power supply units.
10. Battery Backup Lock Power Supply with Fire Alarm interface Distribution (see Security Wall Elevation Details)
11. Provision battery backup capacity for 4 hours of operation.
12. Altronix model AL with ACM series or YISD approved equal.
13. Concealed Door Position Switch

14. GE/Sentrol 1078C series or equivalent or YISD approved equal.
15. Surface Mount Overhead Door Position Switch
16. GEISentrol 2300 series or equivalent or YISD approved equal.
17. Tamper Switch for Security Equipment Enclosures
18. Provide tamper switches for all security equipment enclosures
19. GE/Sentrol 3000 series or equivalent or YISD approved equal.
20. Duress Button
21. Amesco HUS-1 or equivalent or YISD approved equal.
22. End of Line Circuit Supervision Module
23. Base Electronics 200796 or equivalent or YISD approved equal.
24. Multi-Pin Wiring Connector and Demarc For Electrified Access Controlled Door Components
25. Phoenix Contact Combicon mating plug and receptacle 1827842 and 1858170 (No Substitute).
26. Motion Detector
27. Provide addressable dual technology (microwave and FIR) detectors
28. Visonix Duet / Tower series or equivalent or YISD approved equal.
29. Curtain type detectors are to be used in corridors.
30. Curtain type detectors are to be used on all classrooms located on first floor.
31. Wireless detectors not acceptable.
32. Slotted Wire Management Duct System
33. Panduit Type F or equivalent or YISD approved equal.

END OF DIVISION 28

Division 31 - Earthwork

References

- A. Geotechnical Report
- B. El Paso Water Utilities Standards
- C. City of El Paso Transportation and Engineering Department Standards
- D. City of El Paso Bicycle Ordinance
- E. Texas Gas Standards
- F. Local Zoning Ordinance
- G. Local Subdivision Ordinance
- H. Fire Code and Local Amendments

31.01 General Requirements

- A. Ysleta Independent School District (YISD) budget includes all site development costs incurred, including parking, on site utilities, storm water detention, drainage facilities, erosion and sediment controls, curb cuts, drives, paved play areas, walks and sidewalks at the street, unloading zone, landscaping and exterior furniture and equipment. Street, curb, gutters, and utility extension beyond the immediate site are generally not included but rather as a separate allocated budget amount. It is therefore essential that economy of means be a prime consideration in designing site improvements such as pavements, walks, utility distances, drainage and other elements affected by layout and location.
- B. Minimize cut/fill operations at site and try to maintain a balanced site. Discuss cut/fill quantities when requiring import or export of material with authorized YISD official to determine if other sites can use excess material. Also verify with YISD on other sites in the district that may have excess materials when needing import to see if existing recourses can be feasibly reused.
- C. Other Design Disciplines: The consultant shall coordinate his work with other consultants throughout development of the project to eliminate conflicts.

31.02 Earthwork

- A. Excavation: Control runoff and limit erosion during construction, excavation, and grading. Stockpile good topsoil and store. Excess fill material, subsoil, and materials which are deemed unsuitable for fill shall be removed from the YISD property at the Contractor's expense.
- B. Fill: Provide guidelines based on Geotechnical Engineer's report for acceptable fill. Consider native soil to be utilized in planting areas. Importation and stockpiling of fill and topsoil materials shall be shown in staging plan.

31.03 Soils

- A. Top Soil: Top soil removed during grading or excavation of site shall be stockpiled on site for re-use during landscape work. The top soil that is stockpiled shall be clean and free of debris. If quantity of stockpiled topsoil is insufficient, provide additional topsoil, as required, to complete landscape work. Provide direction to contractor that new topsoil shall be obtained from local sources or areas having similar soil characteristics from naturally well-drainage sites. Provide recommendations to add soil amendments as necessary to meet fertility and pH level requirements of selected plantings.

31.04 Subterranean Termite Treatment

- A. Design of the buildings shall include consideration of Integrated Pest Management principles per the Texas Department of Agriculture Texas Structural Pest Control Service. Provide termite treatment below all new construction and additions (Termidor is preferred).

31.05 Sediment Control

- A. Consider existing and proposed site grading, topography, adjacent properties, downstream conditions and drainage features. Provide a plan to guide the contractor through the construction process to maintain site sediment runoff. Refer to TCEQ regulations. Provide areas and plan for sedimentation basins during construction. Ensure requirements that the contractor will provide a Storm Water Pollution Prevention Plan for the site and will be responsible for maintenance and day to day operation in accordance with all local, state and federal requirements.

31.06 Critical Site Information

- A. Determine if the property is properly platted and zoned. If platting or zoning is improper, notify YISD to ensure that this can be corrected at the same time the site topography field work is being performed.
- B. If no topographic survey exists, notify YISD immediately to initiate acquisition. Specifically request any unusual site data required for the project.
- C. After new facilities have been "sited," work in conjunction with the geotechnical engineer to provide a base site drawing locating all required test borings. Once complete, request that YISD order geotechnical investigations.
- D. All site and geotechnical data will be provided to the Architect/Engineer by YISD. In order to assure that project schedules will be met, the Architect/Engineer shall initiate request for this data as soon as predictable. The Architect/Engineer shall cooperate with YISD and provide required documentation to facilitate contracting for these services at the earliest possible date and shall periodically review the status of required services with YISD to prevent potential delays.

31.07 Site Planning

- A. The Architect/Engineer shall be concerned with all improvements within the property line boundaries, including, but not limited to, parking, drives, walks, all-weather play areas, drainage, and utility and/or service entrances. In all instances, the Architect/Engineer shall design drive approaches, walks, and similar municipal-required facilities crossing public rights of way in accordance with City of El Paso Specifications and Standards. The design and implementation of off-site utility and street extensions in the public right of way shall be the responsibility of YISD. All site development shall be done in an efficient manner and shall weigh initial cost in relation to long term maintenance.

End of Division 31

Division 32 - Exterior Improvement

References

- A. Geotechnical Report
- B. El Paso Water Utilities Standards
- C. City of El Paso Transportation and Engineering Department Standards
- D. City of El Paso Bicycle Ordinance
- E. Texas Gas Standards
- F. Local Zoning Ordinance
- G. Local Subdivision Ordinance
- H. Fire Code and Local Amendments

32.01 Purpose

- A. This document is a narrative describing YISD Basis of Design for grounds and exterior improvements. The information contained herein shall be used by the Project Design Team to develop grounds and exterior improvements that help the District meet its goals of creating an environment that is conducive to learning; provides a safe and secure environment for physical activity and promotes physical fitness; is easy to maintain; and helps the District meet its goals for sustainability. The document shall be used as part of the District's Construction Design Standards.

32.02 General

- A. Site work, landscaping and other exterior improvements are to be designed to be durable, low maintenance, and vandal resistant, while creating an aesthetically pleasing, safe, and secure environment. The cost of site maintenance is kept to an absolute minimum. Low maintenance cost is to be a primary consideration during selection of materials, plantings, and site equipment.
 - 1. Locate and orient building to make best use of site conditions. Account for ground water, soil conditions, and wind and weather exposure. Ensure properties of the building materials are appropriate for site conditions. Typically, orient the building with a north-south axis for natural lighting opportunities. Consider architectural appearance, future expansion, and functional requirements when locating utility service entrances, cooling towers (away from direct view of the front area), pad mounted transformers, gas meters, generators, manholes, and other mechanical items. Flagpoles shall be located near the main entrance of the building in order to identify its location.
 - 2. Design shall provide for safety, accessibility, and durability. Where possible, slopes and equipment shall meet, and exceed, ADA accessibility requirements.
 - 3. Landscape design is to be developed as a part of the overall project design. Courtyards shall have direct outside access without passing through halls or rooms. Architectural design is to include a service entry for all courtyards. Adequate drainage shall be incorporated into all designs.
 - 4. The main entrance shall be protected to ensure vehicular access to sidewalks, entrances, and walkways are deterred.

32.03 Site Review / Existing Conditions

- A. Architect/Engineer shall determine location of, field verify, and identify on drawings, all underground utilities, vaults, tanks, fiber optics, etc. Contact a YISD Representative for assistance in locating existing services and irrigation. Consultant and surveyor shall call for utility locates and verify location of underground utilities. The surveyor shall locate all visible and marked utilities in coordination with the ONECALL utility locates. The consultants should determine any existing utilities that may require potholing to verify elevation and location. Coordination of these efforts should be done with the YISD.
 - 1. The Architect/Engineer shall visit the site with the VLK and YISD representative and review existing conditions. The following listed items are weighted in relation to modification of existing facilities but shall apply equally to new schools' sites.
 - a. Consider traffic patterns, staging areas, student drop-off and pick-up from cars and buses, parking areas, safety of small children while crossing streets or drives, and convenient access to office entry.
 - b. Preserve existing trees and shrubs.
 - c. Provide adequate services and staff parking.
 - d. Consider topography and existing drainage structures, swells, etc.
 - e. Consider existing easements, building lines, parking encroachments, and electrical, utility, or gas/oil transmission lines.
 - f. Locate contractor's work and staging area.
 - g. Locate existing structures, their size, and if they are portable or permanent.
 - h. Evaluate for addition of bollards to ensure student safety while in areas adjacent to drop off and pick up zones.
 - i. Include crosswalks, drive arrows, traffic signs, and bollards as needed.
 - j. Concrete planters may be used as bollards.

32.04 Paving

- A. To conserve land available for green areas, recreational spaces, and future expansion, consider consolidation of drive, parking, and service drives.
- B. Provide precast concrete tire stops in parking lots wherever student walkways are adjacent. At new schools, provide typical site furnishings, including bike racks, basketball backstops (4"-diameter steel pipe, steel backboards, goals, and chain nets), trash containers, benches etc. YISD will provide all playground equipment.
- C. Use City of El Paso standard guidelines for all drive layouts and requirements. Circulation patterns should be simple and non-confusing. Consider separation of bus and vehicular circulation. Provide sufficient parking for staff and visitors. Entrances and exits into parking areas should be located so as not to create a traffic hazard. Consider fire lane requirements for width, clearance and pavement design capable of accommodating emergency vehicles. Refer to local jurisdiction for required sizes of parking, drive isles and fire lanes. Painted pavement markings shall utilize thermoplastic pavement markings. Particular attention shall be paid to turning radius for buses to enter and exit the facility without crossing over lanes. Provide for a minimum inside turning radii of 30' on all bus lanes. Design all roadways in accordance with soils report/geo-tech. Design sidewalks with reinforcement adequate to withstand accidental vehicular traffic. Bollards shall be installed as needed. Benches, retaining walls, and other surfaces shall be designed to discourage vandalism and skateboarding on school property.
- D. Pavement designs should be based on the recommendations of the soils engineering report and published weights for various vehicle classifications. A reinforced concrete apron drive at transition with the street should be provided. All driveways shall be Portland cement reinforced concrete for new and

renovation construction. All parking areas shall be asphalt paving for new and renovation construction. Architect/Engineer shall check with local jurisdiction having authority to confirm paving requirements. Asphalt paving should meet TxDOT Standards ITEM 340, 247, and 300.

- E. Use of exposed aggregate concrete (poured-in-place) as a “finish” material is not permitted.
 - 1. Utilize concrete mixes with a high percentage of fly ash content as a substitute for Portland cement up to 20% will not affect finishing conditions, but may change appearance. Coordinate with the District all fly ash content prior to Design Development.
 - 2. Utilize recycled aggregate in concrete design mixes where possible.
 - 3. Curing compounds used at school sites should contain no more than 10% solvents.
- F. Establish top elevations of manhole covers and cleanouts flush with pavements and in grass areas at an elevation, which will allow unobstructed mowing and which will assure good positive drainage. Lids in driveways shall be able to withhold vehicular traffic.
- G. At street unloading zones, where permitted, provide for reinforced concrete sidewalk continuous with curb to permit stepping directly from an auto to an all-weather surface. Provide sidewalks along the street frontage of all facilities from property line to property line, including connection to building.
- H. Minimize the use of curbs in loading dock areas.
- I. Paved areas shall be provided with curbs and gutters, unless directed otherwise by YISD.
- J. Vehicular access to restricted areas or controlled parking areas shall use tubular steel gates. Gates shall cantilever or clear span all openings. Intermediate posts are not allowed. If route is part of a fire lane, provide necessary KNOX boxes per EPFD.
- K. All paving joints shall be sealed with silicone type sealants.
- L. Special consideration shall be given to all entrance sidewalks and paving. Design should minimize the likelihood that paving will buckle and/or move causing the doors to the entrance to not open. Porches and sidewalks immediately located next to entrances shall be integrated into the structural design rather than being independent of the facility.
- M. A provision for access by the handicapped is required including provisions for drop-off and unobstructed entry into the building from parking area or point of drop off. Provide loading areas as required by code. Ensure curb ramps do not collect water. Refer to the Architectural Barriers Act, Article 9102, Texas Civil Statutes, including the Texas Accessibility Standards (TAS); and the Americans with Disabilities Act, Public Law 101- 336, including Part 36 as amended, (ADA).
- N. Lighting
 - 1. Provide adequate site security lighting during early morning and late evening activities for safe egress around buildings and in parking lots. Site lighting and plantings shall be placed so that mature plants do not obstruct or obscure security lighting.
- O. Transportation
 - 1. Design Documents shall provide details and sections for pavement and fill designed to support: 1) bus, fire, and service truck traffic and 2) automobile traffic, parking, and paved playgrounds. Separate bus loading and service traffic from parent drop off and other parking areas. Layout so that bus queuing does not interfere with deliveries and service vehicles. The layout must address pedestrian and bicycle safety by providing safe routes for access that minimizes interaction with vehicular traffic. Site specific designs must be reviewed and approved by YISD.

P. Parking Lots

1. To ensure there is safe access into and out of the school grounds and to provide the maximum flexibility in scheduling of school hours and deliveries, the service entry should not be shared with bus traffic or parent/student drop off lanes. Traffic patterns and parking lots shall be evaluated to ensure that service traffic does not interfere or conflict with other vehicular or pedestrian traffic. Provide entry to the service yard for kitchen deliveries and trash pick-up separate from bus traffic, staff parking, and parent/student drop off areas. Refer to city minimum requirements for off-street parking for elementary, middle and high schools. Consultant shall confirm in writing with YISD all parking requirements. In certain situations, YISD may require additional parking above city minimum requirements. At High School sites, separate visitor, employee and student parking. Consult with YISD on required bus parking for each site. Precast concrete tire stops are required where no curb is present. Precast concrete splash blocks shall be provided at all exterior downspouts.
2. All parking lot spaces shall be numbered.
3. Service yard shall be designed to allow easy access by large delivery vehicles and waste disposal trucks. Provide adequate turning radius to accommodate tractor/ trailer deliveries and access to dumpsters by disposal service. The dumpster location and access route require review and approval by the service provider. Enclosure gates shall be wrought iron with perforated metal with the approved YISD design.

