



# 2002 ASHRAE Student Design Project Competition



## Fitness and Wellness Center for Lincoln, Nebraska



*North Carolina A&T State University  
Architectural Engineering Department*



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

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

Faculty Advisor

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*North Carolina Agricultural and Technical State University . Architectural Engineering Department*

*447 McNair Hall . NCA&T State University . Greensboro, NC 27411*



*Family Fitness & Wellness Center  
for  
Lincoln, Nebraska*



**STATEMENT OF OBJECTIVES  
2002 ASHRAE COMEPTION  
FALL 2001 – SPRING 2002**

**A combined family center and athletic facility located in Lincoln, Nebraska**

**PROJECT:** Design a new fitness facility

**Objectives:**

We have produced a preliminary design and design development package for a simple building. In addition, we have familiarize ourselves with the concept and design development procedures as applied to a simple building, and introduce ourselves to the architectural and code requirements typical for this type of building.

1. Develop floor plan (s) for a simple single story building to meet a specified program.
2. Develop a simple site plan and elevations for this floor plan.
3. Design the structural system in steel and concrete to resist vertical loading.
4. Design the HVAC system and plumbing to meet code requirements.
5. Define the preliminary electrical design for the building.
6. Determine typical lighting layouts and typical reflected ceiling plan.

**Reference Manual:** We used the Graphics Standards book for reference and all relevant course notes and textbooks from prerequisite courses.

All drawings where done to scale on AutoCAD to meet standards of final submission of 11x17 paper.

# Basis For Architectural Design

**Project :** Defined under **Project Description** on a preceeding page

**Step 1**    **Function of the Facility**

Basic Function: The facility is to provide for a center for exercising, learning and supervising younger adults and children.

**Step 2**    **Forms**

- A. Square Footage
- B. Well defined Mechanical Spaces
- C. Lockers to have Direct access to Pool
- D. Exterior Aesthetics
- E. Project Cost
- F. Additional Anciliary Spaces

**Step 3**    **Define Alternatives**

x. Plan I, shown on next page

Total Sq. Ft.	Cost per Square Foot	Prelim. Project Cost
33,375.00	\$83.10	\$2,773,462.50

Cost per Sq. Ft. taken from National average in RSMMeans  
Cost Estimation for Commercial Buildings Handbook



y. Plan II shown on next page

Total Sq. Ft.	Cost per Square Foot	Prelim. Project Cost
28,525.00	\$83.10	\$2,370,427.50

Cost per Sq. Ft. taken from National average in RSMMeans  
Cost Estimation for Commercial Buildings Handbook



**Step 4**    **Define Criteria (Ranking and Weight)**

Based on a scale from 1 to 5  
1 - Least, 5 - Most

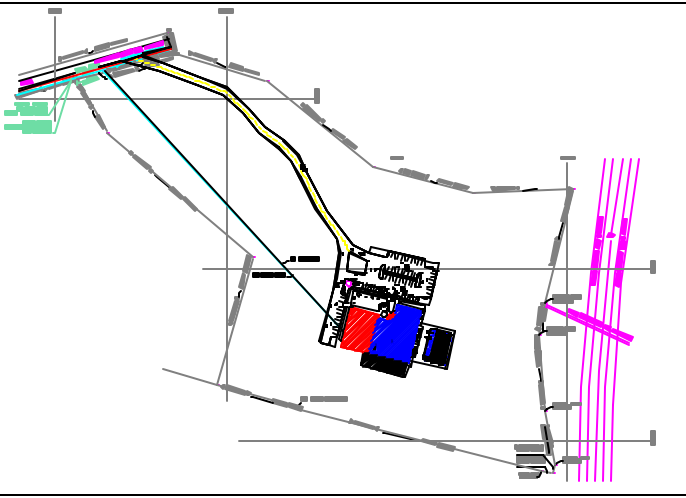
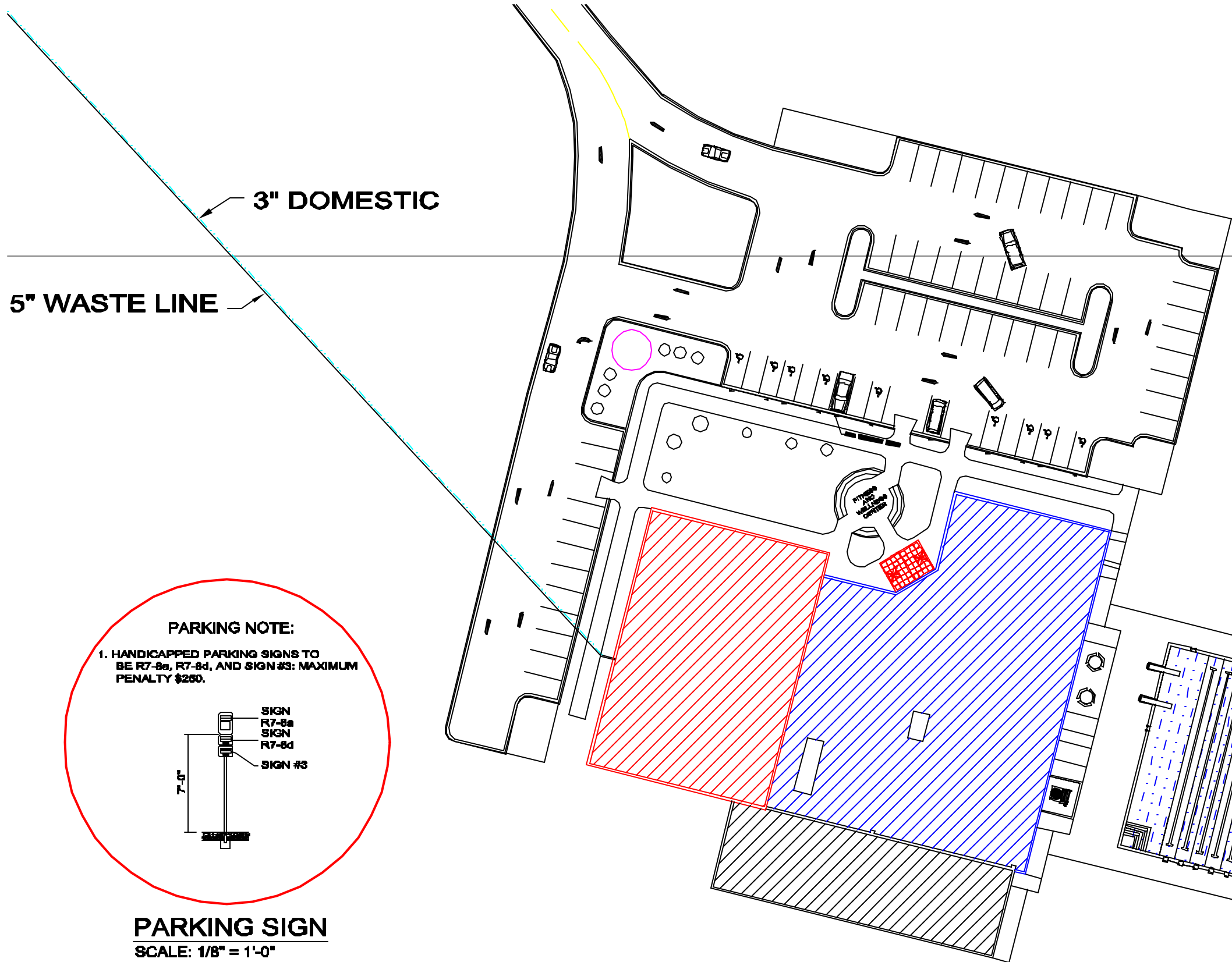
Criteria	Ranking	Justification for rankings given in Step 5
A. Square Footage	5	<i>Not to exceed 30,000 sq. ft. Less Sq. Ft = High Ranking</i>
B. Well Defined Mechanical Space	4	<i>The more the space there is the less the less the conflict between Mechanical Electrical and Plumbing. More Space = Higher Ranking</i>
C. Direct Access to Pool for Locker Area	4	<i>We do not want to have people with wet clothing interfering with those with dry degrading interior spaces from with moisture. Thus Shorter Distance = Higher Ranking</i>
D. Exterior Aesthetics	3	<i>More Exterior Features = Higher Ranking as long is the feature is feasible</i>
E. Project cost	2	<i>Unconstrained but shound not be outragously high. Thus Lower Cost = Higher Ranking</i>
Additional Spaces	4	<i>Must have space for Teens as well as younger children More Spaces = Higher Ranking</i>

