

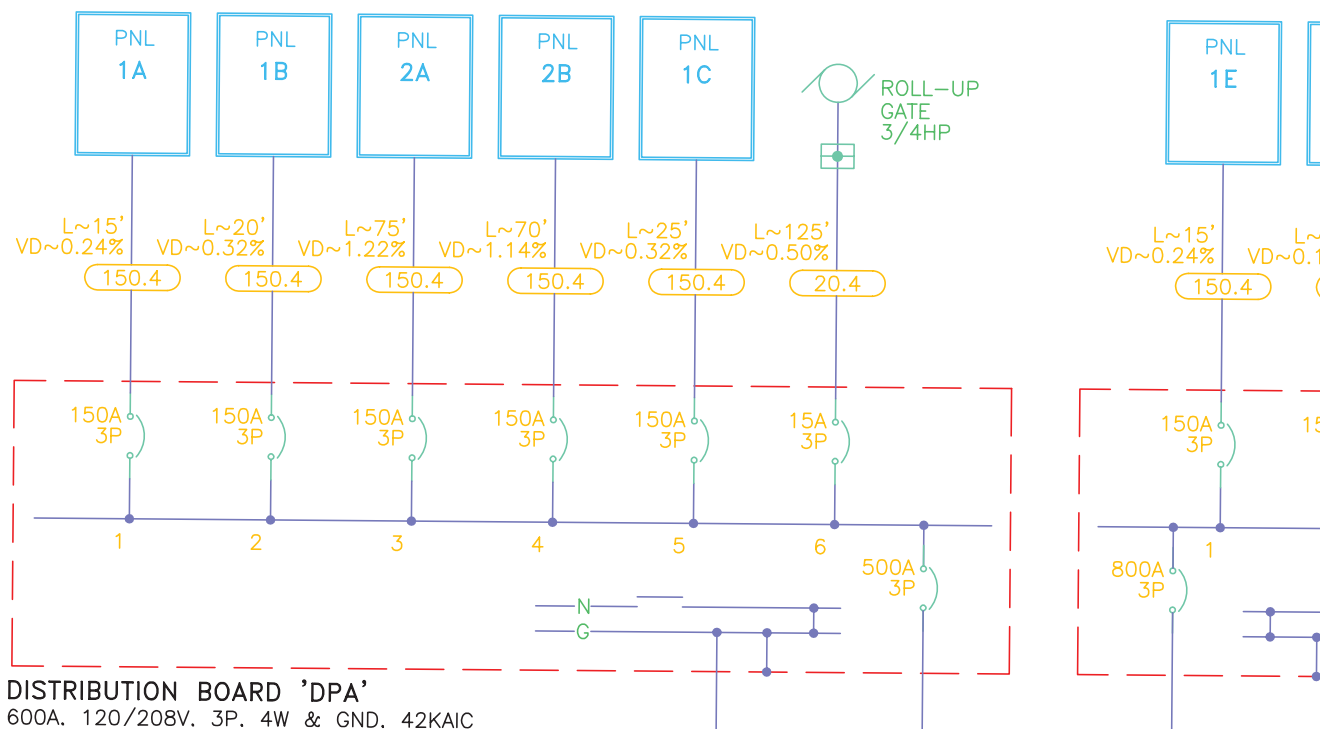
*Electrical
Depth*

Introduction

Rio Hondo Library and Learning Resource Center is 93,740 square feet which borders on a project that might be too large for only one transformer, however, there are a small number of panelboards and the distribution panels are sized for a lot of future growth. This depth investigates combining the two transformers into one large transformer and the cost and the affect on the system. This also goes into a depth on a new control system for the lighting redesign.