Q. Dumpster, Loading Dock, and Service Areas

1. Provide reinforced concrete pad and approach that shall withstand traffic of service trucks and support dumpsters and/or compactors without cracking or rutting as recommended by the Geotechnical report. Design dumpster and/or compactor pad so that trash and recycle dumpsters do not roll while being filled or emptied. Pad shall have between 1% and 2% slope to provide drainage. Minimum design requires bus rated pavement for all service areas; concrete pad for approach and service area is preferred. See Exhibits 01 and 02 for dumpster and compactor layout design requirements and collection vehicle approach and turn radius diagram. Service drives should accommodate long wheelbase trucks approximately 50-60 feet long, including appropriate turning radii. Provide parking for 2 service vehicles near loading areas. Provide an exterior hose bibb at all loading area locations and dumpster enclosures. Provide separate receiving areas for food service and general deliveries. Provide separate exits for food service and custodial access to dumpster locations. Provide slab area and screening as required by the City of El Paso for recycling dumpster and trash dumpster. Typical dumpster size: 8 cubic yard, Quantity - provide as shown in Exhibit 01. Gates for dumpster enclosures shall be lightweight wrought iron with perforated metal with the approved YISD design to prevent food service and custodial personnel injuries when opening and shall follow the approved YISD design. End post shall be made of at least a Sch. 40 steel with enough strength to support the weight of the gates. An electrical service shall be located close to dumpster locations for compactors.

EXHIBIT 01 - TYPICAL DUMPSTER ENCLOSURES AND COMPACTOR PAD

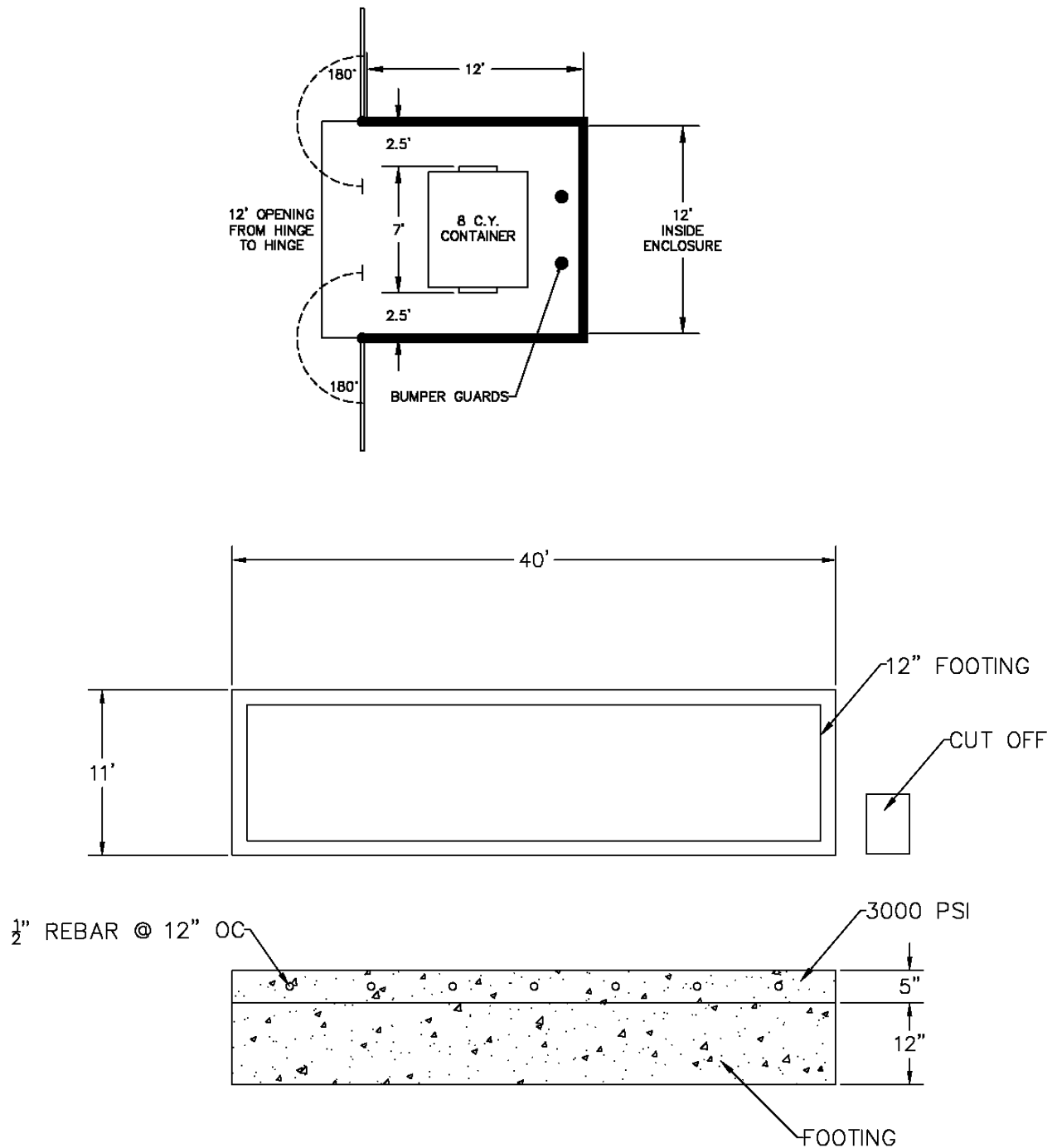
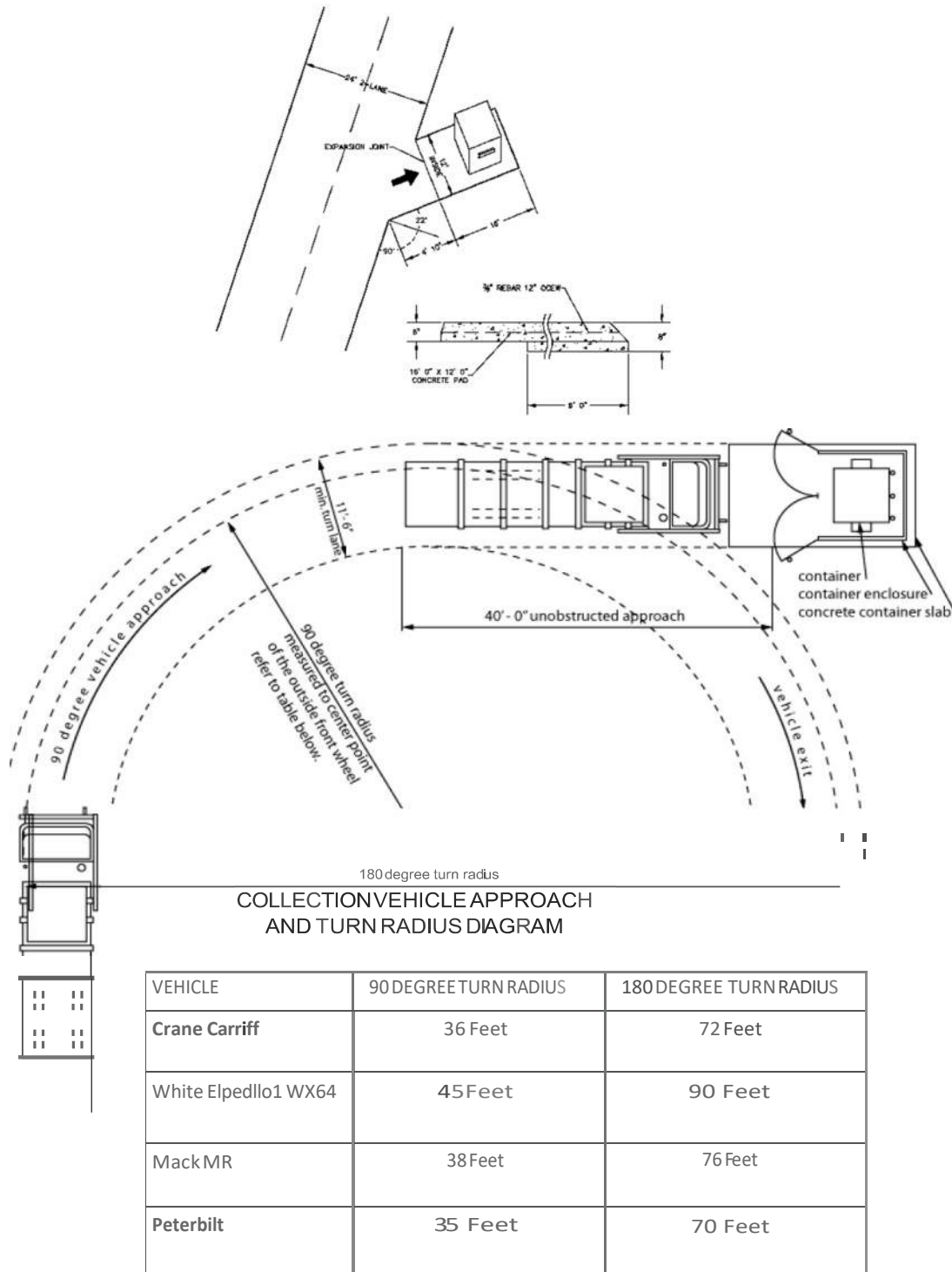


EXHIBIT 02 - COLLECTION VEHICLE APPROACH + TURN RADIUS DIAGRAM



NOTE: Verify actual required turning
radiuses with vehicle manufacturer s
specifications.

- R. Bollards: Bollards shall be concrete-filled steel pipe. Bollards shall be painted safety yellow. Provide bollards to protect front entrance, utilities and transformers. Where bollards block access by service vehicles, the center bollard shall be sleeved to allow removal. See Exhibit 1 for dumpster layout design requirements.
- S. Sidewalks: Concrete sidewalks and walkways shall be a minimum of 5' wide. Finished grade of sidewalks and walkways shall be no more than 1" above surrounding grade and have a cross slope of less than 2%. Sidewalks by bus drop-off shall be a minimum of 8' wide. Design should consider a covered area or overhang to provide a dry area for students waiting by bus drop-off.
- T. Mowing Strips: A hard surface mowing strip shall be installed adjacent to vertical barriers such as buildings, fences, and retaining walls. Mow strips must be flush with the grass.

32.05 Retaining Walls

- A. All retaining walls over 4'-0" shall be engineered and have fencing installed at the top of the wall in such a way that access is blocked for fall protection.
- B. When using a decorative concrete masonry unit, all caps and corner pieces shall match decorative units. All caps shall be secured in place using the manufacturer specified adhesive for that product.
- C. Provide a minimum 12" wide mow strip at the bottom and top of all walls when turf is present.

32.06 Fences and Gates

- A. Fencing material is determined by the jurisdiction and there may be other requirements or materials than those listed below. Consultant shall verify with the City of El Paso requirements as to allowable fencing materials.
- B. All chain link type fences used in the District shall be galvanized 12-gauge steel. Tension wire shall be spiraled or crimped at tops and bottoms. Fence ties and fabric edges shall be appropriately knuckled and tied back so that there are no protruding sharp edges. Fence ties are to be at industry-standard minimum spacing and twisted (no looped).
- C. Entire perimeter of site should be fenced with 6' high fencing, 10' fencing at tennis courts including lockable vehicular gates. Wrought Iron Fencing shall be used at front of sites and other designated locations remaining sides and rear shall be agreed upon by YISD. Coordinate with YISD for wrought iron fence pattern and details. Adequate pedestrian gates shall be provided. Gate stop shall latch over gate. Gate shall be designed with wheels located 3' maximum from end. Fencing should not have more than 4-inches of space between the ground level and the bottom of the fence. Gate locking mechanism shall be contractor provided and YISD approved with a provision for an owner provided padlock.
- D. Gate Access
 - 1. Maintenance access shall have a minimum of a 10' opening. Any opening over 10' shall be double gate.
 - 2. Gates shall not be constructed of solid steel. Gates shall be constructed with lightweight durable materials such as wrought iron. Wheels shall be included on all gates greater than 8'. Wheels shall be of adequate strength to support the weight of the gate.
 - 3. Gates sized at 10' shall be provided on all retention ponds. Pedestrian access shall be 24" with offset post to keep motorized vehicles off of school grounds.
 - 4. Follow ADA guidelines for facility access points.

5. Fire Department must be notified for installation of Fire Department Connection (FDC) for all fire lane access gates to facility sites.
 6. If ornamental fencing is used, it shall be powder coated tubular steel. No powdered coated aluminum or aluminum chain link shall be used. The minimum height on ornamental fencing shall be 6'. Coordinate with YISD for ornamental fencing details, standard and requirements.
 7. 12-gauge fencing shall be used around all athletic fields and bleacher areas. All baseball and softball back stops shall have the bottom 6' from the ground in 12-gauge steel. All end posts for back stops shall be set to a minimum 4' depth or greater so that backstops can tolerate strong winds and weight of ice, especially if the goal has an overhang as part of the construction.
 8. End post shall be a minimum of Sch. 40 gauge steel. Aluminum end post will not be allowed. End post shall be strong enough to support the weight of the gate.
- E. Gate Hinges: Hinges shall be structurally capable of supporting the gate and allow the gate to open and close without binding. The hinges shall be designed to permit the gate to swing a full 180 degrees.
 - F. Single Gate Latch: The gate latch shall be capable of retaining the gate in a closed position and shall have a provision for a padlock. Panic hardware is required on all gates which are considered part of the path of egress as defined by EPFD.
 - G. Double Gate Latch: The gate latch shall be a drop rod or plunger bar arranged to engage the gate stop. Locking device shall be constructed so that the center drop rod or plunger bar cannot be raised when the gate is locked. Latching devices shall have a provision for a padlock. Holes shall be provided to drop the drop rod or plunger bar when gate is fully open to prevent gate unintentionally closing.
 - H. Keepers: Keepers shall be provided for each gate over 4' so they do not swing unintentionally.