## Basis For Architectural Design

**Step 5** *Evaluate using a Decision Matrix*

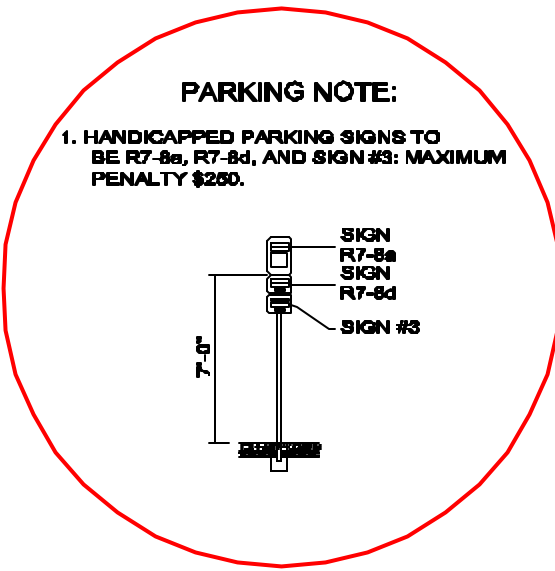
Decision Matrix							
	Criteria						Total
	Sq. Ft.	Mech. Space	Pool Access	Aesthetics	Cost	Extra Space	
Weight	5	4	4	3	2	4	
Design 1	4 20	3 12	5 20	5 15	2 4	5 20	91
Design 2	4 20	5 20	4 16	5 15	4 8	4 16	95

Based on the values presented above the second Design was the most feasible options, although the first design does well on additional spaces and direct pool access it does not outscore design 2 mainly due to the fact that the building costs were higher in the first design due to the difference in the total square footage. Thus Making our second design the Best Choice.

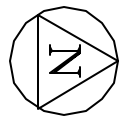


**VICINITY MAP**  
NOT TO SCALE

3" DOMESTIC  
5" WASTE LINE



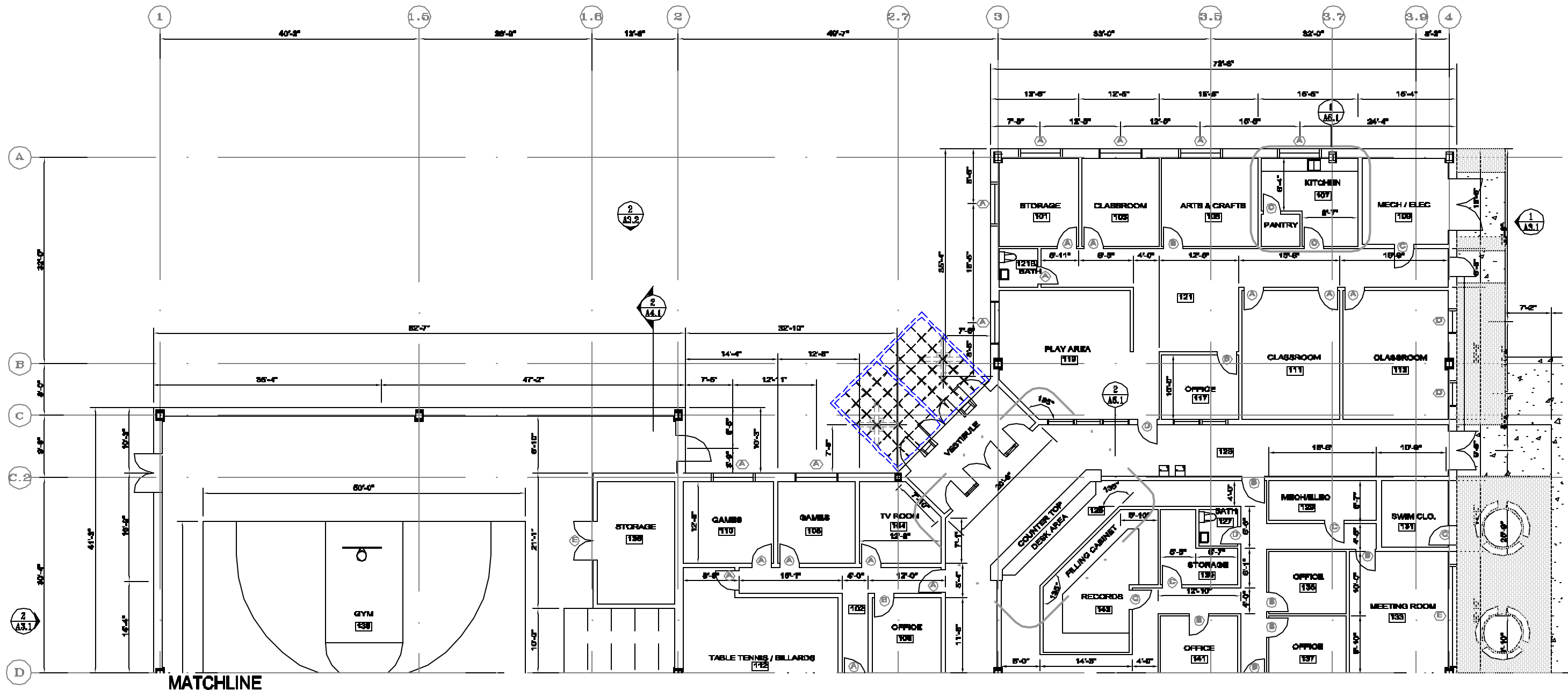
**PARKING SIGN**  
SCALE: 1/8" = 1'-0"



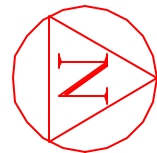
**SITE PLAN**  
SCALE: 1" = 80'-0"

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MATCHLINE

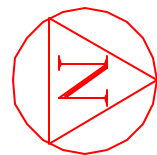
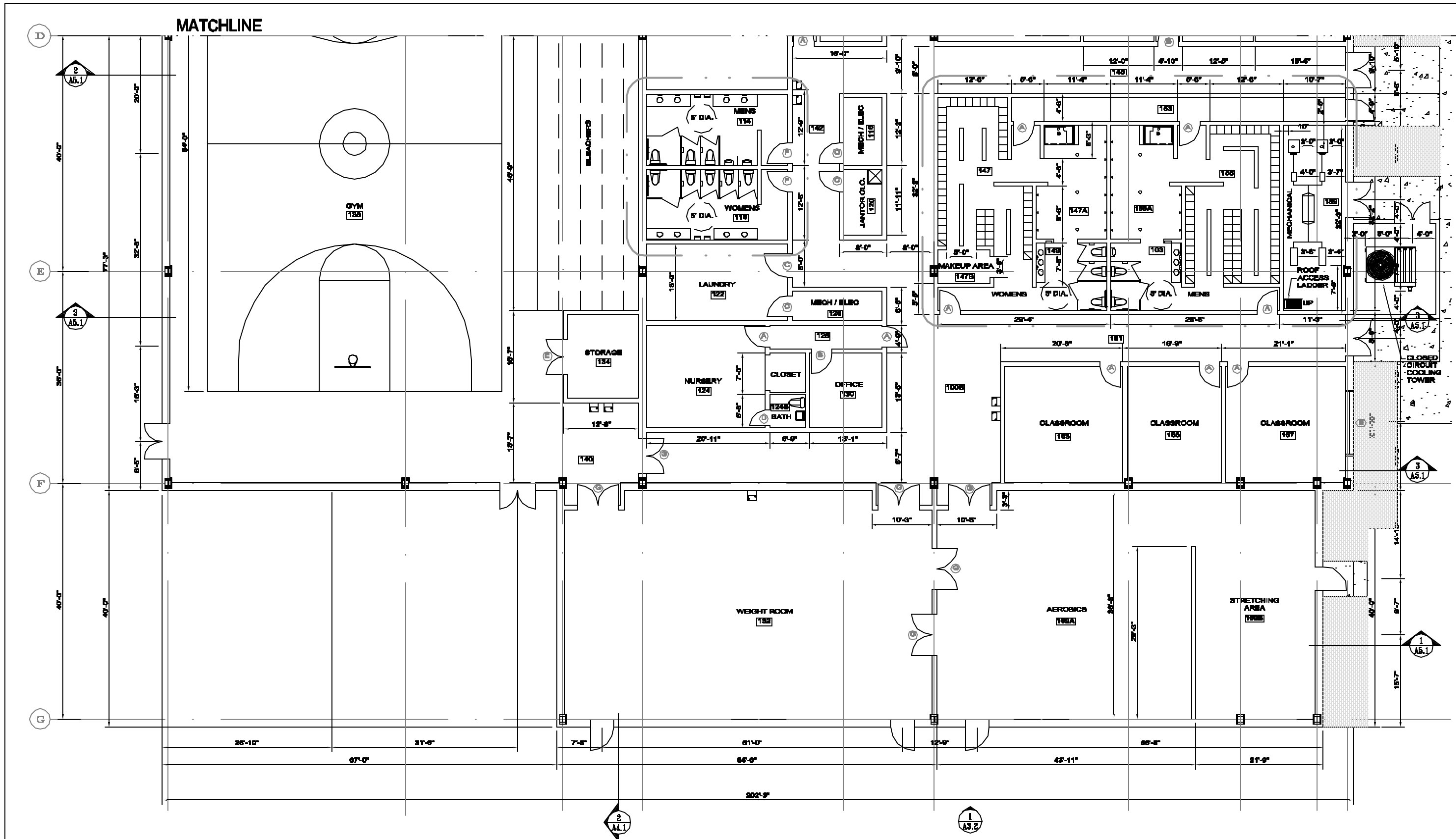