Transformer Configurations

This building runs off two step-down transformers to provide power at both 277/480V and 120/208V. T-1 is rated at 150 KVA while T-2 is rated at 225 KVA. T-1 steps down the power for the first distribution panel running at 120/208V that services panels 1A, 1B, 2A, 2B, 1C, and the roll up gate that is running at 3/4 HP. T-2 steps down the power for the second distribution panel running at 120/208V that services panels 1E, 1D, 2C, 2D, 1F, 2E, and 1G. Two sets of 2.50" conduit with conductors sized at (4) phase, 250 KC-MIL and a #2 sized ground wire carries the power that runs from T-1 to the distribution board while three sets of 3.00" conduit with conductors sized at (4) phase, 300 KCMIL and a #1/0 sized ground wire carries the power that runs from T-2 to its distribution board. The single line diagram can be found in the appendix.



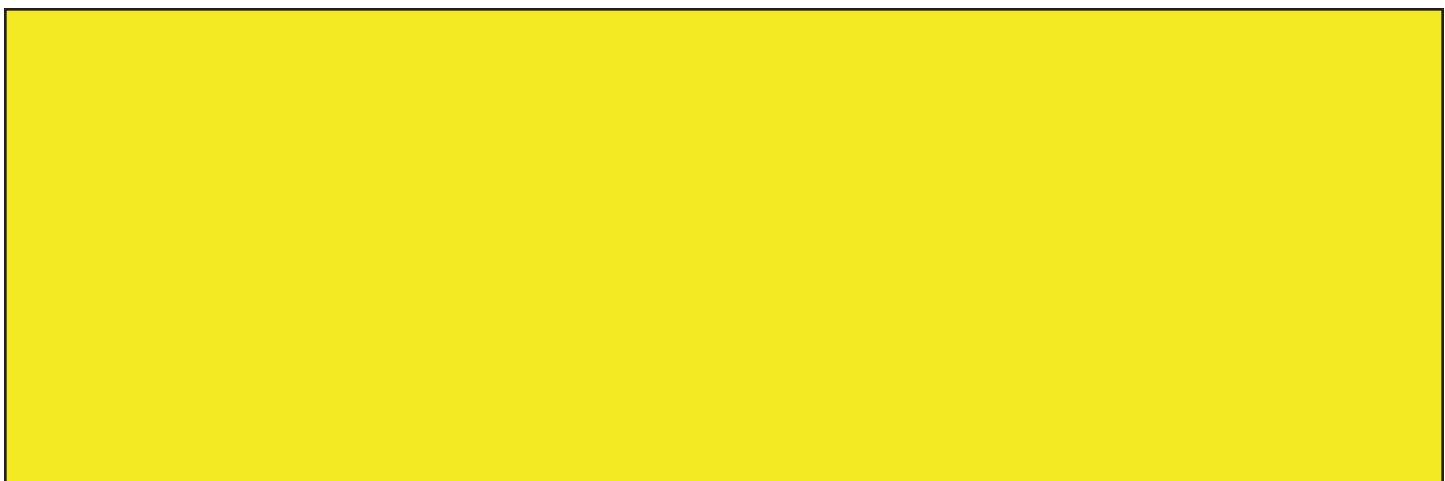
		Main Distribution Panel DSA		KVA				
Poles	BKR	Service	Total	A	B	C		
3	150	Panel 1A		7.74	8.28	7.3		
3	150	Panel 1B		10.44	9.54	8.46		
3	150	Panel 2A		10.5	10.72	9.18		
3	150	Panel 2B		9.44	8.57	10.99		
3	150	Panel 1C		7.5	7.5	7.58		
3	150	Roll Up Door		0.38	0.38	0.38		
		Space		0				
		Space			0			
		Space				0		
		Space	0					
		Space			0			
		Space		0				
		Space			0			
		Connected load per phase		46	44.99	43.89		
		Load Summary		Conn. KVA	Deman Factor	Demand KVA		
		Type "L" Continuous Loads		0	1.25	0		
		Type "R" Receptacles (First 10KVA)		10	1	10		
		Type "R" Receptacles (Over 10 KVA)		107.84	0.5	53.92		
		Type "M" Miscellaneous Loads		9.25	1	9.25		
		Type "A" AC Loads		7.8	1	7.8		
		Type "K" Kitchen Loads			0.65			
			Largest Motor Load		0.25			
			Total	134.88		80.97	Amps	Size
							224.7568	600 A
		Main Distribution Panel DSA		KVA				
Poles	BKR	Service	Total	A	B	C		
3	150	Panel 1E		13.04	11.56	11.66		
3	150	Panel 1D		11.32	11.7	10.26		
3	150	Panel 2C		14.3	12.52	12.34		
3	150	Panel 2D		6.84	5.94	4.86		
3	150	Panel 1F		10.97	9.18	9.86		
3	150	Panel 2E		12.77	10.67	15.17		
		Panel 1G		10.32	9.12	8.14		
		Space			0			
		Space				0		
		Space	0					
		Space			0			
		Space		0				
		Space			0			
		Connected load per phase		79.56	70.69	72.29		
		Load Summary		Conn. KVA	Deman Factor	Demand KVA		
		Type "L" Continuous Loads		0	1.25	0		
		Type "R" Receptacles (First 10KVA)		10	1	10		
		Type "R" Receptacles (Over 10 KVA)		143.28	0.5	71.64		
		Type "M" Miscellaneous Loads		38.48	1	38.48		
		Type "A" AC Loads		30.78	1	30.78		
		Type "K" Kitchen Loads			0.65			
			Largest Motor Load		0.25			
			Total	222.54		150.9	Amps	Size
							418.8688	800A