32.07 Grading

- A. There must also be concern for neighborhood scale, visual impact, aesthetics of proportion and color, good drainage, the safety and comfort of the students, and the satisfaction of parents and constituents.
- B. Care should be taken to prevent sheet flow and drainage from intersecting with walkways from student, staff, and visitor parking lots.
- C. If an addition results in an enclosed courtyard, provide drainage analysis, provide for primary and overflow drainage. Provide positive slope from enclosed courtyards to interior catch basins or French drains.
- D. Grade crawl spaces with a positive slope from perimeter grade beam to interior catch basins or French drain system.
- E. Provide surface drainage of storm water to off-site discharge points.
- F. When practical, provide surface drainage of storm water to off-site discharge points. Provide underground drainage structures only when surface drainage is not feasible.

32.08 Play Fields

- A. Play Fields: Play fields shall be designed with positive drainage at a minimum of 2% slope and maximum of 5% slope. Provide a drainage system on site to ensure play field shall be usable in wet weather

- B. Athletic Fields and Surfaces: Consultant shall coordinate and verify in writing with YISD staff on materials on all athletic facilities including, turf, fencing, field events, types of goals, size of fields, striping, marking and logos. Also discuss what appurtenances shall be required with the development of athletic facility and all planned uses. Artificial turf may be considered with written approval from YISD. At tennis courts, provide typical exterior nets, poles, and cranks.
- C. Backstops: Provide structural engineering for backstops. Vendor should be able to provide specifications/engineering calculations or a structural guideline. Minimum height for backstops at elementary schools shall be 12' play an additional angled cantilever of 6' to help prevent foul balls from leaving playing area. Consultant shall coordinate with YISD the height and materials to be used for high school baseball fields.
- D. High School baseball and softball fields shall be artificial turf thus back stops shall include safety padding.
- E. Power in batting cages, front and back of cage.
- F. Windscreen – shall be secured with hog rings.
- G. Bull Pens – Shall be of artificial turf to match the field.

32.09 On-Site Traffic Signs

- A. Provide traffic and regulatory signs for parking and drives mounted as required by the City of El Paso and the Texas MUTCD. Signage shall include pavement markings, "Daycare Vans Only", "Pick Up and Drop Off Zone", "Staff Parking Only", and "Visitors Parking". Signs shall be mounted at a minimum 7' measured from the bottom of the sign if in grass areas or a minimum of 7' to bottom of sign if mounted in pavement. All signs shall be located and installed to comply with all TAS & ADA standards and requirements.

32.10 Site Work

- A. Site Grading: Engineering plans shall show:
 - 1. Surface drainage, detention areas, and discharge points
 - 2. Subsurface drainage (if required), footing drains, and under-floor drainage systems
 - 3. Total amount of disturbed area showing hard surface and non-hard surface area amounts (pervious, non-pervious)
 - 4. Include a site plan showing existing and finish grades for entire site
 - 5. Include an erosion control plan showing location and details of proposed erosion devices. All temporary erosion control devices shall be removed prior to final project completion.
 - a. Natural features, such as drainage ways, wetlands, and hillside slopes, shall be incorporated into the overall design and landscape design for the property.
 - b. Site building and design grading to minimize cut and fill requirements. Cut and fill should be balanced to reduce the need for import or export of soil. Limit gradients to provide slope capable of supporting landscape materials, that can be reasonably maintained, and mitigate potential impacts such as erosion, deposition, and drainage flows on adjacent properties.
 - c. Finish grades shall be designed to provide positive drainage away from buildings and to approved drainage systems.
 - d. No site grading or work shall be allowed to create potential drainage problems to neighboring properties.

- e. Prior to any construction of buildings or site paving, topsoil shall be stripped from the areas to be covered by buildings or paving and stockpiled for later on-site redistribution in those areas where there shall be landscape plantings.
- f. Maximum grades shall not exceed 4' horizontal to 1' vertical on any earthen surface. Refer to local codes for maximum grades for emergency vehicles.
- g. 0.50% grade is the minimum grade for paving and shall not be used unless required. Grass and earthen areas shall have no less than 2% grade unless recommended in writing by the engineer and approved in writing from YISD. Consultant grade areas throughout the site such that it is not adverse to the function it will serve. Playgrounds should not have hostile slopes.
- h. Consultant shall consider ADA accessibility to all functions of the facility such that it may be used by all staff and students. Coordinate accessible routes with (Having YISD coordinate accessible routes sets liability on YISD) TAS specialist and review proposed designs with YISD prior to finalization. At existing sites, the consultant shall review the TAS reports for the site and coordinate improvements required to bring site into current ADA compliance. (If no TAS report is available, one should be commissioned to ensure TAS compliance of existing sites).

B. Drainage

- 1. Provide an engineered drainage plan for the site conforming to all applicable state, local, and federal regulations. Drainage system shall be designed to manage water on the site without flooding or erosion. The drainage plan shall address surface roof, foundation, subsurface, and under-floor drainage. Proposed landscaping shall reflect provisions to minimize erosion both during construction and after occupancy. Footing and foundation drains shall be rigid, perforated, non-corrugated PVC, and surrounded by drain rock.
- 2. Hard surface play areas shall be designed to support vehicles and landscape service equipment. Hard surfaces shall be sloped to provide drainage. Provide drainage system to prevent flooding or play areas and to collect and manage runoff from hard surfaces. Drain hard surfaces away from the building. Provide 2% slope away from building wall to a distance of 10' from outside wall or as specified in geotechnical report. Design drainage so it does not create tripping hazards. Locate drain grates, catch basins, and manhole covers out of the area of play. Trench drains should be designed with high strength metal grate to withstand vehicle traffic.

C. Stormwater Conveyance and Detention Ponds

- 1. Detention and retention areas shall be integrated into the total design when required. Slopes shall not exceed 4:1. Review proposed slope stabilization treatments with YISD prior to finalization. All ponds shall be designed to promote water quality of storm water runoff. Manage runoff to minimize impacts on flooding, erosion and water quality. Consider and discuss use of bioswells, downspouts discharging to grade, rain gardens, saw tooth curbs, raised inlets, wet ponds, porous pavement/pavers and grass channels. Ensure whenever possible that utility lines and facilities are not located in detention and retention areas.

32.11 Playground and Surfacing Requirements

- A. Playground areas vary from campus to campus but shall be located within visual line of sight of each other and located on the same side of the building. Refer to Educational Specifications.
- B. All playground areas shall meet TAS/ADAAG standards and requirements.

- C. All playground areas shall be enclosed with 24" high rock wall. Provide minimum clear distance from play equipment to edge of rock wall of at least 6ft. Add weep holes to perimeter rock walls to promote drainage away from playground areas.
- D. Provide TAS compliant accessible path from school exit(s) into playground area.
- E. Place playground in close proximity to the main building.
- F. All new playground equipment must meet the latest published standards/guidelines for both the American Society for Testing and Materials (ASTM) and the U.S. Consumer Product Safety Commission (CPSC).
- G. All equipment installations shall be performed by factory authorized and trained installation personnel and will be completed per ASTM and CPSC standards.
- H. TAS compliant play surfaces shall be provided around all playgrounds. Wood chips are allowed. All surface material shall meet state and federal requirements and shall be approved in writing by YISD. Clarify with YISD for material selection.
- I. All play areas shall have on-site signage indicating use guidelines for the equipment. Example: "This play area is designed for children 2 to 5 years of age (or 5 to 12, or whatever is appropriate for the play area). Adult supervision is recommended."
- J. Play equipment area boundaries (retaining walls) shall be located a minimum of 20' from any street, driveway, parking lot, etc. where vehicles are likely to drive or park. If they must be located nearer than this, a fence shall divide the area, in its entirety, from vehicular traffic.
- K. Play areas requiring fencing shall have fabric screening installed on the play equipment side of the fence.
- L. Paved play areas at school sites must not be contiguous with vehicular traffic areas. If in close proximity, an adequate barrier should be provided.
- M. All playgrounds shall have positive drainage around them. Sites where equipment is to be installed should have enough slope to provide positive drainage of water per manufacturer's recommendations. Playgrounds shall be TAS/ADAAG accessible.
- N. All playgrounds shall be inspected to ensure that full zones are met, complies with all safety requirements, and meets all TAS/ADAAG requirements.

32.12 Athletic Facilities

- A. All athletic facilities and appurtenances shall be designed and marked according with UIL, National Federation of High Schools (NFHS) and NCAA regulations as required. Consultant shall coordinate with the YISD on the material, layout, size and seating for all athletic facilities. Where possible parking for athletic venues should utilize existing parking around the site in the required parking counts prior to adding parking. All methods to determine provided and required parking shall be approved by city and YISD. If artificial turf or paving is required for an athletic facility, the consultant shall design the subgrade and paving in accordance with the geotechnical recommendations.

- B. Track Surfacing - Provide red structural surface at the middle and high school level. All tracks shall be polyurethane with pavement and subgrade as specified in the geotechnical report. All tracks shall have an interior and exterior 12" wide by 24" deep reinforced concrete curb and cross YISD tracks shall be sloped to drain according to field elevations. All tracks shall have a storm sewer system to convey storm water away from the track. Subgrade and paving for the track shall be designed in accordance with the geotechnical recommendations.
- C. All athletic fields shall be crowned properly to provide good drainage, and baseball and softball fields shall be crowned to drain to sideline areas. Artificial Turfs shall be designed to provide proper drainage.
- D. Athletic fields in conjunction with track shall provide for positive drainage off of the track and onto the field where it is collected and discharged in the storm drainage system. Rainwater or irrigation overspray shall not pond on track. Tracks where artificial turf is used on the football field or scheduled, drainage shall be coordinated with the artificial turf design.
- E. Access for maintenance equipment to athletic fields shall be considered in fencing and gate locations and sizes. Typical maintenance gate: Pair 6' -0".
- F. Football fields shall have a minimum of 3-3-inch sleeves installed to provide electrical power for future needs. The location of the sleeves runs shall be coordinated with YISD. A 4' fence may be required with appropriate access gates to be coordinated with YISD.
- G. All athletic fields shall have a buffer around the perimeter for auxiliary activities such as cheerleading. The type of material shall be coordinated with YISD.

32.13 Site Security / Fencing

- A. Fencing as required by the City of El Paso ordinances shall be provided in contract. All new fence installations shall be reviewed with YISD to evaluate existing trees and fences that YISD may need to coordinate with adjacent owners. At a minimum, chain link fencing shall be provided at all perimeter property lines with the exception of the main frontage road entrance. Provide steel gates to allow remote areas of the site to be secured. Typical perimeter fence height shall be 6'-0".

32.14 Irrigation

- A. Irrigation System Design Parameters
 1. System shall be designed with a single mainline, using the necessary amount of double checks, water meters, and valves required to comply with the application requirements listed in Item B (Irrigation Operation Parameters). Should the Operations Parameters require the operation of multiple zone valves simultaneously, a Looped Mainline may be used with addition of additional valves to create individual Flow Zones for better control. Any looped Mainline shall have isolation valves designed in the main to prevent a total loss of irrigation capabilities during a major line break.
 2. Irrigation components shall be manufactured by Rainbird or approved equal.
 3. System shall be designed for future utilization of evaporation/transpiration operation.
 4. System shall have a rain/freeze sensor at each site.
 5. Provide separate irrigation and domestic meter(s).
 6. System shall have individual zones designed to irrigate athletic turf, landscape beds, and other turf areas separately.
 7. Irrigation zones shall utilize rotor and spray heads in any single zones.
 8. All proposed control systems shall be approved by YISD before bid.

9. Sprinklers, control boxes, manhole covers, and catch basins are to be at a height where they do not present a trip hazard or interfere with mowing. When possible, do not locate these items on playing fields or in play areas.
10. Provide irrigation for all ground cover areas.
11. All elementary and middle schools should have an irrigation system at the front yard; at the sides only when possible. Playfields should be irrigated via sprinkler systems or if not possible, via quick couplings.
12. Play areas in elementary schools are not required to be irrigated.
13. Flower beds shall have an irrigation system.
14. Drip systems shall be on its own zone.

B. Irrigation Operation Parameters

1. Precipitation: 1.5" per week for lawns and plantings; Athletic fields: 2" per week or as specified.
2. Water Frequency: Per El Paso Water Utilities guidelines.
3. Available Time: 8 hours (10:00 p.m. to 6 am.)
4. Seasonal Conditions: Peak irrigation demand during the summer school break shall hold to the identified parameters. Discretion is given to operation not the design of the system unless otherwise approved by the district.
5. The Owner is to be notified if the design requires the use of an irrigation pump.

C. Provide athletic irrigation materials as follows:

1. No irrigation mainline or valve shall be located within the field-of-play. Provide either hose bibbs or underground waterline with quick-couplers, including shut off isolation valves, in boxes with lockable covers a grade level for athletic facilities. Verify quantity and location with YISD.
2. Softball Field:
 - a. Provide spray heads along each baseline to the far corner of the dugout as separate zones.
 - b. An additional zone of spray heads shall follow the infield to outfield transition.
 - c. Quick-couplers (4) shall be located near each base within the turf area, location verified with YISD.
 - d. Provide rotors in the outfield
 - e. Provide spray heads to each pitcher warm-up area as separate zones
3. Baseball Field:
 - a. Provide spray heads along each baseline to the far corner of the dugout as separate zones.
 - b. An additional zone of spray heads shall follow the infield to outfield transition.
 - c. Quick-couplers (4) shall be located near each base within the turf area, location verified with YISD.
 - d. Provide rotors in the outfield.
 - e. Provide spray heads to each pitched warm-up area as separate zone.
4. Football Field Natural Turf Only:
 - a. Provide 5 rows of rotors from inside edge of track to inside edge of track.
 - b. Provide rotors on hash lines.
 - c. Set watering sequence to water from the middle of the field out.
 - d. Locate all valves beyond the end zone.
 - e. All zone lateral lines shall be aligned to run with field.
5. Practice Fields:
 - a. Provide a rotor layout that is symmetrical from sideline to sideline and avoids a head location in the soccer goal or goalie box.
 - b. Locate all valves beyond the end zone or sideline fence.
 - c. All zone lateral lines shall be aligned to run with the field.