**FLOOR PLAN**  
SCALE: 1/16" = 1'-0"

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A2.1

SHEET 2 of 11



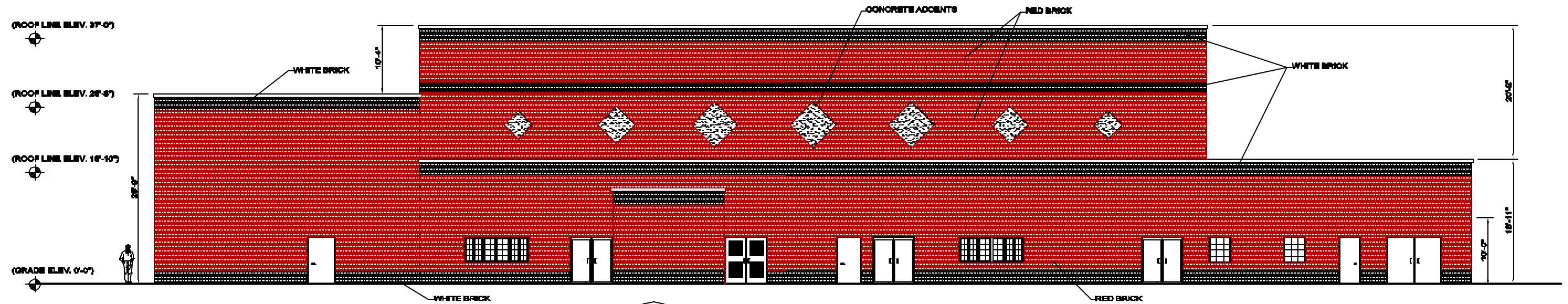
**FLOOR PLAN**  
SCALE: 1/16" = 1'-0"

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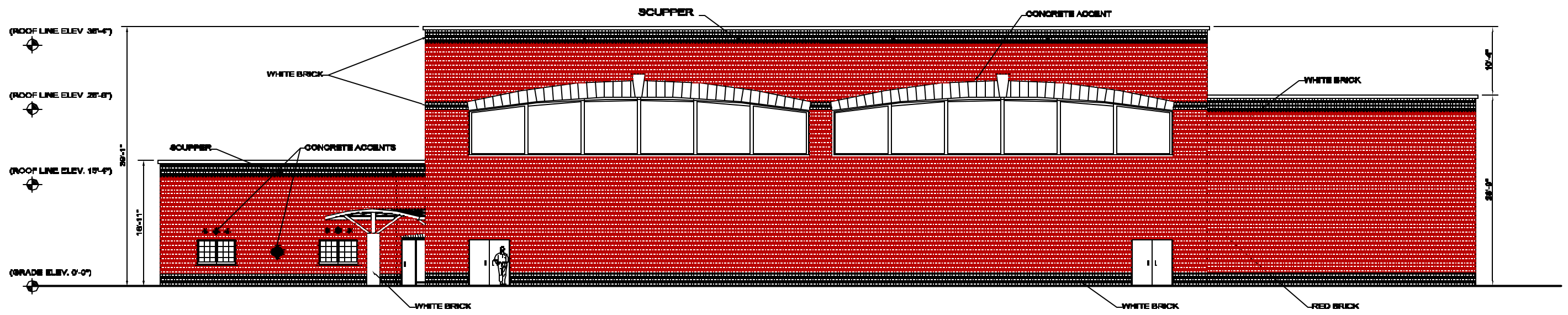
A2.2

SHEET 3 of 11

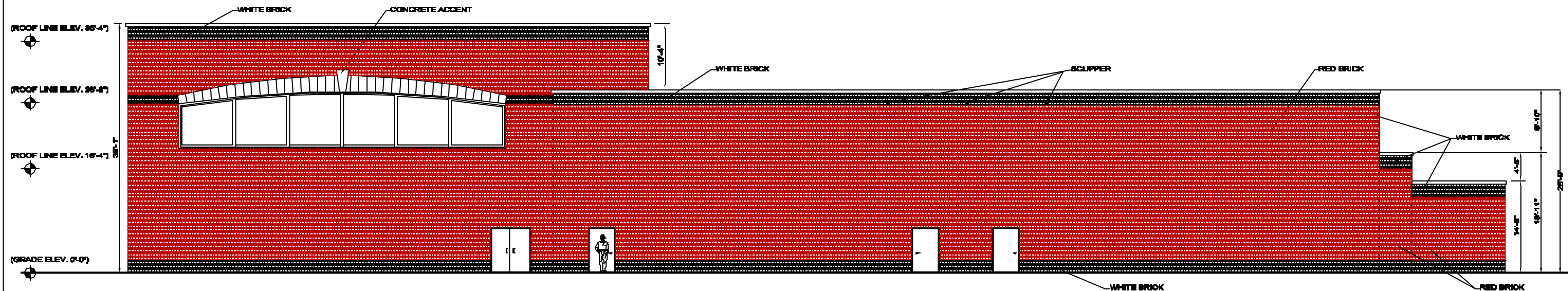




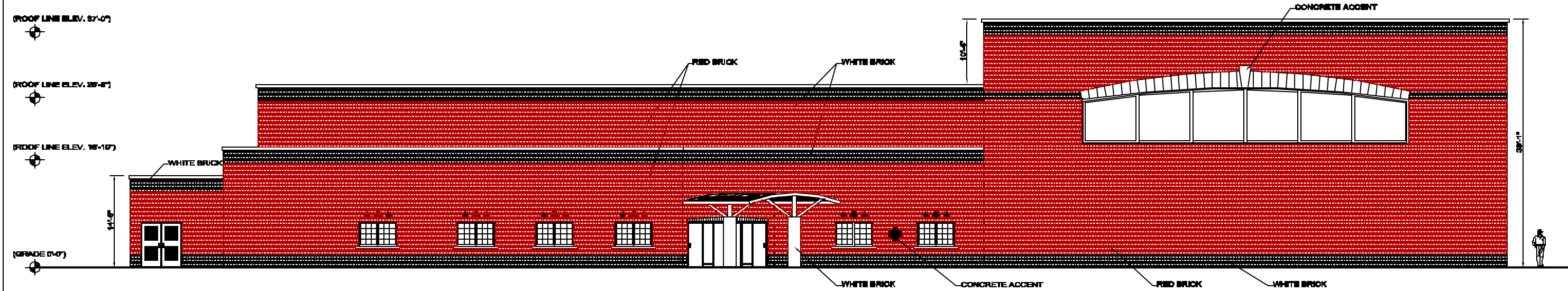
1 NORTH ELEVATION  
 A2.1 SCALE: 1/16" = 1'-0"