Main Distribution Panel DSA								
Poles	BKR	Service	Total	A	B	C		
3	150	Panel 1A		7.74	8.28	7.3		
3	150	Panel 1B		10.44	9.54	8.46		
3	150	Panel 2A		10.5	10.72	9.18		
3	150	Panel 2B		9.44	8.57	10.99		
3	150	Panel 1C		7.5	7.5	7.58		
3	150	Roll Up Door		0.38	0.38	0.38		
3	150	Panel 1E		13.04	11.56	11.66		
3	150	Panel 1D		11.32	11.7	10.26		
3	150	Panel 2C		14.3	12.52	12.34		
3	150	Panel 2D		6.84	5.94	4.86		
3	150	Panel 1F		10.97	9.18	9.86		
3	150	Panel 2E		12.77	10.67	15.17		
3	150	Panel 1G		10.32	9.12	8.14		
		Space		0				
		Connected load per phase		125.56	115.68	116.18		
		Load Summary		Conn. KVA	Deman Factor	Demand KVA		
		Type "L" Continuous Loads		0	1.25	0		
		Type "R" Receptacles (First 10KVA)		10	1	10		
		Type "R" Receptacles (Over 10 KVA)		251.12	0.5	125.56		
		Type "M" Miscellaneous Loads		47.73	1	47.73		
		Type "A" AC Loads		38.58	1	38.58		
		Type "K" Kitchen Loads			0.65			
			Largest Motor Load		0.25			
			Total	347.43		221.87		
							Amps	Size
							615.8676	1231.735

The new single distribution panel would be sized at 1200A which would allow for ample growth of the system. The new wire size for this distribution panel would be 3P, 4W and GND, 100KAIC.

Below is a chart of a cost comparison of the two systems:

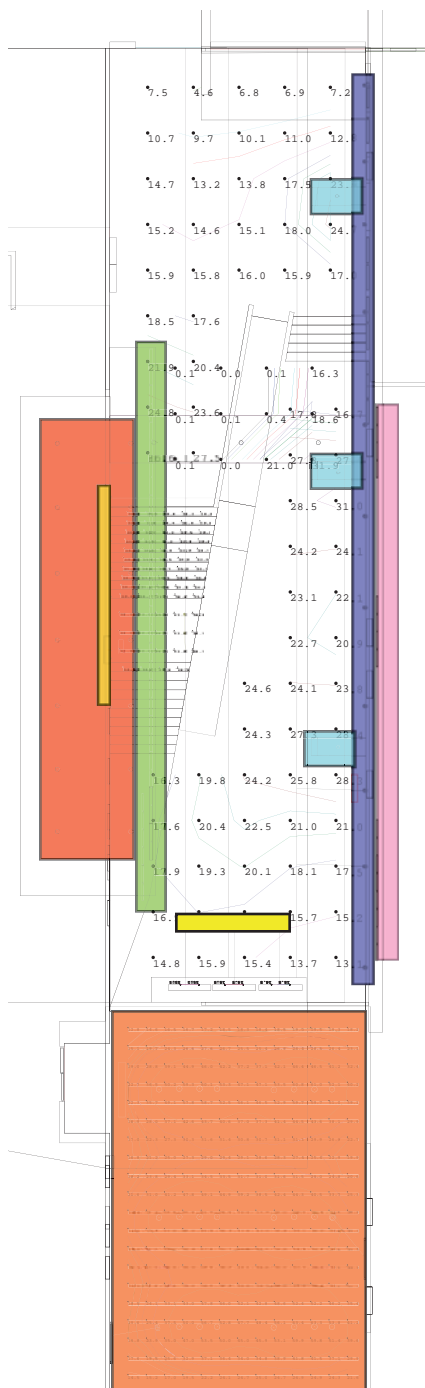
	Transformer	Cost	Circuit Breaker	Cost	Distribution Panel	Cost	Fuse Size	Cost	Total
New System	500 KVA	20783	1200A	106	1200 A	2450	1200	300	23639
Old System	150 KVA + 225 KVA	15488	500 A + 800 A	212	600 A + 800 A	4542		50	20292



Another part of the electrical depth is the new control system for the redesign of the lighting system. Since the library is open for the majority of daylight hours for sunny California the necessity for a fully dimmable system is absolute. With all glass facades on the larger group areas choosing to zone luminaires by location of daylight coming into the space seemed obvious. With the new lighting control system by Super Dim, luminaires will be able to be dimmed by the amount of daylight entering the space. Photocells will receive the light and dim the assigned luminaires. It provides architectural dimming levels: 1% for T5 and T5HO, and 3% for Compact Fluorescents. See below for controls.

Lighting Zones

- Green
- Yellow
- Red
- Purple In columns - sky blue
- Orange
- Yellow
- Green



The first pink lighting zone is the linear wallwash fixture F04. These are zoned together because they all serve the same purpose in the same location. During the day hours these lights have the potential to be dimmed down to as much as 1% with the daylight entering the space through the skylight.

The navy lighting zone is the recessed adjustable F17 that is located in the wall above the second floor. These are zoned and circuited together due to the fact their purpose is to light the ceiling and they run parallel to the skylight. So for most hours of the day these can be dimmed due to the fact that the skylight will be naturally highlighting the ceiling.

The next lighting zone moving away from the skylight are more of the recessed adjustable F17 fixtures. These are zoned together because their photocell will be located closer to the ground level because they are the primary source of light for the walkway.

The green lighting zone are all the cove light F05 fixtures and also the linear wallwash that is located below the stairwell. These luminaires have the ability to be dimmed but will mostly be staying at output to create a uniform lighting effect with all the daylight spilling in from the skylight located on the opposite side of the angled ceiling.