6. Shot Put:
 - a. Provide rotor coverage with no head located within 50 foot of the pad.
7. Controller Location:
 - a. Coordinate the controller location with the YISD. Provide communication/data line to all controllers. Provide complete systems on all new projects. Provide controller per YISD requirements. Refer to guide specifications for special product preference for heads, valves and backflow preventers.
 - b. Provide temporary controllers for use during construction.
 - c. Irrigation main lines and laterals shall be sleeved under all paving. Jetting is not allowed. Coordinate with paving plan.
 - d. Provide pavement marking in concrete curb (saw cut of two parallel lines 2-inches in length and 1-inch apart) designating the location of all irrigation sleeving.
 - e. All ground valve boxes shall be supported by a 2-inch-thick solid paver that extends beyond the limits of the box bottom.
 - f. System shall have individual zones designed and grouped to irrigate athletic turf, landscape beds, and other turf areas separately.
 - g. Deviations from any part of this irrigation section should have the District approval and documented in writing.
- D. Drip systems to the athletic tracks both inside (natural grass) and outside. Two to three small (1/2") lines buried parallel to the track. These should be on an automatic time controller and hooked to a City irrigation piping system. This is essential in controlling movement of the subgrade in areas of hi PI (clays) that essentially will destroy the integrity of the tracks. This is a low cost method of installation. Also, inline irrigation controllers 6-12 of these.

32.15 Landscaping

- A. On new schools, Architect/Engineer is responsible for landscape and irrigation systems design. On existing schools, consideration should be given to landscape design at the front of each building. Repair existing systems and remove any landscape timbers and replace with environmentally friendly solution.
 1. Where landscaping is being provided at an existing campus (i.e., an addition), the plant material selection should generally conform to complement existing plant material. Coordinate plant location with utilities so as not to conflict with utility lines.
 2. Use of native drought resistant plant material is required. Plant material requiring excessive irrigation or maintenance shall be avoided. Design should be based on the most extreme water restrictions imposed by city requirements. No plants with thorns
 3. Ground cover shall be planted in such a manner and quantity that full coverage can be achieved within 12 months.
 4. Trees shall be planted far enough away from sidewalks and buildings so that they cannot be used to access roofs. This will also minimize the accumulation of leaves and debris on the roof and in gutters.
 5. All tree and plant material shall be readily adaptable to area soils, reasonable disease resistant, and require low maintenance. Tree and plant material shall be approved by YISD. The use of Bald Cypress, mesquite trees and other water intensive trees is prohibited.
 6. All trees shall require a minimum of three (3) stakes. All trees and planting areas shall be properly mulched to a depth of two (2) inches. Use safety stake with high visibility. Post and guy wires shall not be permitted in these areas.
 7. Trees shall be planted to allow a minimum of 11' -0" between tree and any object to allow for lawn equipment. Trees shall not be placed in close proximity of sidewalks where buckling is likely to occur due to tree growth. Trees shall not be placed within 35' of building.

8. Where existing turf areas are to be converted to bed or planting areas, the turf shall be chemically eradicated to minimize re-growth in the future. These areas shall be properly prepared with amended organic matter.
9. Landscaped areas shall be kept to a minimum. Aggregate size location shall be coordinated with YISD.
10. Final grades shall be smooth and consistent at proper elevations prior installation of aggregate.
11. Courtyard landscape shall not contain grass or deciduous trees. Topsoil imported to the site shall come from naturally well-drained local sources having similar soil structure and characteristics.
12. Sloped areas shall maintain a grade to provide safe operation of six (6) foot wide mowing equipment.
13. Areas with slopes of 4:1 or greater shall be landscaped to be stable, provide for erosion control and special protective measures shall be implemented. These measures shall be reviewed with YISD Maintenance.
14. Athletic fields and other competition areas shall be sodded with Shalara Bermuda grass. Playfields and other areas shall be sodded with common Bermuda grass.
15. Consideration shall be given to maintenance requirements of tree islands.
16. Hardy plant materials shall be utilized, including Red-Tipped Photinia, Nandinas, Dwarf Yaupons, Indian Hawthorne, Crape Myrtles, and Sea Green Junipers.
17. All hedges shall be planted at least five feet from building walls.
18. Preferred tree species: Chinese Pistache, Lacebark Elm, Raywood Ash, Shademaster Honeylocust, Chitalpa "Morning Cloud". For a complete list of acceptable Trees refer to the City of El Paso Approved Plant and Tree List.
19. Preferred Shrub Species: Candelila, Damianita, Deer Grass, Fairy Duster, Mexican Feathergrass, Red Yucca, "Brakelights", Texas Sage "Rain Cloud", Texas Sage "Lynn's Legacy". For a complete list of acceptable Trees refer to the City of El Paso Approved Plant and Tree List.
20. Groundcover: Aggregate
21. Limit the use of metal edging and hundreds of small shrubs. Use larger diameter trees and a lesser amount of small trees.
22. Contractors' proposals shall include an alternate price for a one (1) year warranty and maintenance contract to include fertilizer, trimming and irrigation of all shrubs and trees.
23. Fruit trees are not permitted.

END OF DIVISION 32

Division 33 - Utilities

References

- A. Geotechnical Report
- B. El Paso Water Utilities Standards
- C. City of El Paso Transportation and Engineering Department Standards
- D. City of El Paso Gas Ordinance
- E. Texas Gas Standards
- F. Fire Code and Local Amendments
- G. Plumbing Code
- H. Current TCEQ Water and Wastewater Regulations
- I. Integrated Solid Waste Management (ISWM) and local requirements
- J. Sustainable Site Design Standards Low Impact Design (LID)

33.01 General Requirements

- A. Design professional shall consider low impact design strategies LID for the site drainage.
- B. Avoid routing water, sewer or drainage lines and utility lines under the building structure and under reinforced concrete pavement.
- C. Careful attention should be given to planning the location and detailing of utility service entrances and service equipment such as, stacks, grease traps, manholes, cleanouts, hose bibbs, valves, service vaults, transformers, backflow preventers, and gas and water meters. A successful design requires a careful balance of aesthetics, functional operating features, and cost.
- D. Careful consideration shall be given to avoid drainage near playground equipment. Drainage must be routed away from playground equipment and safety surfacing.
- E. Provide steel pipe bollards around all electric transformers, gas regulators, or meters where exposed to vehicular traffic.
- F. Require provision in plans for the requirement of Trench Safety plan for the specific site.
- G. Required installation of tracer wire or tape capable of tracing in all utility trenches.
- H. Coordinate with other disciplines for gas, electric, communication lines.

33.02 Water System

- A. Conform to City of El Paso Water Utilities Standards for materials, backfill and embedment.
- B. Provide isolation valves at all outside hose bibbs.
- C. Obtain fire flow test data prior to any water design for domestic, fire or irrigation. Provide information to MEP, Landscape Architect, Architect and YISD for review and consideration of existing conditions.
- D. Have separate water meter for domestic and irrigation. Coordinate with El Paso Water Utilities. A surface mounted reinforced concrete apron shall be provided on all valves not in pavement.

33.03 Sanitary Sewer System

- A. Conform to El Paso Water Utilities Standards for materials, backfill and embedment.
- B. Conform to El Paso Water Utilities for wastewater laterals and cleanouts.
- C. Sanitary sewer manholes or cleanouts shall be placed at all bends, change of size, or grade and shall not exceed a maximum spacing of 200' or per local code.
- D. All condensate lines shall be drained to sanitary sewer system.

33.04 Storm Sewer System

- A. Conform to City of El Paso - Stormwater Standards for materials, backfill and embedment.
- B. Concrete pipe - C-76, Class III for minimum of 2' of cover or IV for cover less than 2'.
- C. Consider design of appurtenances with City of El Paso Standards.
- D. Provide steel downspout boots at all downspouts that discharge above grade.
- E. Provide pre-cast concrete splash blocks at each downspout.
- F. Minimum slopes of closed conduits shall not be less than 0.50%.
- G. Consider pilot flumes in the bottom or detention ponds or channels where grade is less than 2%
- H. Flumes crossing sidewalks shall have metal covers with rigid connection to pavement sufficient to carry projected loads and shall have a non-slip surface.
- I. All exposed grates for inlets shall be cast iron and capable of carrying intended loads.
- J. Consider ADA compliance for inlets in pedestrian paths.
- K. Consider opening sizes of inlets for use.
- L. Minimum cover on storm sewer pipes shall be 2'.
- M. Primary and headwall drains should not empty across parking or sidewalks.

END OF DIVISION 33

APPENDIX A

Reserved for Future Contract

APPENDIX B

Reserved for Future Contract

APPENDIX C

Control Diagrams

All control diagrams shall be coordinate on a case by case basis between Design Professional and District approved Controls Contractor.

APPENDIX D

Typical Direct Digital Control System Specification

Instrumentation and Control for HVAC

EMCS Guide Standard for YISD

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Direct-Digital Control System for HVAC

PART 1: GENERAL

Section Includes

- 1.1 Products Furnished but Not Installed under This Section
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1.1 Products Furnished but Not Installed under This Section

- A. Section 23 09 13.23 - Sensors and Transmitters
 - 1. Flow switches
 - 2. Press and temp sensor wells & sockets
 - 3. Temp sensor wells and sockets
- B. Section 23 09 13.33 - Control Valves
 - 1. Control valves
- C. Section 23 09 13.43 - Control Dampers
 - 1. Automated Dampers

1.2 Products Installed but Not Furnished under This Section

- A. None

1.3 Products Not Furnished or Installed under but Integrated with the Work of This Section

- A. Section - General
 - 1. Coordination Meeting
- B. Section 23 52 00 - Heating Boilers
 - 1. Boiler controls
- C. Section 23 60 00 - Central Cooling Equipment
 - 1. Chiller controls

1.4 Related Sections

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are part of this specification and shall be used in conjunction with this section as part of the contract documents.
- B. The following sections constitute related work:

1.5 Description

- A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface.
- B. System software shall be based on a server/thin client architecture, designed around the open standards of web technology. The control system server shall be accessed using a Web browser over the control system network, the owner's local area network, and (at the owner's discretion) over the Internet. The intent of the thin-client architecture is to provide operators complete access to the control system via a Web browser. No special software other than a web browser shall be required to access graphics, point displays, and trends, configure trends, configure points and controllers, or to download programming into the controllers.
- C. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. I/O points, schedules, setpoints, trends and alarms specified in 23 09 93 – "Sequence of Operations for HVAC Controls" shall be BACnet objects.

1.6 Approved Control system Manufacturers

A. The following are approved control system suppliers, manufacturers, and product lines:

Supplier	Manufacturer	Product Line
PC Automated Controls, Inc	Automated Logic Corporation	WebCTRL
Prior Approved Equal will be considered.		

The above list does not indicate order of preference. Inclusion on this list does not guarantee acceptance of products or installation. Control systems shall comply with the terms of this specification.

1. The Contractor shall use only operator workstation software, controller software, custom application programming language, and controllers from the corresponding manufacturer and product line unless Owner approves use of multiple manufacturers.
2. Other products specified herein (such as sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.7 Quality Assurance

A. Installer and Manufacturer Qualifications

1. Installer shall have an established working relationship with Control System Manufacturer.
2. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

1.8 Codes and Standards

A. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with the current editions in effect 30 days prior to the receipt of bids of the following codes:

1. National Electric Code (NEC)
2. International Building Code (IBC)
3. International Mechanical Code (IMC)
4. ANSI/ASHRAE 135-2004: Data Communication Protocol for Building Automation and Control Systems (BACNET)
5. ANSI/ASHRAE Standard 135, BACnet - A Data Communication Protocol for Building Automation and Control Systems

1.9 System Performance

- Q. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).
- R. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
- S. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.
- T. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

- U. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
- V. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 sec.
- W. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
- X. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
- Y. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.
- Z. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
- AA. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2

Table-1
Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5°C (±1°F)
Ducted Air	±0.5°C (±1°F)
Outside Air	±1.0°C (±2°F)
Dew Point	±1.5°C (±3°F)
Water Temperature	±0.5°C (±1°F)
Delta-T	±0.15° (±0.25°F)
Relative Humidity	±5% RH
Water Flow	±2% of full scale
Airflow (terminal)	±10% of full scale (see Note 1)
Airflow (measuring stations)	±5% of full scale
Airflow (pressurized spaces)	±3% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Air Pressure (space)	±3 Pa (±0.01 in. w.g.)
Water Pressure	±2% of full scale (see Note 2)
Electrical	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO2)	±50 ppm

Note 1: Accuracy applies to 10%–100% of scale

Note 2: For both absolute and differential pressure

Note 3: Not including utility-supplied meters

Table 2
Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Air Pressure	±50 Pa (±0.2 in. w.g.) ±3 Pa (±0.01 in. w.g.)	0–1.5 kPa (0–6 in. w.g.) -25 to 25 Pa (-0.1 to 0.1 in. w.g.)
Airflow	±10% of full scale	
Space Temperature	±1.0°C (±2.0°F)	
Duct Temperature	±1.5°C (±3°F)	
Humidity	±5% RH	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1–150 psi) 0–12.5 kPa (0–50 in. w.g.) differential

1.10 Submittals

- A. Product Data and Shop Drawings: Meet requirements of Section 01 30 00 on Shop Drawings, Product Data, and Samples. In addition, the contractor shall provide shop drawings or other submittals on hardware, software, and equipment to be installed or provided. No work may begin on any segment of this project until submittals have been approved for conformity with design intent. Provide drawings as AutoCAD 2006 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and three 11" x 17" prints of each drawing. When manufacturer's cutsheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawing shall clearly reference the specification and/or drawing that the submittal is to cover. General catalogs shall not be accepted as cutsheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work. Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Submittals shall be provided within 12 weeks of contract award. Submittals shall include:

1. DDC System Hardware

- a. A complete bill of materials to be used indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.
- b. Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:
 - i. Direct digital controllers (controller panels)
 - ii. Transducers and transmitters
 - iii. Sensors (including accuracy data)
 - iv. Actuators
 - v. Valves
 - vi. Relays and switches
 - vii. Control panels
 - viii. Power supplies
 - ix. Batteries
 - x. Operator interface equipment
 - xi. Wiring
- c. Wiring diagrams and layouts for each control panel. Show termination numbers.
- d. Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware. Riser diagrams showing control network layout, communication protocol, and wire types.