2 SOUTH ELEVATION  
 A2.1 SCALE: 1/16" = 1'-0"



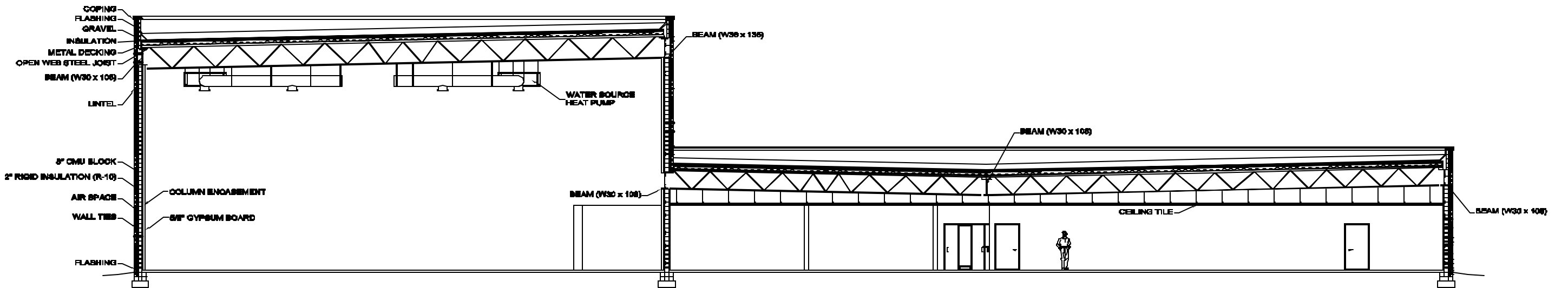
1  
A2.2 EAST ELEVATION  
SCALE: 1/16" = 1'-0"



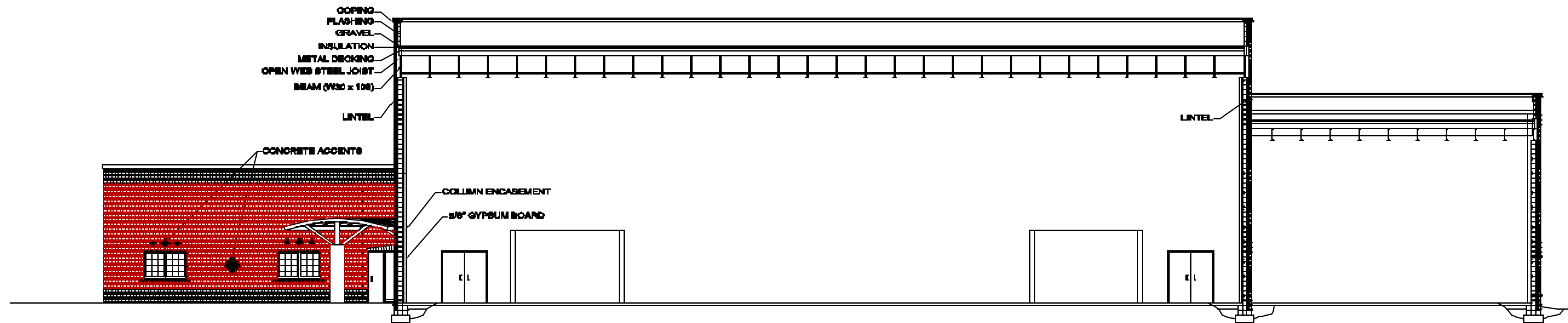
2  
A2.2 WEST ELEVATION  
SCALE: 1/16" = 1'-0"

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A3.2  
 SHEET 5 of 11

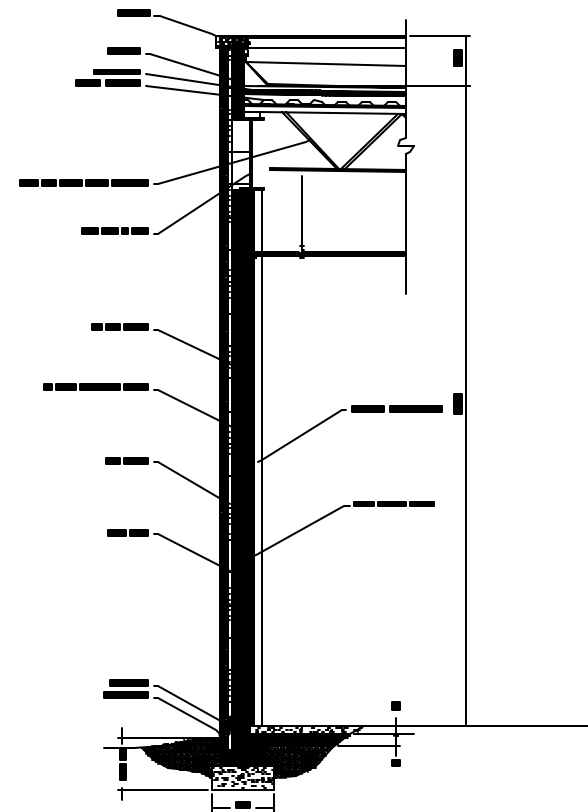


1 BUILDING SECTION  
 A2.2 SCALE: 1/16" = 1'-0"

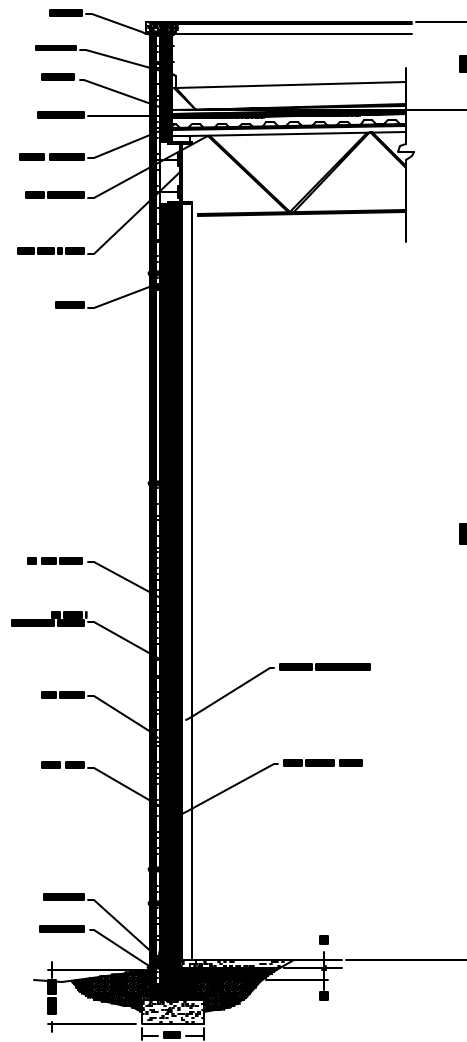


2 BUILDING SECTION  
 A2.2 SCALE: 1/16" = 1'-0"

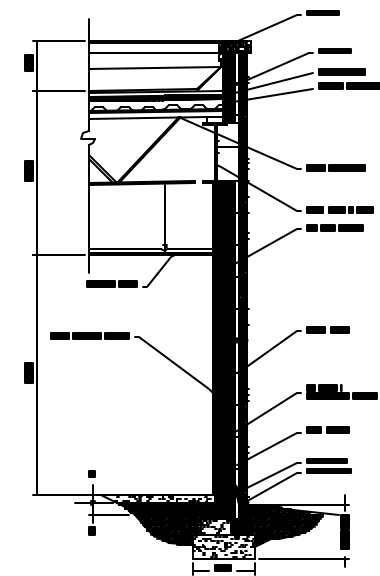
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1  
A2.2  
**WALL SECTION**  
SCALE: 1/8" = 1'-0"