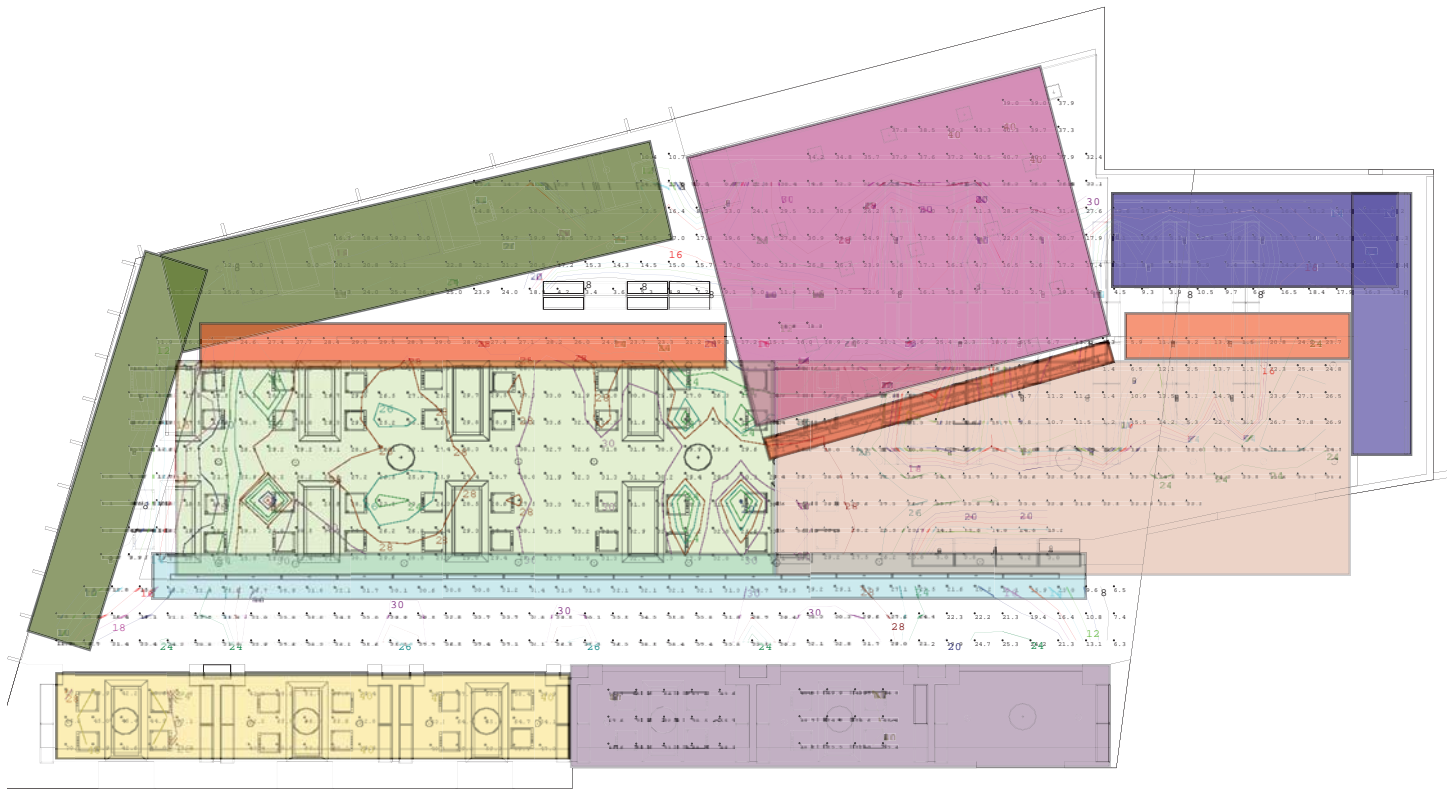
Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F08	Fluorescent	Recessed Step Light	"Heli" series, 5-1 1/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	20w	(1) T9	85	3500
F10	Fluorescent	Recessed 6" Downlight	"Grid in Limit" series, includes Reflector FL-20 degrees and Glass UV Q Top	42w	(1) TT	82	3500
F17	Halogen	Adjustable Light	"Classic" series	50w	(2) 50w (1) 50w	82	3000
F21	Halogen	Juno Track Light	Erco "Nadir" series, 30 degree angle	50w	MR16 (1) PAR	100	3050
F22	Halogen	Recessed Floor luminaire		75w	30 (1) 28w	81	2830
F04	Fluorescent	Wallwash Troffer	"Avenue A" series	28w	T5	82	3500

The red lighting zone are the downlights, F10, located in the floating ceiling . Staying at output for the majority to achieve the correct light level on the stairwell and corridor.