2. Central System Hardware and Software

- a. A complete bill of material of equipment used indicating quantity, manufacturer, model number, and relevant technical.
- b. Manufacturer's description and technical data such as product specifications and installation and maintenance instructions for items listed below and for relevant items furnished under this contract not listed below:
 - i. Central Processing Unit (CPU) or web server
 - ii. Monitors
 - iii. Keyboards
 - iv. Power supplies
 - v. Battery backups
 - vi. Interface equipment between CPU or server and control panels
 - vii. Operating System software
 - viii. Operator interface software
 - ix. Color graphic software

- x. Third-party software
 - c. Schematic diagrams for all control, communication, and power wiring. Provide a schematic drawing of the central system installation. Label all cables and ports with computer manufacturers' model numbers and functions. Show interface wiring to control system.
 - d. Network riser diagrams of wiring between central control unit and control panels.
 - 3. Controlled Systems
 - a. Riser diagrams showing control network layout, communication protocol, and wire types.
 - b. A schematic diagram of each controlled system. The schematics shall have all control points labeled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.
 - c. A schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
 - d. An instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
 - e. A mounting, wiring, and routing plan-view drawing. The design shall take into account HVAC, electrical, and other systems' design and elevation requirements. The drawing shall show the specific location of all concrete pads and bases and any special wall bracing for panels to accommodate this work.
 - f. A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.
 - g. A point list for each control system. List I/O points and software points specified in Section 23 09 93. Indicate alarmed and trended points.
 - 4. Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.
 - 5. Description of process, report formats, and checklists to be used in Section 23 09 23 Article 3.16 (Control System Demonstration and Acceptance).
 - 6. BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.
- B. Schedules
- 1. Within one month of contract award, provide a schedule of the work indicating the following:
 - a. Intended sequence of work items
 - b. Start date of each work item
 - c. Duration of each work item
 - d. Planned delivery dates for ordered material and equipment and expected lead times
 - e. Milestones indicating possible restraints on work by other trades or situations
 - 2. Monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.
- C. Project Record Documents. Upon completion of installation, submit three copies of record (as-built) documents of the documents shall be submitted for approval prior to final completion and shall include:
- 1. Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD 2006 (or newer) compatible files on magnetic or optical media (file format: .DWG, .DXF, .VSD, or comparable) and as 11" x 17" prints.
 - 2. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Section 23 09 23 Article 3.16 (Control System Demonstration and Acceptance).
 - 3. Operation and Maintenance (O&M) Manual.

4. As-built versions of submittal product data.
 5. Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
 6. Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
 7. Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
 8. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
 9. Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
 10. Graphic files, programs, and database on magnetic or optical media.
 11. List of recommended spare parts with part numbers and suppliers.
 12. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
 13. Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
 14. Licenses, guarantees, and warranty documents for equipment and systems.
 15. Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.
- D. Training Materials: Provide course outline and materials for each class at least six weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Engineer will modify course outlines and materials if necessary to meet Owner's needs. Engineer will review and approve course outlines and materials at least three weeks before first class.

1.11 Warranty

- A. Warrant work as follows:
1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.
 2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
 3. If the engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, the engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.
 4. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve the contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

5. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

1.12 Ownership of Proprietary Material

- A. Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
 1. Graphics
 2. Record drawings
 3. Database
 4. Application programming code
 5. Documentation

1.13 Definitions

Term	Definition
BACnet Interoperability Building Blocks (BIBB)	A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBS are combined to build the BACnet functional requirements for a device in a specification.
BACnet/BACnet Standard	BACnet communication requirements as defined by the latest version of ASHRAE/ANSI 135 and approved addenda.
Control Systems Server	A computer(s) that maintain(s) the systems configuration and programming database.
Controller	Intelligent stand-alone control device. Controller is a generic reference to building controllers, custom application controllers, and application specific controllers.
Direct Digital Control	Microprocessor-based control including Analog/Digital conversion and program logic.
Gateway	Bi-directional protocol translator connecting control systems that use different communication protocols.
Local Area Network	Computer or control system communications network limited to local building or campus.
Master-Slave/Token Passing	Data link protocol as defined by the BACnet standard.
Point-to-Point	Serial communication as defined in the BACnet standard.
Primary Controlling LAN	High speed, peer-to-peer controller LAN connecting BCs and optionally AACs and ASCs. Refer to System Architecture below.
Protocol Implementation Conformance Statement	A written document that identifies the particular options specified by BACnet that are implemented in a device.
Router	A device that connects two or more networks at the network layer.
Wiring	Raceway, fittings, wire, boxes and related items.

PART 2: PRODUCTS

Section Includes

- 2.1 Materials
- 2.2 Communication
- 2.3 Operator Interface
- 2.4 Controller Software
- 2.5 Controllers
- 2.6 Input and Output Interfaces
- 2.7 Power Supplies and Line Filtering
- 2.8 Auxiliary Control Devices
- 2.9 Wiring and Raceways
- 2.10 Fiber Optic Cable System

2.1 Materials

- A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least five years after completion of this contract.

2.2 Communication

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.
- B. Install new wiring and network devices as required to provide a complete and workable control network.
- C. Use existing Ethernet backbone for network segments marked "existing" on project drawings.
- D. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- E. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
 - 1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
 - 2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified in Section 23 09 93. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.
- F. Workstations, Building Control Panels, and Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight saving and standard time as applicable.

- G. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.3 Operator Interface

- A. The Operator Workstation or server shall conform to the BACnet Operator Workstation (B-OWS) or BACnet Advanced Workstation (B-AWS) device profile as specified in ASHRAE/ANSI 135 BACnet Annex L.
- B. Operator Interface. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information.
- C. In addition to the primary operator interface, the system shall include a secondary interface compatible with a locally available commercial wireless network and viewable on a commercially available wireless device such as a Wireless Access Protocol (WAP) enabled cellular telephone. This secondary interface may be text-based and shall provide a summary of the most important data. As a minimum, the following capabilities shall be provided through this interface:
 - 1. An operator authentication system that requires an operator to log in before viewing or editing any data, and which can be configured to limit the privileges of an individual operator.
 - 2. The ability to view and acknowledge any alarm in the system. Alarms or links to alarms shall be provided on a contiguous list so the operator can quickly view all alarms.
 - 3. A summary page or pages for each piece of equipment in the system. This page shall include the current values of all critical I/O points and shall allow the operator to lock binary points on or off and to lock analog points to any value within their range.
 - 4. Navigation links that allow the operator to quickly navigate from the home screen to any piece of equipment in the system, and then return to the home screen. These links may be arranged in a hierarchical fashion, such as navigating from the home screen to a particular building, then to a specific floor in the building, and then to a specific room or piece of equipment.
- D. Communication. Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135, BACnet Annex J.
- E. Hardware. Each workstation or web server shall consist of the following:
 - 1. Computer. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times specified elsewhere in this document. The following hardware requirements also apply:
 - a. The hard disk shall have sufficient memory to store:
 - i. All required operator workstation software.
 - ii. A DDC database at least twice the size of the delivered system database.
 - iii. One year of trend data based on the points specified to be trended at their specified trend intervals.
 - b. Provide additional hardware (communication ports, video drivers, network interface cards, cabling, etc.) to facilitate all control functions and software requirements specified for the DDC system.
 - c. Minimum hardware configuration shall include the following:
 - i. Dual or Quad Core Processor
 - ii. 6 GB RAM
 - iii. 500 GB hard disk providing data at 3.0 Gb/sec
 - iv. 16x DVD-RW drive

- v. Serial, parallel, and network communication ports and cables as required for proper DDC system operation

F. System Software.

1. Operating System. Web server or workstation shall have an industry-standard professional-grade operating system. Operating system shall meet or exceed the DDC System manufacturers minimum requirements for their software. Typically acceptable systems include Microsoft Windows7, Microsoft Vista, Microsoft Windows XP Pro, Windows Server 2003 or 2008, Red Hat Enterprise Linux, or Ubuntu Desktop 10.04.
2. System Graphics. The operator interface software shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.
 - a. Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
 - b. Animation. Graphics shall be able to animate by displaying different image files for changed object status.
 - c. Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
 - d. Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Adobe Flash).
3. Custom Graphics. Custom graphic files shall be created with the use of a graphics generation package furnished with the system. The graphics generation package shall be a graphically based system that uses the mouse to create and modify graphics that are saved in the same formats as are used for system graphics.
4. Graphics Library. Furnish a complete library of standard HVAC equipment graphics such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. This library also shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.

G. System Applications. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

1. Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.
2. Manual Controller Memory Download. Operators shall be able to download memory from the system database to each controller.
3. System Configuration. The workstation software shall provide a method of configuring the system. This shall allow for future system changes or additions by users under proper password protection. Operators shall be able to configure the system.

4. On-Line Help. Provide a context-sensitive, on-line help system to assist the operator in operating and editing the system. On-line help shall be available for all applications and shall provide the relevant data for that particular screen. Additional help information shall be available through the use of hypertext.
5. Security. Each operator shall be required to log on to the system with user name and password in order to view, edit, add, or delete data.
 - a. Operator Access. The user name and password combination shall define accessible viewing, editing, adding, and deleting privileges for that operator. Users with system administrator rights shall be able to create new users and edit the privileges of all existing users. System Administrators shall also be able to vary and deny each operator's privileges based on the geographic location, such as the ability to edit operating parameters in Building A, to view but not edit parameters in Building B, and to not even see equipment in Building C.
 - b. Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. This auto logoff time shall be user adjustable.
 - c. Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.
6. System Diagnostics. The system shall automatically monitor the operation of all building management panels and controllers. The failure of any device shall be annunciated to the operator.
7. Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified in Section 23 09 93 (Sequences of Operation). Alarms shall be BACnet alarm objects and shall use BACnet alarm services.
8. Alarm Messages. Alarm messages shall use the English language descriptor for the object in alarm in such a way that the operator will be able to recognize the source, location, and nature of the alarm without relying on acronyms.
9. Alarm Reactions. Operator shall be able to configure (by object) what, if any actions are to be taken during an alarm. As a minimum, the workstation or web server shall be able to log, print, start programs, display messages, send e-mail, send page, and audibly annunciate.
10. Alarm and Event log. Operators shall be able to view all system alarms and changes of state from any location in the system. Events shall be listed chronologically. An operator with the proper security level may acknowledge and delete alarms, and archive closed alarms to the workstation or web server hard disk.
11. Trend Logs. The operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk. Configure trends as specified in Section 23 09 93 (Sequences of Operation). Trends shall be BACnet trend objects.
12. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object or property in the system. The status shall be available by menu, on graphics, or through custom programs.
13. Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.
14. Standard Reports. Furnish the following standard system reports:
 - a. Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.

- b. Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.
 - c. Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:
 - i. Alarm History.
 - ii. Trend Data. Operator shall be able to select trends to be logged.
 - iii. Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.
15. Energy Reports. System shall include an easily configured energy reporting tool that provides the capabilities described in this section.
- a. The energy reporting tool shall be accessible through the same user interface (Web browser or operator workstation software) as is used to manage the BAS.
 - b. The energy reporting tool shall be preconfigured by the Contractor to gather and store energy demand and consumption data from each energy source that provides metered data to the BAS. Meter data shall be stored at 5 minute intervals unless otherwise specified in the Sequence of Operation provided in section 23 09 93. This data shall be maintained in an industry standard SQL database for a period of not less than five years.
 - c. The energy reporting tool shall allow the operator to select an energy source and a time period of interest (day, week, month, year, or date range) and shall provide options to view the data in a table, line graph, bar graph, or pie chart. The tool shall also allow the operator to select two or more data sources and display a comparison of the energy used over this period in any of the listed graph formats, or to total the energy used by the selected sources and display that data in the supported formats.
 - d. The energy reporting tool shall allow the operator to select an energy source and two time periods of interest (day, week, month, year, or date range) and display a graph that compares the energy use over the two time periods in any of the graph formats listed in the previous paragraph. The tool shall also allow the operator to select multiple energy sources and display a graph that compares the total energy used by these sources over the two time periods.
 - e. The energy reporting tool shall allow the operator to easily generate the previously described graphs "on the fly," and shall provide an option to store the report format so the operator can select that format to regenerate the graph at a future date. The tool shall also allow the user to schedule these reports to run on a recurring basis using relative time periods, such as automatically generating a consumption report on the first Monday of each month showing consumption over the previous month. Automatically generated reports shall be archived on the server in a common industry format such as Adobe PDF or Microsoft Excel with copies e-mailed to a user editable list of recipients.
 - f. The energy reporting tool shall be capable of collecting and displaying data from the following types of meters:
 - i. Electricity
 - ii. Gas
 - iii. Oil
 - iv. Steam
 - v. Chilled Water
 - vi. Potable Water
 - vii. Heating and cooling degree days. (May be calculated from sensor data rather than metered.)
 - g. The user shall have the option of using Kw (Kwh) or Btu/hr (Btu) as the units for demand and consumption reports. Multiples of these units (MWH, kBtu, etc.) shall be used as appropriate. All selected sources shall be automatically converted to the selected units. The user shall similarly have the option of entering facility area and occupancy hours

- and creating reports that are normalized on an area basis, an annual use basis, or an occupied hour basis.
 - h. The user shall have the option of entering benchmark data for an individual facility or a group of facilities.
 - i. The user shall have the option of displaying any or all of the following data on any chart, line, or bar graph generated by the energy reporting tool:
 - i. Low/High/Average value of the metered value being displayed.
 - ii. Heating and/or Cooling Degree Days for the time period(s) being displayed.
 - iii. The Environmental Index for the facilities and time periods being displayed.
 - 16. Environmental Index. System shall monitor all occupied zones and compile an index that provides a numerical indication of the environmental comfort within the zone. As a minimum, this indication shall be based upon the deviation of the zone temperature from the heating or cooling setpoint. If humidity is being measured within the zone then the environmental index shall be adjusted to reflect a lower comfort level for high or low humidity levels. Similarly, if carbon dioxide levels are being measured as an indication of ventilation effectiveness then the environmental index shall be adjusted to indicate degraded comfort at high carbon dioxide levels. Other adjustments may be made to the environmental index based upon additional measurements. The system shall maintain a trend of the environmental index for each zone in the trend log. The system shall also compute an average comfort index for every building included in this contract and maintain trendlogs of these building environmental indices. Similarly, the system shall compute the percentage of occupied time that comfortable conditions were maintained within the zones. Through the UI the user shall be able to add a weighting factor to adjust the contribution of each zone to the average index based upon the floor area of the zone, importance of the zone, or other static criteria.
 - 17. Custom Reports. Operator shall be able to create custom reports that retrieve data, including archived trend data, from the system, that analyze data using common algebraic calculations, and that present results in tabular or graphical format. Reports shall be launched from the operator interface.
- H. Workstation Application Editors. Each PC or browser workstation shall support editing of all system applications. The applications shall be downloaded and executed at one or more of the controller panels.
- 1. Controller. Provide a full-screen editor for each type of application that shall allow the operator to view and change the configuration, name, control parameters, and set points for all controllers.
 - 2. Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a method of selecting the desired schedule and schedule type. Exception schedules and holidays shall be shown clearly on the calendar. The start and stop times for each object shall be adjustable from this interface.
 - 3. Custom Application Programming. Provide the tools to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:
 - a. Language. Language shall be graphically based and shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks.
 - b. Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.