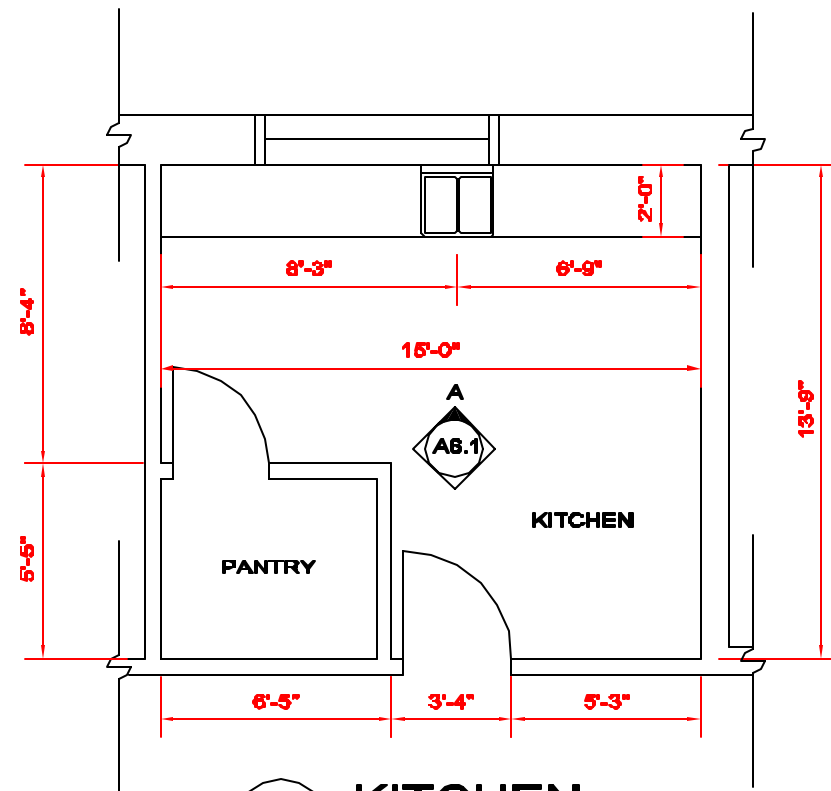
2  
A2.2  
**WALL SECTION**  
SCALE: 1/8" = 1'-0"



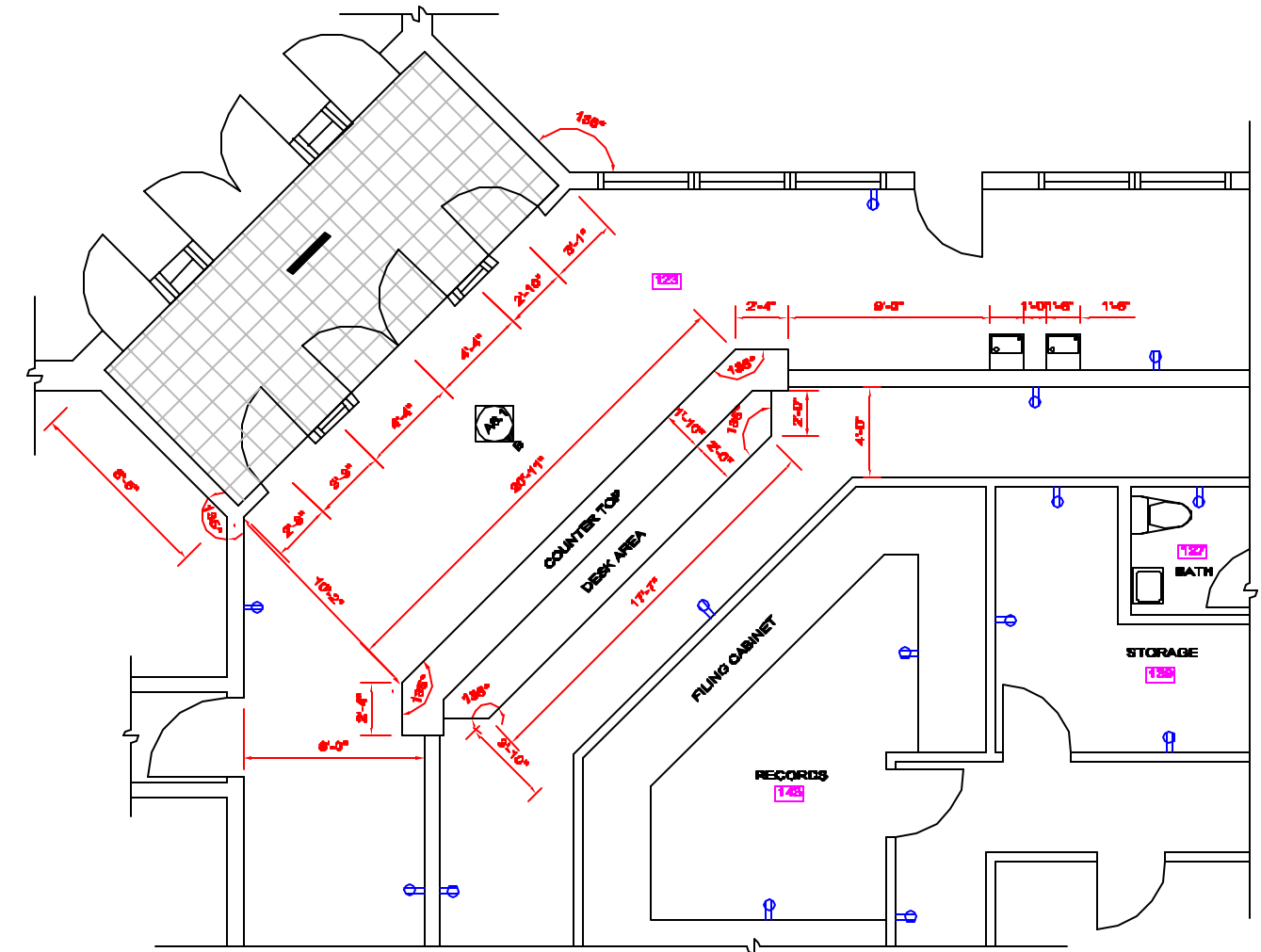
3  
A2.2  
**WALL SECTION**  
SCALE: 1/8" = 1'-0"

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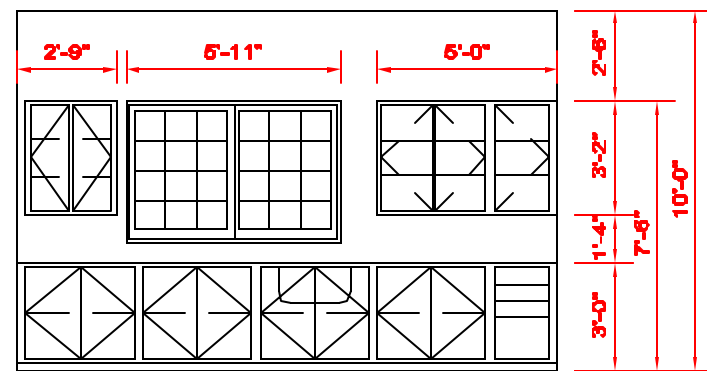
A5.1  
 SHEET 7 of 11



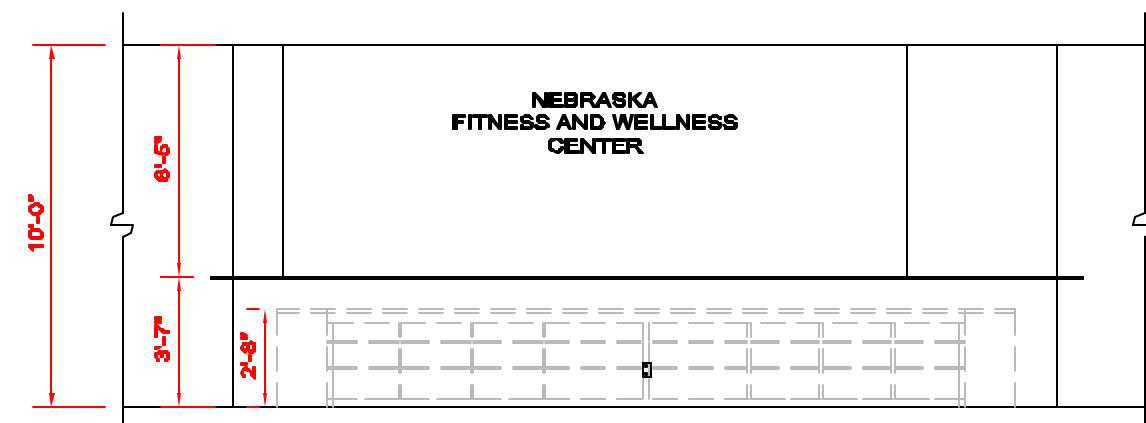
**1 KITCHEN**  
SCALE: 3/16" = 1'-0"