The orange lighting zone is the gallery space where the track lighting is located. The track has the ability to turn on/off fixtures that do not need to be used conserving energy.

The last lighting zone is the yellow lighting zone. This zone consists of the step light from Deltalight and the recessed floor uplights from Erco. These luminaires will not be dimmed due to the importance. The uplights highlight the main focal point in the space and the step lights highlight the main stairwell for the entire library.

Photocells will be located along the ceiling for the blue zone and near the walkway for the sky blue zone. The pink and green zones will have cells near the walls they are highlighting.



Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28w T5	82	3500
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	32w	(1) TT	82	3500
F12	Fluorescent	Recessed 6" WallWash	"Haze" Alzak reflector	32w	(1) TT	82	3500
F18	Fluorescent	Indirect Pendant Recessed 2'x2'	"Metro" series, low profile round housing 11" diameter luminous acrylic diffuser	42w	(4) TT	82	3500
F23	Fluorescent	Square	"Sky" series, Bi directional	14w	(4) 14w T5	82	3500

The first lighting zone is the dark green that follows the perimeter of the glass facade. These are zoned to have ability to be fully dimmed to the 3% when the daylight is at its full peak in the space.

Following along the perimeter the yellow zone is circuited and grouped together because of the large windows in the small space. The ability to dim these should also be addressed for energy conservation.

The purple zone consisting of the 6" wallwash F12 and the Metro pendant, F18, will have to stay at high output because this area gets the least amount of bounce from the daylight entering the space. This area is also a work area so to achieve a minimum of 30 fc is a requirement.

The blue zone of F04, cove lights are separated from the other side because even if the opposite side is receiving enough daylight the other side must be tested because of the main walkway through the space.

The green and pink area is zoned separately because in most of the studies the daylight was easily reached the middle of the space but at certain times is when it began to drop off further in the space. If they are on separate circuits than the dimmability will still pay off.

The magenta zone is comprised of the Sky, F23 fixture. This zone will remain at full output because of location of the stacks.

The red zone, will have the ability to be dimmed while the daylight is sufficient to light the space alone.

The dark blue zone, will remain at full output. This zone is kept at full output because it is washing the wall and keeping the cave-like feeling out of this small stack area. These linear wallwashers will remain a highlight point.

Type	Source	Name	Notes	Wattage	Lamp	CRI	CCT
D01	Fluorescent	Decorative Pendant - 3'	"Club C" series, Deltalight, Halospot 111, Alu-reflektor	75w	(4) 75w	82	3500
F10	Fluorescent	Recessed 6" Downlight	5-11/16" aperture, horizontal lamp orientation, "haze" Alzak reflector with white trim ring, emergency battery pack as required by the Electrical Engineer	42w	(1) 42w TT	82	3500
F13	Compact Fluorescent	Surface Mounted Cylinder - 6"	Medium beam distribution, haze Alzak reflector	42w	(1) 42w TT	82	3500
F14	Fluorescent	Stack Light		54w	(2) 54w T5HO	85	3500
F05	Fluorescent	Slot Light	"Ashley" series, integral electronic ballast, emergency ballast as required by Electrical Engineer	54w	(1) T5HO	85	3500
F04	Fluorescent	Recessed 1x4 Wallwash Troffer	"Avenue A" series	28w	(1) 28wT5	82	3500

The blue zone that contains the surface mounted cylinders, F13, that follow the perimeter of the glass facade are zoned together.

As you go back further into the area the zones start following the shape of the building. Each area contains the stack lights. The now indirect/direct fixture from Focal Point, F10. Keeping zones that follow the shape of daylight will allow the most energy conservation.

The red zone are the downlights, F10, that are recessed into the floating ceiling. These will remain at full output due to the workplane underneath.