- c. Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.
- d. Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.
 - i. Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.
 - ii. Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.
- e. Variables. Operator shall be able to use variable values in program conditional statements and mathematical functions.
 - i. Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.
 - ii. System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.
- I. Portable Operator's Terminal. Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

2.4 Controller Software

- A. Furnish the following applications for building and energy management. All software application shall reside and operate in the system controllers. Applications shall be editable through operator workstation, web browser interface, or engineering workstation.
- B. System Security. See Paragraph 2.3.E.5 (Security) and Paragraph 2.3.E.14.c.iii (Operator Activity).
- C. Scheduling. Provide the capability to execute control functions according to a user created or edited schedule. Each schedule shall provide the following schedule options as a minimum:
 - 1. Weekly Schedule. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).
 - 2. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule has executed, the system shall discard and replace the exception schedule with the standard schedule for that day of the week.
 - 3. Holiday Schedules. Provide the capability for the operator to define up to 24 special or holiday schedules. These schedules will be repeated each year. The operator shall be able to define the length of each holiday period.

- D. System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.
- E. Binary Alarms. Each binary object shall have the capability to be configured to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
- F. Analog Alarms. Each analog object shall have both high and low alarm limits. The operator shall be able to enable or disable these alarms.
- G. Alarm Reporting. The operator shall be able to determine the action to be taken in the event of an alarm. An alarm shall be able to start programs, print, be logged in the event log, generate custom messages, and display on graphics.
- H. Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.
- I. Demand Limiting.
 - 1. The demand-limiting program shall monitor building power consumption from a building power meter (provided by others) which generates pulse signals or a BACnet communications interface. An acceptable alternative is for the system to monitor a watt transducer or current transformer attached to the building feeder lines.
 - 2. When power consumption exceeds adjustable levels, system shall automatically adjust setpoints, de-energize low-priority equipment, and take other programmatic actions to reduce demand as specified in Section 23 09 93 (Sequences of Operation). When demand drops below adjustable levels, system shall restore loads as specified.
- J. Maintenance Management. The system shall be capable of generating maintenance alarms when equipment exceeds adjustable runtime, equipment starts, or performance limits. Configure and enable maintenance alarms as specified in 23 09 93 (Sequences of Operation).
- K. Sequencing. Application software shall sequence chillers, boilers, and pumps as specified in Section 23 09 93 (Sequences of Operation).
- L. PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs. The calculation interval, PID gains, and other tuning parameters shall be adjustable by a user with the correct security level.
- M. Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.
- N. Energy Calculations.
 - 1. The system shall accumulate and convert instantaneous power (kW) or flow rates (L/s [gpm]) to energy usage data.
 - 2. The system shall calculate a sliding-window average (rolling average). Operator shall be able to adjust window interval to 15 minutes, 30 minutes, or 60 minutes.
- O. Anti-Short Cycling. All binary output objects shall be protected from short cycling by means of adjustable minimum on-time and off-time settings.

- P. On and Off Control with Differential. Provide an algorithm that allows a binary output to be cycled based on a controlled variable and a setpoint. The algorithm shall be direct-acting or reverse-acting.
- Q. Runtime Totalization. Provide software to totalize runtime for each binary input and output. Operator shall be able to enable runtime alarm based on exceeded adjustable runtime limit. Configure and enable runtime totalization and alarms as specified in Section 23 09 93 (Sequence of Operations).

2.5 Controllers

- A. General. Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified in Section 23 09 23 Article 1.9 (System Performance). Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.
- B. BACnet.
 - 1. Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L, and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
 - 2. Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
 - 3. Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
 - 4. Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.
 - a. BACnet Communication.
 - b. Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
 - c. BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
 - d. Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - e. Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - f. Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
 - g. Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.
- C. Communication
 - 1. Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

2. Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
 3. Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
 4. Stand-Alone Operation. Each piece of equipment specified in Section 23 09 93 shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.
- D. Environment. Controller hardware shall be suitable for anticipated ambient conditions.
1. Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
 2. Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- E. Keypad. Provide a local keypad and display for each BC and AAC. Operator shall be able to use keypad to view and edit data. Keypad and display shall require password to prevent unauthorized use. If the manufacturer does not normally provide a keypad and display for each BC and AAC, provide the software and any interface cabling needed to use a laptop computer as a Portable Operator's Terminal for the system.
- F. Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.
- G. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to a field-removable modular terminal strip or to a termination card connected by a ribbon cable. Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.
- H. Memory.
1. Controller memory shall support operating system, database, and programming requirements.
 2. Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
 3. Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.
- I. Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
- J. Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.6 Input and Output Interface

- A. General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.
- B. Protection. All input points and output points shall be protected such that shorting of the point to itself, to another point, or to ground shall cause no damage to the controller. All input and output points shall be protected from voltage up to 24 V of any duration, such that contact with this voltage will cause no controller damage.
- C. Binary Inputs. Binary inputs shall allow the monitoring of ON/OFF signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices and shall be protected against contact bounce and noise. Binary inputs shall sense dry contact closure without application of power external to the controller.
- D. Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to binary input requirements and shall also accumulate up to 10 pulses per second.
- E. Analog Inputs. Analog inputs shall monitor low-voltage (0–10 Vdc), current (4–20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- F. Binary Outputs. Binary outputs shall provide for ON/OFF operation or a pulsed low-voltage signal for pulse width modulation control. Binary outputs on Building Controllers shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.
- G. Analog Outputs. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0–10 Vdc or a 4–20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.
- H. Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated binary outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.
- I. System Object Capacity. The system size shall be expandable to at least twice the number of input/output objects required for this project. Additional controllers (along with associated devices and wiring) shall be all that is necessary to achieve this capacity requirement. The operator interfaces installed for this project shall not require any hardware additions or software revisions in order to expand the system.

2.7 Power Supplies and Line Filtering

- A. Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
 - 1. DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.

- a. Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
- b. Line voltage units shall be UL recognized and CSA listed.

B. Power Line Filtering.

1. Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:
 - a. Dielectric strength of 1000 V minimum
 - b. Response time of 10 nanoseconds or less
 - c. Transverse mode noise attenuation of 65 dB or greater
 - d. Common mode noise attenuation of 150 dB or greater at 40–100 Hz

2.8 Auxiliary Control Devices

A. Motorized Control Dampers, unless otherwise specified elsewhere, shall be as follow.

1. Type. Control dampers shall be the parallel or opposed-blade type as specified below or as scheduled on drawings.
 - a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be parallel-blade and shall direct airstreams toward each other.
 - b. Other modulating dampers shall be opposed-blade.
 - c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals.
2. Frame. Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (¼ in.) extruded aluminum with reinforced corner bracing.
3. Blades. Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).
4. Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.
5. Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 L/s·m² (10 cfm per ft²) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).
6. Sections. Individual damper sections shall not exceed 125 cm × 150 cm (48 in. × 60 in.). Each section shall have at least one damper actuator.
7. Modulating dampers shall provide a linear flow characteristic where possible.
8. Linkages. Dampers shall have exposed linkages.

B. Electric Damper and Valve Actuators.

1. Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.
2. Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).
3. Signal and Range. Proportional actuators shall accept a 0–10 Vdc or a 0–20 mA control signal and shall have a 2–10 Vdc or 4–20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)
4. Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
5. Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.

C. Control Valves.

1. Control valves shall be two-way or three-way type for two-position or modulating service as shown.
2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - a. Water Valves:
 - i. Two-way: 150% of total system (pump) head.
 - ii. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 - b. Steam Valves: 150% of operating (inlet) pressure.
3. Water Valves.
 - a. Body and trim style and materials shall be in accordance with manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
 - b. Sizing Criteria:
 - i. Two-position service: Line size.
 - ii. Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or 5 psi, whichever is greater.
 - iii. Three-way modulating service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), 35 kPa (5 psi) maximum.
 - iv. Valves ½ in. through 2 in. shall be bronze body or cast brass ANSI Class 250, spring-loaded, PTFE packing, quick opening for two-position service. Two-way valves to have replaceable composition disc or stainless steel ball.
 - v. Valves 2½ in. and larger shall be cast iron ANSI Class 125 with guided plug and PTFE packing.
 - c. Water valves shall fail normally open or closed, as scheduled on plans, or as follows:
 - i. Water zone valves—normally open preferred.
 - ii. Heating coils in air handlers—normally open.
 - iii. Chilled water control valves—normally closed.
 - iv. Other applications—as scheduled or as required by sequences of operation.
4. Steam Valves.
 - a. Body and trim materials shall be in accordance with manufacturer's recommendations for design conditions and service with linear ports for modulating service.
 - b. Sizing Criteria:
 - i. Two-position service: pressure drop 10% to 20% of inlet psig.
 - ii. Modulating service: 100 kPa (15 psig) or less; pressure drop 80% of inlet psig.
 - iii. Modulating service: 101 to 350 kPa (16 to 50 psig); pressure drop 50% of inlet psig.
 - iv. Modulating service: over 350 kPa (50 psig); pressure drop as scheduled on plans.

D. Binary Temperature Devices.

1. Low-Voltage Space Thermostats. Low-voltage space thermostats shall be 24 V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C–30°C (55°F–85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
2. Line-Voltage Space Thermostats. Line-voltage space thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C–30°C (55°F–85°F) setpoint range, 1°C (2°F) maximum differential, and vented ABS plastic cover.
3. Low-Limit Thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft)

section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

E. Temperature Sensors.

1. Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
2. Duct Sensors. Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m²(10 ft²) of duct cross-section.
3. Immersion Sensors. Provide immersion sensors with a separable stainless steel well. Well pressure rating shall be consistent with system pressure it will be immersed in. Well shall withstand pipe design flow velocities.
4. Space Sensors. Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.
5. Differential Sensors. Provide matched sensors for differential temperature measurement.

F. Humidity Sensors.

1. Duct and room sensors shall have a sensing range of 20%–80%.
2. Duct sensors shall have a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20%–95% RH and shall be suitable for ambient conditions of -40°C–75°C (-40°F–170°F).
4. Humidity sensors shall not drift more than 1% of full scale annually.

G. Flow Switches. Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

1. Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.
2. Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

H. Relays.

1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

I. Override Timers.

1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0–6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

J. Current Transmitters.

1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4–20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
3. Unit shall be split-core type for clamp-on installation on existing wiring.

K. Current Transformers.

1. AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.
2. Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full-scale output.
3. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

L. Voltage Transmitters.

1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4–20 mA output with zero and span adjustment.
2. Adjustable full-scale unit ranges shall be 100–130 Vac, 200–250 Vac, 250–330 Vac, and 400–600 Vac. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.
3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

M. Voltage Transformers.

1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4°C–55°C (40°F–130°F) and shall provide $\pm 0.5\%$ accuracy at 24 Vac and 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

N. Power Monitors.

1. Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0 amp current inputs or 0–0.33 volt inputs.
2. 1.0% full-scale true RMS power accuracy, +0.5 Hz, voltage input range 120–600 V, and auto range select.
3. Under voltage/phase monitor circuitry.
4. NEMA 1 enclosure.
5. Current transformers having a 0.5% FS accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

O. Hydronic Flowmeters

1. Insertion-Type Turbine Meter

- a. Dual counter-rotating axial turbine elements, each with its own rotational sensing system, and an averaging circuit to reduce measurement errors due to swirl and flow profile distortion. Single turbine for piping 2 inches and smaller. Flow sensing turbine rotors shall be non-metallic and not impaired by magnetic drag.
- b. Insertion type complete with 'hot-tap' isolation valves to enable sensor removal without water supply system shutdown.
- c. Sensing method shall be impedance sensing (non magnetic and non photoelectric)
- d. Volumetric accuracy
- e. $\pm 0.5\%$ of reading at calibrated velocity
- f. $\pm 1\%$ of reading from 3 to 30 ft/s (10:1 range)
- g. $\pm 2\%$ of reading from 0.4 to 20 ft/s (50:1 range)
- h. Each sensor shall be individually calibrated and tagged accordingly against the manufacturer's primary standards which must be accurate to within 0.1% of flow rate and traceable to the National Institute of Standards and Technology (NIST).
- i. Maximum operating pressure of 400 psi and maximum operating temperature of 200°F continuous (220°F peak).