**2 RECEPTION AREA**  
SCALE: 1/8" = 1'-0"

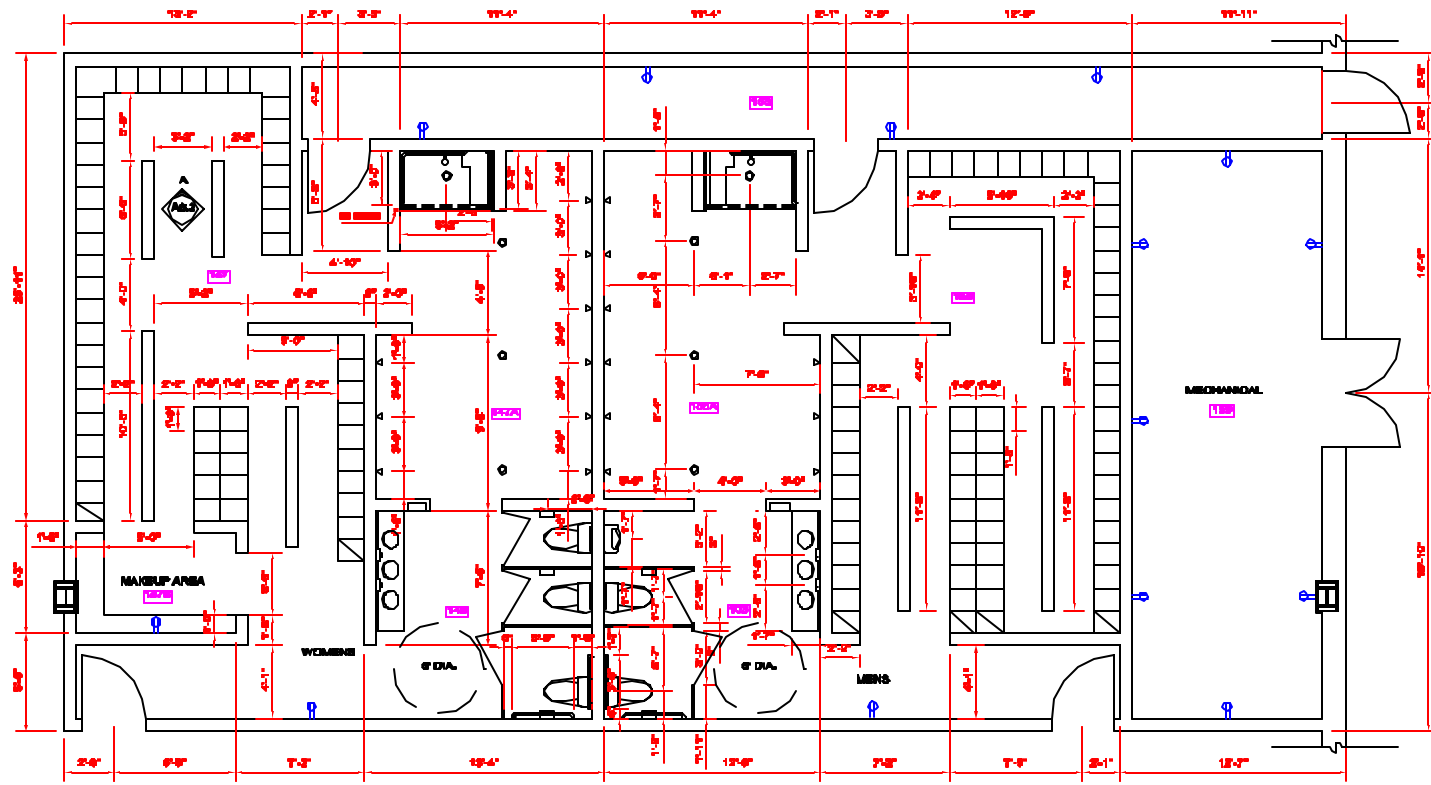


**A ELEVATION @ KITCHEN**  
SCALE: 3/16" = 1'-0"

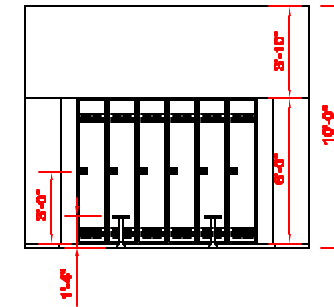


**B ELEVATION @ RECEPTION AREA**  
SCALE: 3/16" = 1'-0"

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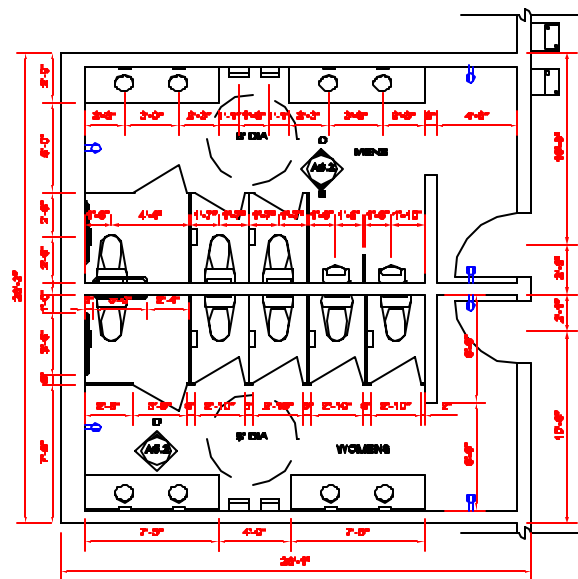


**1**  
A2.2 **LOCKER ROOMS**  
SCALE: 1/4" = 1'-0"

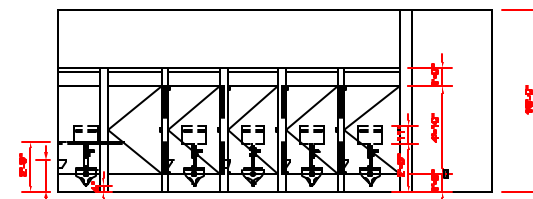


**A**  
A6.2 **ELEVATION @ LOCKER ROOM**  
SCALE: 1/4" = 1'-0"

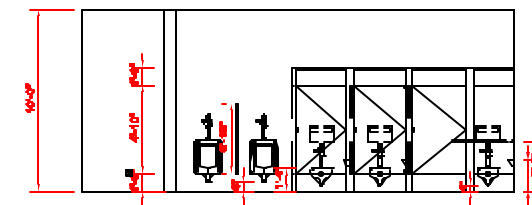
TOILET ACCESSORIES		
NO.	ITEM	MTG. HT.
TA1	TOILET HOLDER	8A2
TA2	TOWEL DISPENSER	36"
TA3	HP GRAB BAR	AA2
TA4	MIRROR	8A2
TA5	SHOWER ROD	7'-0"
TA6	HP SHOWER GRAB	26"
TA7	SOAP DISPENSER	8A2
TA8	HAND DRYER	AA2
TA9	SEAT COVER DISPENSER	AA2



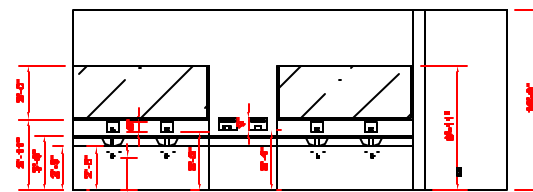
**2**  
A2.2 **RESTROOMS**  
SCALE: 1/4" = 1'-0"