- j. All wetted metal parts shall be constructed of 316 stainless steel.
- k. Analog outputs shall consist of non interactive zero and span adjustments, a DC linearly of 0.1% of span, voltage output of 0-10 Vdc, and current output of 4-20 mA.
- 2. Magnetic Flow-Tube Type Flowmeter
 - a. Sensor shall be a magnetic flowmeter, which utilizes Faraday's Law to measure volumetric fluid flow through a pipe. The flowmeter shall consist of two elements, the sensor and the electronics. The sensor shall generate a measuring signal proportional to the flow velocity in the pipe. The electronics shall convert this EMF into a standard current output.
 - b. Electronic replacement shall not affect meter accuracy (electronic units are not matched with specific sensors).
 - c. Four-wire, externally powered, magnetic type flow transmitter with adjustable span and zero, integrally mounted to flow tube. Output signal shall be a digital pulse proportional to the flow rate (to provide maximum accuracy and to handle abrupt changes in flow). Standard 4-20 mA or 0-10 Vdc outputs may be used provided accuracy is as specified.
 - d. Flow Tube:
 - i. ANSI class 150 psig steel
 - ii. ANSI flanges
 - iii. Protected with PTFE, PFA, or ETFE liner rated for 245°F minimum fluid temperature
 - e. Electrode and grounding material
 - i. 316L Stainless steel or Hastelloy C
 - ii. Electrodes shall be fused to ceramic liner and not require o-rings.
 - f. Electrical Enclosure: NEMA 4, 7
 - g. Approvals:
 - i. UL or CSA
 - ii. NSF Drinking Water approval for domestic water applications
 - h. Performance
 - i. Accuracy shall be $\pm 0.5\%$ of actual reading from 3 to 30 ft/s flow velocities, and 0.015 ft/s from 0.04 to 3 ft/s.
 - ii. Stability: 0.1% of rate over six months.
 - iii. Meter repeatability shall be $\pm 0.1\%$ of rate at velocities > 3 ft/s.
- 3. Magnetic Insertion-Type Flowmeter
 - a. Magnetic Faraday point velocity measuring device.
 - b. Insertion type complete with hot-tap isolation valves to enable sensor removal without water supply system shutdown.
 - c. 4-20 mA transmitter proportional to flow or velocity.
 - d. Accuracy: larger of 1% of reading and 0.2 ft/s.
 - e. Flow range: 0.2 to 20 ft/s, bidirectional.
 - f. Each sensor shall be individually calibrated and tagged accordingly against the manufacturer's primary standards which must be accurate to within 0.1% of flow rate and traceable to the National Institute of Standards and Technology (NIST).
- 4. Vortex Shedding Flowmeter
 - a. Output: 4-20 mA, 0-10 Vdc, 0-5 Vdc.
 - b. Maximum Fluid Temperature: 800°F (427 °C).
 - c. Wetted Parts: Stainless Steel.
 - d. Housing: NEMA 4X.
 - e. Turndown: 25:1 minimum.
 - f. Accuracy: 0.5% of calibrated span for liquids, 1% of calibrated span for steam and gases.
 - g. Body: Wafer style or ANSI flanged to match piping specification.
- 5. Transit-Time Ultrasonic Flowmeter
 - a. Clamp-On transit-time ultrasonic flowmeter

- b. Wide-Beam transducer technology
- c. 4-20 mA transmitter proportional to flow or velocity.
- d. Accuracy: 0.5% of reading in range 1 to 30 ft/s, 0.001 ft/s sensitivity.

P. Thermal Energy Meters

- 1. Matched RTD, solid state, or thermistor temperature sensors with a differential temperature accuracy of $\pm 0.15^{\circ}\text{F}$.
- 2. Flow meter : See "Hydronic Flowmeters" section.
- 3. Unit accuracy of $\pm 1\%$ factory calibrated, traceable to NIST with certification.
- 4. NEMA 1 enclosure.
- 5. Panel mounted display.
- 6. UL listed.
- 7. Isolated 4–20 ma signals for energy rate and supply and return temperatures and flow.

Q. Current Switches.

- 1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

R. Pressure Transducers.

- 1. Transducers shall have linear output signal and field-adjustable zero and span.
- 2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.
- 3. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4–20 mA output, suitable mounting provisions, and block and bleed valves.
- 4. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300 psi.) Transducer shall have 4–20 mA output, suitable mounting provisions, and 5-valve manifold.

S. Differential Pressure Switches. Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

T. Pressure-Electric (PE) Switches.

- 1. Shall be metal or neoprene diaphragm actuated, operating pressure rated for 0–175 kPa (0–25 psig), with calibrated scale minimum setpoint range of 14–125 kPa (2–18 psig) minimum, UL listed.
- 2. Provide one- or two-stage switch action (SPDT, DPST, or DPDT) as required by application Electrically rated for pilot duty service (125 VA minimum) and/or for motor control.
- 3. Switches shall be open type (panel-mounted) or enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.
- 4. Each pneumatic signal line to PE switches shall have permanent indicating gauge.

U. Occupancy Sensors. Occupancy sensors shall utilize Passive Infrared (PIR) and/or Microphonic Passive technology to detect the presence of people within a room. Sensors shall be mounted as indicated on the approved drawings. The sensor output shall be accessible by any lighting and/or HVAC controller in the system. Occupancy sensors shall be capable of being powered from the lighting or HVAC control panel, as shown on the drawings. Occupancy sensor delay shall be software adjustable through the user interface and shall not require manual adjustment at the sensor.

V. Local Control Panels.

1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.
2. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

2.9 Wiring and Raceways

- A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.
- B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

2.10 Fiber Optic Cable System

- A. Optical Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. Sheath shall be UL listed OFNP in accordance with NEC Article 770. Optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125mm.
- B. Connectors. Field terminate optical fibers with ST type connectors. Connectors shall have ceramic ferrules and metal bayonet latching bodies.

PART 3: EXECUTION

Section Includes

- 3.1 Examination
- 3.2 Protection
- 3.3 Coordination
- 3.4 General Workmanship
- 3.5 Field Quality Control
- 3.6 Wiring
- 3.7 Communication Wiring
- 3.8 Fiber Optic Cable
- 3.9 Installation of Sensors
- 3.10 Flow Switch Installation
- 3.11 Actuators
- 3.12 Warning Labels
- 3.13 Identification of Hardware and Wiring
- 3.14 Controllers
- 3.15 Programming
- 3.16 Control system Checkout and Testing
- 3.17 Control System Demonstration and Acceptance
- 3.18 Cleaning
- 3.19 Training
- 3.20 Sequences of Operation
- 3.21 Control Valve Installation
- 3.22 Control Damper Installation
- 3.23 Smoke Damper Installation
- 3.24 Duct Smoke Detection
- 3.25 Controls Communication Protocol
- 3.26 Start-Up and Checkout Procedures

3.1 Examination

- A. conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.
- B. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by—and at the expense of—this contractor.

3.2 Protection

- A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.
- B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 Coordination

- A. Site
 - 1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
 - 2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.
- B. Submittals. See Section 23 09 23 Article 1.10 (Submittals).
- C. Test and Balance.
 - 1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
 - 2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
 - 3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
 - 4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.
- D. Life Safety.
 - 1. Duct smoke detectors required for air handler shutdown are provided under Division 28. Interlock smoke detectors to air handlers for shutdown as specified in Section 23 09 93 (Sequences of Operation).

2. Smoke dampers and actuators required for duct smoke isolation are provided under Division 23. Interlock smoke dampers to air handlers as specified in Section 23 09 93 (Sequences of Operation).
 3. Fire and smoke dampers and actuators required for fire-rated walls are provided under Division 23. Fire and smoke damper control is provided under Division 28.
- E. Coordination with controls specified in other sections or divisions. Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:
1. All communication media and equipment shall be provided as specified in Section 23 09 23 Article 2.2 (Communication).
 2. Each supplier of a controls product is responsible for the configuration, programming, start up, and testing of that product to meet the sequences of operation described in Section 23 09 93.
 3. The contractor shall coordinate and resolve any incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
 4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
 5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.4 General Workmanship

- A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install equipment in readily accessible locations as defined by Chapter 1 Article 100 Part A of the National Electrical Code (NEC).
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.5 Field Quality Control

- A. All work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in Section 23 09 23 Article 1.8 (Codes and Standards).
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.
- C. Contractor shall have work inspection by local and/or state authorities having jurisdiction over the work.

3.6 Wiring

- A. All control and interlock wiring shall comply with national and local electrical codes, and Division 26 of this specification, Where the requirements of this section differ from Division 26, the requirements of this section shall take precedence.
- B. All NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway according to NEC and Division 26 requirements.
- C. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.
- D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL listed for the intended application.
- E. All wiring in mechanical, electrical, or service rooms – or where subject to mechanical damage – shall be installed in raceway at levels below 3 m (10ft).
- F. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
- G. Do not install wiring in raceway containing tubing.
- H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.
- I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.
- J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.
- K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.
- M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.
- N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.
- O. Size of raceway and size and type of wire type shall be the responsibility of the contractor in keeping with the manufacturer's recommendations and NEC requirements, except as noted elsewhere.
- P. Include one pull string in each raceway 2.5 cm (1 in.) or larger.

- Q. Use color-coded conductors throughout with conductors of different colors.
- R. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.
- S. Conceal all raceways except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g. steam pipes or flues).
- T. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.
- U. Adhere to this specification's Division 26 requirements where raceway crosses building expansion joints.
- V. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of vertical raceways.
- W. The contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- X. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.
- Y. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.7 Communication Wiring

- A. The contractor shall adhere to the items listed in the "Wiring" article in Part 3 of the specification.
- B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling
- C. Do not install communication wiring in raceways and enclosures containing Class 1 or other Class 2 wiring.
- D. Maximum pulling, tension, and bend radius for the cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.
- E. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.
- F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lightning arrestor shall be installed according to manufacturer's instructions.
- G. All runs of communication wiring shall be unspliced length when that length is commercially available.

- H. All communication wiring shall be labeled to indicate origination and destination data.
- I. All communication wiring shall be labeled to indicate origination and destination data.
- J. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."
- K. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:
 - 1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
 - 2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
 - 3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
 - 4. An MS/TP EIA-485 network shall have no T connections.

3.8 Fiber Optic Cable

- A. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post-installation residual cable tension shall be within cable manufacturer's specifications.
- B. All cabling and associated components shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii, as specified by cable manufacturer, shall be maintained.

3.9 Installation of Sensors

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequately for environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by wall framing.
- D. All wires attached to sensors shall be sealed in their raceways or in the wall to stop air transmitted from other areas from affecting sensor readings.
- E. Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.
- F. Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m (1 ft) of sensing element for each 1 m²(1 ft²) of coil area.
- G. Do not install temperature sensors within the vapor plume of a humidifier. If installing a sensor downstream of a humidifier, install it at least 3 m (10 ft) downstream.

- H. All pipe-mounted temperature sensors shall be installed in wells. Install liquid temperature sensors with heat-conducting fluid in thermal wells.
- I. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.
- J. Differential Air Static Pressure.
 - 1. Supply Duct Static Pressure. Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.
 - 2. Return Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.
 - 3. Building Static Pressure. Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.
 - 4. The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.
 - 5. All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.
 - 6. All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shut-off valves installed before the tee.
- K. Smoke detectors, freezestats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.
- L. Install humidity sensors for duct mounted humidifiers at least 3 m (10 ft) downstream of the humidifier. Do not install filters between the humidifier and the sensor.

3.10 Flow Switch Installation

- A. Use correct paddle for pipe diameter.
- B. Adjust flow switch according to manufacturer's instructions.

3.11 Actuators

- A. General. Mount and link control damper actuators according to manufacturer's instructions.
 - 1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
 - 2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
 - 3. Provide all mounting hardware and linkages for actuator installation.
- B. Electric/Electronic
 - 1. Dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a

minimum 5° travel available for tightening the damper seal. Actuators shall be mounted following manufacturer's recommendations.

2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

C. Pneumatic Actuators.

1. Size pneumatic damper actuator to operate the related control damper(s) with sufficient reserve power to provide smooth modulating action or two-position action. Actuator also shall be sized for proper speed of response at the velocity and pressure conditions to which the control damper is subject.
2. Pneumatic damper actuators shall produce sufficient torque to close off against the maximum system pressures encountered. Size the pneumatic damper actuator to close off against the fan shutoff pressure, as a minimum.
3. Where two or more pneumatic damper actuators are installed for interrelated operation in unison, such as dampers used for mixing, provide the dampers with a positive pilot positioner. The positive pilot positioner shall be directly mounted to the pneumatic damper actuator and have pressure gauges for supply input and output pressures.
4. The total damper area operated by an actuator shall not exceed 80% of the manufacturer's maximum area rating. Provide at least one actuator for each damper section. Each damper actuator shall not power more than 2 m²(20 ft²) of damper.
5. Use line shafting or shaft couplings (jackshafting) in lieu of blade-to-blade linkages or shaft coupling when driving axially aligned damper sections.

3.12 Warning Labels

- A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the control system.
 1. Labels shall use white lettering (12-point type or larger) on a red background.
 2. Warning labels shall read as follows.

CAUTION

This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

- B. Permanent warning labels shall be affixed to all motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.
 1. Labels shall use white lettering (12-point type or larger) on a red background.
 2. Warning labels shall read as follows.

CAUTION

This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.13 Identification of Hardware and Wiring

- A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with control system address or termination number.

- B. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.
- C. Permanently label or code each point of field terminal strips to show the instrument or item served.
- D. Identify control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.
- E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that label removal of the component does not remove the label.
- F. Identify room sensors related to terminal boxes or valves with nameplates.
- G. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.
- H. Identifiers shall match record documents.

3.14 Controllers

- A. Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all of the hardware points listed in Section 23 09 93 (Sequences of Operation).

3.15 Programming

- A. Provide sufficient internal memory for the specified sequences of operation and trend logging.
- B. Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. See Section 23 09 93 (Sequences of Operation). If character limitations or space restrictions make it advisable to shorten the name, the abbreviations given in Appendix B to Section 23 09 93 may be used. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.
- C. Software Programming.
 - 1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Embed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:
 - a. Text-based:
 - i. Must provide actions for all possible situations
 - ii. Must be modular and structured
 - iii. Must be commented
 - b. Graphic-based:
 - i. Must provide actions for all possible situations

- ii. Must be documented
- c. Parameter-based:
 - i. Must provide actions for all possible situations
 - ii. Must be documented.

D. Operator Interface.

1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as setpoints. As a minimum, show on each equipment graphic the input and output points and relevant calculated points as indicated on the applicable Points List in Section 23 09 93.
2. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.16 Control System Checkout and Testing

- A. Startup Testing. All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner's representative is notified of the system demonstration.
 1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.
 2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
 3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers' recommendations.
 4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
 5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
 6. Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops.
 7. Alarms and Interlocks:
 - a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
 - b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
 - c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action

3.17 Control System Demonstration and Acceptance

- A. Demonstration.
 1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.

2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician's initials, and any corrective action taken or needed.
6. Demonstrate compliance with Part 1, "System Performance."
7. Demonstrate compliance with sequences of operation through all modes of operation.
8. Demonstrate complete operation of operator interface.
9. Additionally, the following items shall be demonstrated:
 - a. DDC loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.
 - b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.
 - c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.
 - d. Interface to the building fire alarm system.
 - e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.
10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance.

1. All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.

2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, "Submittals."