**D**  
A6.2 **ELEVATION @ WOMENS**  
SCALE: 1/4" = 1'-0"

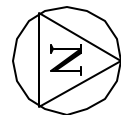
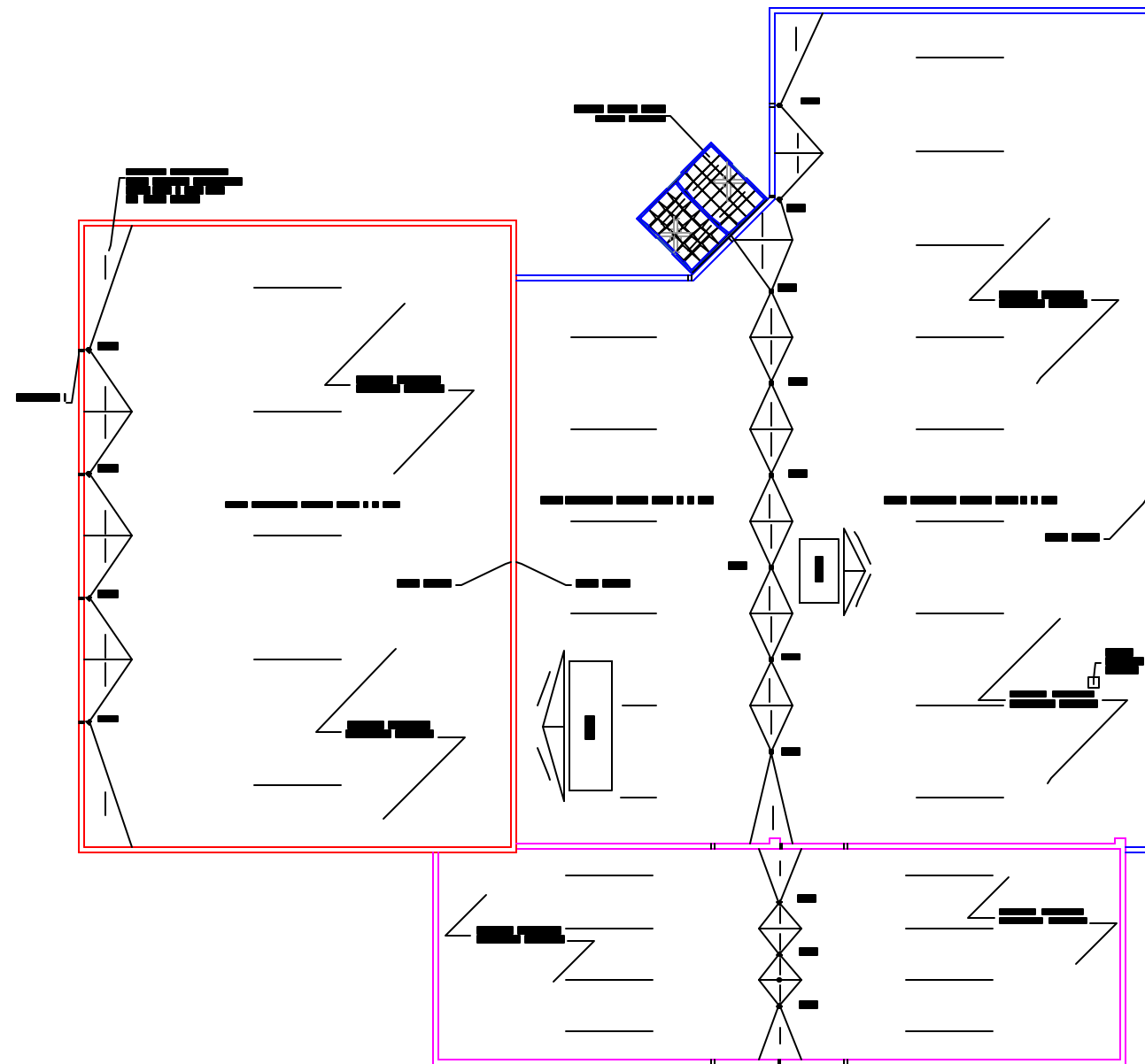


**B**  
A6.2 **ELEVATION @ MENS**  
SCALE: 1/4" = 1'-0"

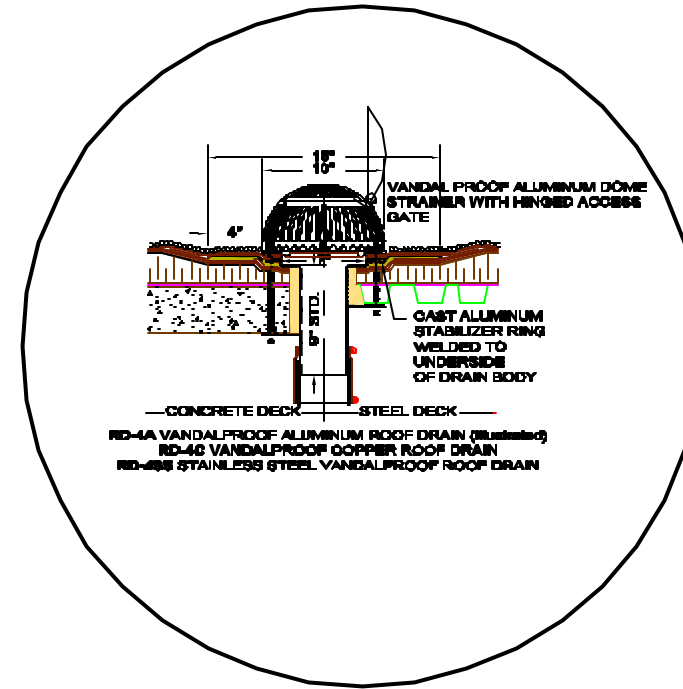


**C**  
A6.2 **ELEVATION @ MENS**  
SCALE: 1/4" = 1'-0"

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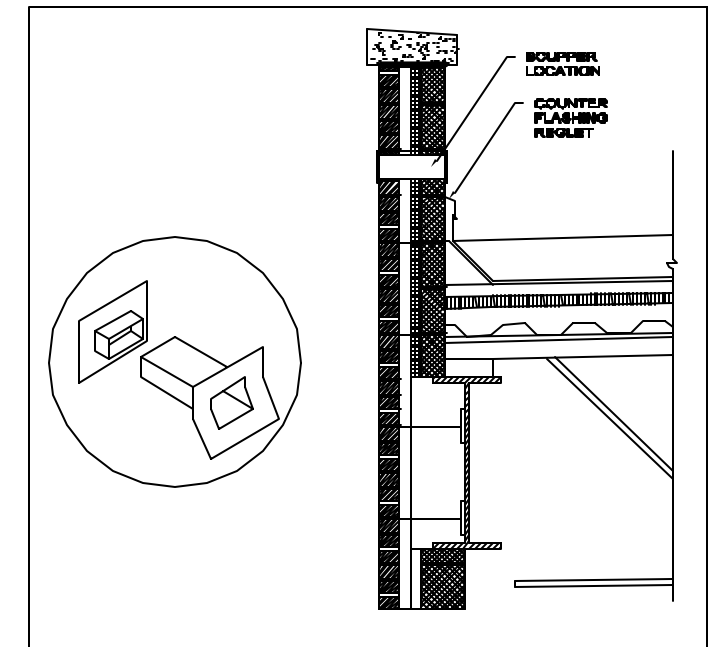
**ROOF PLAN**  
SCALE: 1/32" = 1'-0"



**ROOF DRAIN DETAIL**  
SCALE: 3/4" = 1'-0"

NOTE:

1. ALL DRAIN (R.D.) SIZE DESIGNED TO BE 4"
2. EMERGENCY OVERFLOW SCUPPERS DESIGN TO BE 6" x 4"
3. CRICKETS FORMED BY POLYSTYRENE FOAM AVAILABLE IN 1/2 - 3" THICKNESS. BOARD SIZES 2' x 8' AND 4' x 8'
4. CANOPY SLOPED AT 1/4" +/- FT. FROM CENTER, ALLOWING WATER RUN OFF AT OUTER PERIMETER.



**SCUPPER DETAILS**  
SCALE: NTS

NOTE: SCUPPER SIZE 6" x 4" x 16"

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A7.1  
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**Door Type Designation**

Door Type	Frame Style	Designation	Door Style	Designation	Hinges	Lockset	Closers	Power Supply	Exit Devices	Wall Magnets
A	Hollow Metal	Curries 16 Gauge	Wood (20 Min. Fire Labeled) w/ narrow vision lite	GRAHAM GPC	McKINNEY TA3786 five knuckle bearing hinges	SARGENT 8200 Line Mortise lock with #37 classroom function	SARGENT 250 Series			
B	Hollow Metal	Curries 16 Gauge	Wood (20 Minute Fire Labeled)	GRAHAM GPC	McKINNEY TA2731 two knuckle hinges	SARGENT 8200 Line Mortise lock with #05 office function	SARGENT 250 Series			
C	Hollow Metal	Curries 16 Gauge	Wood	GRAHAM GPC	McKINNEY TA2731 two knuckle hinges	SARGENT 8200 Line mortise lock with #04 storage/service function				
D	Hollow Metal	Curries 18 Gauge	Wood	GRAHAM GPC	McKINNEY TA3750 two knuckle hinges	SARGENT 8200 Line mortise lock with #15 passage function	SARGENT 250 Series			
E	Hollow Metal	Curries 16 Gauge	Wood (30 minute Fire Labeled)	GRAHAM CFM90	McKINNEY TA3750 two knuckle hinges	SARGENT 12-2600 Series Fireguard hold open closers/smoke detectors				
F	Galvanized hollow metal	Curries 16 Gauge	Galvanized hollow metal	CURRIES 707	McKINNEY TA3786 five knuckle hinges	SARGENT 4800 Series deadlock with 110 push/pull latch	SARGENT 250 Series			
G	Hollow Metal	Curries 16 Gauge	Steel Stiffened (90 minute Fire Labeled) with narrow vision lite	CURRIES 747	McKINNEY TA3786 five knuckle bearing hinges		SARGENT 250 Series	SARGENT 3500 Series	SARGENT 12-MD840 concealed vertical rod exit	SARGENT 1501 wall magnets

**Door Schedule**

Door Number	Door Type Designation	Dimensions and Style			
		Height	Width	Depth	Color
100A	A	7'-0"	3'-0"	Standard	Woodgrain
100B	D	7'-0"	6'-0"	Standard	Woodgrain
100C	D	7'-0"	6'-0"	Standard	Woodgrain
100D	G	7'-0"	6'-0"	Standard	Woodgrain
101	A	7'-0"	3'-0"	Standard	Woodgrain
102A	A	7'-0"	3'-0"	Standard	Woodgrain
102B	A	7'-0"	3'-0"	Standard	Woodgrain
103	A	7'-0"	3'-0"	Standard	Woodgrain
104	A	7'-0"	3'-0"	Standard	Woodgrain
105	B	7'-0"	3'-0"	Standard	Woodgrain
106	B	7'-0"	3'-0"	Standard	Woodgrain
107A	C	7'-0"	3'-0"	Standard	Woodgrain
107B	C	7'-0"	3'-0"	Standard	Woodgrain
108	A	7'-0"	3'-0"	Standard	Woodgrain
109	C	7'-0"	3'-0"	Standard	Woodgrain
110	A	7'-0"	3'-0"	Standard	Woodgrain
111A	A	7'-0"	3'-0"	Standard	Woodgrain
111B	A	7'-0"	3'-0"	Standard	Woodgrain
112	A	7'-0"	3'-0"	Standard	Woodgrain
113	A	7'-0"	3'-0"	Standard	Woodgrain
114	F	7'-0"	3'-0"	Standard	Woodgrain
117	B	7'-0"	3'-0"	Standard	Woodgrain
118	F	7'-0"	3'-0"	Standard	Woodgrain
121	D	7'-0"	3'-0"	Standard	Woodgrain
122A	C	7'-0"	3'-0"	Standard	Woodgrain
122B	C	7'-0"	3'-0"	Standard	Woodgrain
124A	A	7'-0"	3'-0"	Standard	Woodgrain
124B	D	7'-0"	3'-0"	Standard	Woodgrain
125	B	7'-0"	3'-0"	Standard	Woodgrain
126	C	7'-0"	3'-0"	Standard	Woodgrain
127	D	7'-0"	3'-0"	Standard	Woodgrain
128	C	7'-0"	3'-0"	Standard	Woodgrain
130	B	7'-0"	3'-0"	Standard	Woodgrain
131	C	7'-0"	3'-0"	Standard	Woodgrain
132	D	7'-0"	3'-0"	Standard	Woodgrain
133	B	7'-0"	3'-0"	Standard	Woodgrain
135	B	7'-0"	3'-0"	Standard	Woodgrain
137	B	7'-0"	3'-0"	Standard	Woodgrain
138	E	7'-0"	6'-0"	Standard	Woodgrain
140A	D	7'-0"	6'-0"	Standard	Woodgrain
140B	E	7'-0"	6'-0"	Standard	Woodgrain
140C	E	7'-0"	6'-0"	Standard	Woodgrain
139	C	7'-0"	3'-0"	Standard	Woodgrain
142A	C	7'-0"	3'-0"	Standard	Woodgrain
142B	C	7'-0"	3'-0"	Standard	Woodgrain
141	B	7'-0"	3'-0"	Standard	Woodgrain
143	C	7'-0"	3'-0"	Standard	Woodgrain
163	A	7'-0"	3'-0"	Standard	Woodgrain
185	A	7'-0"	3'-0"	Standard	Woodgrain
187	A	7'-0"	3'-0"	Standard	Woodgrain
188	C	7'-0"	6'-0"	Standard	Woodgrain

Window Manufacturer: Anderson Windows

Window Type	Window Style	Anderson Designation	Dimensions			Color
			Height	Width	Depth	
A	Sliding	G34	3'-11-1/4"	2'-11-1/4"	3 - 7/8"	White
B	Sliding	G44	3'-11-1/4"	3'-11-1/4"	3 - 7/8"	White
C	Sliding	G64	3'-11-1/4"	5'-11-1/4"	3 - 7/8"	White
D	Fixed	P354D	4' 0"	3' 4-13/16"	3 - 7/8"	White
E	Combination of Windows - A,B,A					

**SCHEDULES**

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**A8.1**

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FIXTURE UNIT TABULATION FOR BUILDING SEWER

Fixture Type	# Fixtures	Fixture Units Value	Subtotal Fixture Units
Water Closets	15	5	80
Urinals	3	4	12
Lavatories	17	2	34
Drinking Fountains	10	0.5	5
Sinks	1	3	3
Showers	20	3	60
Mop Sinks	1	4	4
Total Fixture Units			208

Using Standard Plumbing Code and 1/8 in fall per linear foot and 208 fixture units, Diameter of sewer pipe is 6 in.

HOT WATER HEATER

Fixture	# Fixtures	Demand	Subtotal
Lavatory	17	8	136
Sink	1	20	20
Shower	20	225	4500
Service Sink	1	20	20
Total			4878

Multiply by demand factor of 0.4  
 $4878 \times 0.4 = 1871$

Size hot water heater to hold at least 1871 gallons

FIXTURE UNIT TABLE FOR DOMESTIC WATER SERVICE

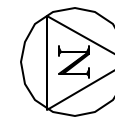
Fixture Type	# Fixtures	Fixture Units Value	Subtotal Fixture Units
Water Closets	15	5	75
Urinals	3	5	15
Lavatories	17	1.5	25.5
Drinking Fountains	10	0.25	2.6
Sinks	1	4	4
Showers	20	4	80
Mop Sinks	1	3	3
Total Fixture Units			205

SIZE MAIN DOMESTIC WATER SUPPLY LINE

Length of water line = 1000 ft.  
 Multiply by 1.5 for friction loss  
 Allowable street pressure 80 psf  
 Minimum pressure at remote fixture -18 psf  
 Meter Loss -12 psf  
 Backflow preventer loss -10 psf  
 Do not use under 3 psi per 100 feet Excess Available Pressure 83 psf  
 1.53 less than 3  
 Use 3 psi per 100 feet

Using 205 fixture units, look at the Standard Plumbing Code for gpm (gallons per minute)  
 Interpolate between 180 F.U. giving 85.5 gpm and 220 F.U. giving 95 gpm  
 Standard Plumbing Code specifies 95 gpm for 205 F.U.

Using 95 gpm and 3 psi per 100 ft. friction loss and the Standard Plumbing Code again,  
 Size of pipe is over 2 - 1/2 in and velocity 5 ft/sec  
 Use 3 in pipe, giving still around 5 ft/sec



**PLUMBING PLAN**

SCALE: 1/32" = 1'-0"

2002 ASHRAE DESIGN COMPETITION  
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 ARCHITECTURAL COORDINATOR: PROFESSOR R. POWELL

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