3.18 Cleaning

- A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.
- B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.
- C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.19 Training

- A. Provide training for a designated staff of Owner's representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.
- B. Training shall enable students to accomplish the following objectives.
 1. Day-to-day Operators:
 - a. Proficiently operate the system
 - b. Understand control system architecture and configuration
 - c. Understand DDC system components
 - d. Understand system operation, including DDC system control and optimizing routines (algorithms)
 - e. Operate the workstation and peripherals
 - f. Log on and off the system
 - g. Access graphics, point reports, and logs
 - h. Adjust and change system set points, time schedules, and holiday schedules
 - i. Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
 - j. Understand system drawings and Operation and Maintenance manual
 - k. Understand the job layout and location of control components
 - l. Access data from DDC controllers and ASCs
 - m. Operate portable operator's terminals
 2. Advanced Operators:
 - a. Make and change graphics on the workstation
 - b. Create, delete, and modify alarms, including annunciation and routing of these
 - c. Create, delete, and modify point trend logs and graph or print these both on an ad-hoc basis and at user-definable time intervals
 - d. Create, delete, and modify reports
 - e. Add, remove, and modify system's physical points
 - f. Create, modify, and delete programming
 - g. Add panels when required
 - h. Add operator interface stations
 - i. Create, delete, and modify system displays, both graphical and others

- j. Perform DDC system field checkout procedures
 - k. Perform DDC controller unit operation and maintenance procedures
 - l. Perform workstation and peripheral operation and maintenance procedures
- m. Perform DDC system diagnostic procedures
- n. Configure hardware including PC boards, switches, communication, and I/O points
- o. Maintain, calibrate, troubleshoot, diagnose, and repair hardware
- p. Adjust, calibrate, and replace system components
- 3. System Managers/Administrators:
 - a. Maintain software and prepare backups
 - b. Interface with job-specific, third-party operator software
 - c. Add new users and understand password security procedures
- C. Organize the training into sessions or modules for the three levels of operators listed above. (Day-to-Day Operators, Advanced Operators, System Managers and Administrators). Students will receive one or more of the training packages, depending on knowledge level required.
- D. Provide course outline and materials according to the "Submittals" article in Part 1 of this specification. Provide one copy of training material per student.
- E. The instructor(s) shall be factory-trained and experienced in presenting this material.
- F. Classroom training shall be done using a network of working controllers representative of installed hardware.

3.20 Sequences of Operation

- A. See Sequences of Operation, With Points Lists to be developed by Consulting Engineer specific to each project.

3.21 Control Valve Installation

- A. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.
- B. Slip-stem control valves shall be installed so that the stem position is not more than 60 degrees from the vertical up position. Ball type control valves shall be installed with the stem in the horizontal position.
- C. Valves shall be installed in accordance with the manufacturer's recommendations.
- D. Control valves shall be installed so that they are accessible and serviceable and so that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.
- E. Isolation valves shall be installed so that the control valve body may be serviced without draining the supply/return side piping system. Unions shall be installed at all connections to screw-type control valves.
- F. Provide tags for all control valves indicating service and number. Tags shall be brass, 1.5 inch in diameter, with ¼ inch high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings.

3.22 Control Damper Installation

- A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure $\frac{1}{4}$ in. larger than damper dimensions and shall be square, straight, and level.
- C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm ($\frac{1}{8}$ in.) of each other.
- D. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- E. Install extended shaft or jackshaft according to manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- F. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- G. Provide a visible and accessible indication of damper position on the drive shaft end.
- H. Support ductwork in area of damper when required to prevent sagging due to damper weight.
- I. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

3.23 Smoke Damper Installation

- A. The contractor shall coordinate all smoke and smoke/fire damper installation, wiring, and checkout to ensure that these dampers function properly and that they respond to the proper fire alarm system general, zone, and/or detector trips. The contractor shall immediately report any discrepancies to the engineer no less than two weeks prior to inspection by the code authority having jurisdiction.
- B. Provide complete submittal data to controls system subcontractor for coordination of duct smoke detector interface to HVAC systems.

3.24 Duct Smoke Detection

- A. Submit data for coordination of duct smoke detector interface to HVAC systems as required in Part 1, "Submittals."
- B. This Contractor shall provide a dry-contact alarm output in the same room as the HVAC equipment to be controlled.

3.25 Controls Communication Protocol

- A. General. The electronic controls packaged with this equipment shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control setpoints as shown in the points list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of Standard 135.
- B. Distributed Processing. The controller shall be capable of stand-alone operation and shall continue to provide control functions if the network connection is lost.
- C. I/O Capacity. The controller shall contain sufficient I/ O capacity to control the target system.
- D. The Controller shall have a physical connection for a laptop computer or a portable operator's tool.
- E. Environment. The hardware shall be suitable for the anticipated ambient conditions.
 - 1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 40°C to 60°C (40°F to 140°F).
 - 2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- F. Serviceability. Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.
- G. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 30 days.
- H. Power. Controller shall be able to operate at 90% to 110% of nominal voltage rating.
- I. Transformer. Power supply for the Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

3.26 Start-Up and Checkout Procedures

- A. Start up, check out, and test all hardware and software and verify communication between all components.
 - 1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
 - 2. Verify that all analog and binary input/output points read properly.
 - 3. Verify alarms and interlocks.
 - 4. Verify operation of the integrated system.

Sequence of Operations for HVAC Controls

PART 4: GENERAL

Section Includes
4.1 Point Summary

4.1 Point Summary

A. Glossary of Terms

Terms used within the Specification Text:

- **Advanced Application Controller (AAC):**

A fully programmable control module. This control module may be capable of some of the advanced features found in Building Controllers (storing trends, initiating read and write requests, etc.) but it does not serve as a master controller. Advanced Application Controllers may reside on either the Ethernet/IP backbone or on a subnet.

- **Application Specific Controller (ASC):**

A pre-programmed control module which is intended for use in a specific application. ASCs may be configurable, in that the user can choose between various pre-programmed options, but it does not support full custom programming. ASCs are often used on terminal equipment such as VAV boxes or fan coil units. In many vendors' architectures ASCs do not store trends or schedules but instead rely upon a Building Controller to provide those functions.

- **BACnet/IP:**

An approved BACnet network type which uses an Ethernet carrier and IP addressing.

- **BACnet MS/TP:**

An approved BACnet network type which uses a Master-Slave Token Passing configuration. MS/TP networks are unique to BACnet and utilize EIA485 twisted pair topology running at 9600 to 76,800 bps.

- **BACnet over ARCNET:**

An approved BACnet network type which uses an ARCNET (attached resource computer network) carrier. ARCNET is an industry standard that can utilize several speeds and wiring standards. The most common configuration used by BACnet controllers is an EIA485 twisted pair topology running at 156,000 bps.

- **Building Controller (BC):**

A fully programmable control module which is capable of storing trends and schedules, serving as a router to devices on a subnet, and initiating read and write requests to other controllers. Typically this controller is located on the Ethernet/IP backbone of the BAS. In many vendors' architectures a Building Controller will serve as a master controller, storing schedules and trends for controllers on a subnet underneath the Building Controller.

- **Direct Digital Control (DDC):**

A control system in which a digital computer or microprocessor is directly connected to the valves, dampers, and other actuators which control the system, as opposed to indirectly controlling a system by resetting setpoints on an analog pneumatic or electronic controller.

- **PICS - Protocol Implementation Conformance Statement:**

A written document, created by the manufacturer of a device, which identifies the particular options specified by BACnet that are implemented in the device.

- Smart Actuator (SA):
- An actuator which is controlled by a network connection rather than a binary or analog signal. (0-10v, 4-20mA, relay, etc.)
- Smart Sensor (SS):

A sensor which provides information to the BAS via network connection rather than a binary or analog signal. (0-10000 ohm, 4-20mA, dry contact, etc.)

- Web services:

Web services are a standard method of exchanging data between computer systems using the XML (extensible markup language) and SOAP (simple object access protocol) standards. Web services can be used at any level within a Building Automation System (BAS), but most commonly they are used to transfer data between BAS using different protocols or between a BAS and a non-BAS system such as a tenant billing system or a utility management system.

B. Terms used within the Sequences of Operation:

- adj.

Adjustable by the end user, through the supplied user interface.

- AI, AO, etc. (Column Headings on Points List)

AI = Analog Input. A physical input to the control module.

AO = Analog Output. A physical output from the control module.

AV = Analog Value. An intermediate (software) point that may be editable or read-only. Editable AVs are typically used to allow the user to set a fixed control parameter, such as a setpoint. Read Only AVs are typically used to display the status of a control operation.

BI = Binary Input. A physical input to the control module.

BO = Binary Output. A physical output from the control module.

BV = Binary Value. An intermediate (software) point that may be editable or read-only. Editable BVs are typically used to allow the user to set a fixed control parameter, such as a setpoint. Read Only BVs are typically used to display the status of a control operation.

Loop = A control loop. Most commonly a PID control loop. Typically a control loop will include a setpoint, an input which is compared to the setpoint, and an output which controls some action based upon the difference between the input and the setpoint. A PID control loop will also include gains for the proportional, integral, and derivative response as well as an interval which controls how frequently the control loop updates its output. These gains may be adjustable by the end user for control loop "tuning," but in self-tuning control loops or loops which have been optimized for a specific application the gains may not be adjustable.

Sched = Schedule. The control algorithm for this equipment shall include a user editable schedule.

Trend. The control system shall be configured to collect and display a trend log of this object. The trending interval shall be no less than one sample every 5 minutes. (Change of Value trending, where a sample is taken every time the value changes by more than a user-defined minimum, is an acceptable alternative.)

Alarm. The control system shall be configured to generate an alarm when this object exceeds user definable limits, as described in the Sequence of Controls.

Note: If the specifications require use of the BACnet protocol, all of the above shall be provided as BACnet objects.

- KW Demand Limiting: *

An energy management strategy that reduces energy consumption when a system's electric power meter exceeds an operator-defined threshold.

When power consumption exceeds defined levels, the system automatically adjust setpoints, de-energizes low priority equipment, and takes other pre-programmed actions to avoid peak demand charges. As the demand drops, the system restores loads in a predetermined manner.

- Occupant Override Switch, or Timed Local Override:

A control option that allows building occupants to override the programmed HVAC schedule for a limited period of time.

When the override time expires, the zone returns to its unoccupied state.

- Occupant Setpoint Adjustment:

A control option that allows building occupants to adjust - within limits set by the HVAC control system - the heating and cooling setpoints of selected zones. Typically the user interface for this function is built into the zone sensor.

- Optimal Start-Up: *

A control strategy that automatically starts an HVAC system at the latest possible time yet ensures comfort conditions by the time the building becomes occupied.

In a typical implementation, a controller measures the temperature of the zone and the outside air. Then, using design heating or cooling capacity at the design outside air temperature, the system computes how long a unit must run at maximum capacity to bring the zone temperature to its occupied setpoint.

The optimal start algorithm often includes a self-learning feature to adjust for variations from design capacity.

A distributed system must use Run on Request with Optimal Start. (See below.)

- Requested, or Run on Request: *

A control strategy that optimizes the runtime of a source piece of equipment that supplies one or more receiving units - such as an air handler unit supplying zone terminal units with heating, cooling, ventilation, or similar service. Source equipment runs only when needed, not on a fixed schedule.

The source equipment runs when one or more receiving units request its services. An operator determines how many requests are required to start the source equipment.

For example, if all the zones in a building are unoccupied and the zone terminal units do not need heating or cooling, the AHU will shut down. However, if a zone becomes occupied or needs cooling, the terminal unit will send a run request to the AHU to initiate the start-up sequence. If this AHU depends on a central chiller, it can send a run request to the chiller.

The run on request algorithm also allows an operator to schedule occupancy for individual zones based on the needs of the occupants without having to adjust the schedules of related AHUs and chillers.

- Trim and Respond, or Setpoint Optimization: *

A control strategy that optimizes the setpoint of a source piece of equipment that supplies one or more receiving units - such as an air handler unit supplying zone terminal units with heating, cooling, ventilation, or similar service.

The source unit communicates with receiving units to determine heating, cooling, and other requirements, and then adjusts its setpoint.

For example, if all zones are comfortable and do not request cooling, the AHU will gradually increase (trim) its supply air setpoint. When a zone requests cooling, the AHU responds by dropping its setpoint. The more zones that request cooling, the more it drops the setpoint. The AHU repeats this process throughout the day to keep zones cool, but with a supply air setpoint that is no cooler than necessary.

C. Contracting Terms:

- Furnished or Provided:

The act of supplying a device or piece of equipment as required meeting the scope of work specified and making that device or equipment operational. All costs required to furnish the specified device or equipment and make it operational are borne by the division specified to be responsible for providing the device or equipment.

- Install or Installed:

The physical act of mounting, piping or wiring a device or piece of equipment in accordance with the manufacturer's instructions and the scope of work as specified. All costs required to complete the installation are borne by the division specified to include labor and any ancillary materials.

- Interface:

The physical device required to provide integration capabilities from an equipment vendor's product to the control system. The equipment vendor most normally furnishes the interface device. An example of an interface is the chilled water temperature reset interface card provided by the chiller manufacturer in order to allow the control system to integrate the chilled water temperature reset function into the control system.

- Integrate:

The physical connections from a control system to all specified equipment through an interface as required to allow the specified control and monitoring functions of the equipment to be performed via the control system.

D. Abbreviations

The following abbreviations may be used in graphics, schematics, point names, and other UI applications where space is at a premium.

AC - Air Conditioning
ACU - Air Conditioning Unit
AHU - Air Handling Unit
AI - Analog Input
AO - Analog Output
AUTO - Automatic
AUX - Auxiliary
BI - Binary Input
BO - Binary Output
C - Common
CHW - Chilled Water
CHWP - Chilled Water Pump
CHWR - Chilled Water Return
CHWS - Chilled Water Supply
COND - Condenser
CW - Condenser Water
CWP - Condenser Water Pump
CWR - Condenser Water Return
CWS - Condenser Water Supply
DA - Discharge Air
EA - Exhaust Air
EF - Exhaust Fan
EVAP - Evaporators
FCU - Fan Coil Unit
HOA - Hand / Off / Auto
HP - Heat Pump
HRU - Heat Recovery Unit
HTEX - Heat Exchanger
HW - Hot Water
HWP - Hot Water Pump
HWR - Hot Water Return
HWS - Hot Water Supply
MAX - Maximum
MIN - Minimum
MISC - Miscellaneous
NC - Normally Closed
NO - Normally Open
OA - Outdoor Air
PIU - Powered Induction Unit
RA - Return Air
RF - Return Fan
RH - Relative Humidity
RTU - Roof-top Unit
SA - Supply Air
SF - Supply Fan
SP - Static Pressure
TEMP - Temperature

UH - Unit Heater
UV - Unit Ventilator
VAV - Variable Air Volume
VVTU - Variable Volume Terminal Unit
W/ - with
W/O - without
WSHP - Water Source Heat Pump