
Selecting a New Spotlight at the M.T.C. (Canada's oldest regional theatre upgrades lighting)

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1.) INTRODUCTION

Recently the Manitoba Theatre Centre decided to replace many of their old and obsolete stage lighting fixtures (luminaires). M.T.C. is Canada's first and longest running regional theatre having been established 1958. The current theatre, finished in 1970 was (and still is) considered to be one of the better designed and equipped theatres in Canada. M.T.C. has always had high standards in lighting design and frequently employs many top lighting designers from both Canada and the U.S.A. The author is pleased to be one of them.

In the late 1990's, M.T.C. began the process of replacing their original lighting equipment. Most of it now had served for almost 30 years. The original 80 (6.0Kw) dimmers (later 100) were replaced with 384 (2.4Kw) dimmers. The theatre was rewired with new circuits and a new Strand 530 lighting console was added (with full tracking back-up of course).

Finally, it was now time to replace some of the obsolete lighting fixtures with new units. Although for the most part the old fixtures still performed well, M.T.C. decided however that they should be retired, as parts were no longer available and they were difficult to maintain. As a professional lighting designer and consultant I was engaged by M.T.C. to assist them in the process. I was delighted (don't go there) to be able to help. Working with Denis Crymble the Head Electrician, we both felt it should be an easy matter to find new modern fixtures to replace the 30 year old ones. We were very wrong!

The task of selecting new fixtures proved much more difficult than anticipated. What follows is a summary of the evaluation process that we went through over a period of several weeks. We decided the best method of choosing a new lighting fixture was to actually evaluate them in the theatre in actual hanging positions. I looked at the performance of the fixtures mostly from the lighting designer's point of view. Denis scrutinized the fixtures in respect to their construction, operation, maintenance and overall performance, from a head electrician's point of view.

We discovered that you can't evaluate a lighting fixture based on data sheets, on manufacturer's claims or even on actual light meter readings. Only after proper visual evaluation and comparison should a luminaire be selected for a specific lighting application. We discovered that it is the 'visual performance' of a fixture that matters and not just the light output. We also learned that performance must also be judged from the audience's point of view (not just from the stage). We also demonstrated that the brightest fixture (photometrically) is not always the brightest or best as far as

the human eye is concerned.

2.) THE OBJECTIVES

Our first objective was to find replacement luminaires for Front of House (FOH) lighting applications. FOH lighting includes all lighting on the audience side of the proscenium arch. Typically, high wattage, long throw (narrow angle) spotlights are used from FOH lighting positions (bridges, catwalks and galleries) to provide all front lighting to the stage.

Specifically, the theatre needed to find replacement fixtures for 66 obsolete FOH fixtures that they wished to retire. These fixtures consisted of: 12 Strand Patt 293's (2K), 12 Strand Patt 253's (2K) and 42 Century 8x9's (1K). All of these luminaires were over 30 years old.



Shown at left is an example of the Strand Patt 253 (24 degree) and the Strand Patt 293 (15 degree) series fixtures. These fixtures used 2000 watt lamps and had a very nice and even beam distribution. The 293 was well suited and often used as a followspot. At M.T.C. the 293's and the 253's were ideally suited for use from the 1st. and 2nd. Lighting Bridges.

The Strand Patt 293's 253's and the 8x9's were also used extensively from the right and left Side Galleries. These multi-level positions (similar to Box Boom positions) provide typical throw distances of 30 to 60 feet .

Could we find a 'zoom' type spotlight (one with a variable spread angle) to suite all of our FOH lighting requirements? That was our plan - once we realized that it was almost impossible to find a fixed focal length spotlight of 15 degrees (same as the existing Strand Patt 293's).

So our mission seemed simple and we set out to find a new modern zoom fixture that would perform well between 15 and 24 degrees AND that would at least perform as well as the old Strand Patt 293 did at 15 degrees.

3.) THE IDEAL LUMINAIRE

We decided that our ideal lighting fixture would have the following minimum requirements.

FIXTURE TYPE:	zoom, ellipsoidal spotlight.
WATTAGE:	2Kw. maximum.
BEAM SPREAD:	adjustable 15-24 degrees minimum, (10-25 degrees ideal).
ILLUMINATION: at 15deg.	130 FC at 45 ft. - at 15 degrees (same as old Strand Patt 293's)
ILLUMINATION: at 23deg.	Equal or better to SL6x16-1K at 23 deg..
MECHANICAL:	must be well engineered, durable, and easy to maintain.
ELECTRICAL:	must be safe, must be CSA approved.
OPTICAL:	must be easy to align, peak to flat to cosine.
DUTY CYCLE:	must allow 4-6 hrs. use at dimmer setting of 80% (festivals).
BEAM DISTRIBUTION:	must have even symmetrical distribution, cosine to flat field.

ACCESSORIES:	must take gobo holder and 'wide' gate accessories.
QUANTITY NEEDED:	60 spotlights total.

4.) THE CONTESTANTS

We approached a number of lighting manufacturers and invited them to submit products for our complete evaluation and testing based on our basic requirements. Through the cooperation of local, national and international lighting companies we received the following products from Altman, Strand, E.T.C., Robert Juliat and Selecon.

- 1.) ALTMAN 1K-L8 (14-24 zoom) (1000 watts)
- 2.) ALTMAN SHAKESPEARE (15-35 zoom) (750 watts)
- 3.) ETC SOURCE 4 (15-30 zoom) (750 watts)
- 4.) ROBERT JULIAT 611 SX (11-26 zoom) (1000 watts)
- 5.) ROBERT JULIAT 711 SX (10-25zoom) (2000 watts)
- 6.) SELECON, PACIFIC (12-28 zoom) (1000 watts)
- 7.) STRAND SL-1532 (15-32 zoom) (575 watts)
- 8.) STRAND CANTATA (11-26 zoom) (1000 watts)

We also considered other manufacturers including; ABD, CCT, Niethammer and Mole Richardson. As these companies are not well represented in Canada and we felt that receiving, product, service and support from them would difficult.

5.) THE PROCEDURE

1.) We wanted to evaluate the new fixtures in a typical lighting position, zoomed to 15 degrees in order to best do a comparison with the old Strand Patt 293's. We all loved the performance of the 293's and we wanted to make sure that any new fixture would at least equal it's performance. At 15 degrees the 293's produced a very usable pool of about 12 feet' in diameter (at 45 feet).

2.) All 8 sample fixtures and the Patt 293 reference fixture were mounted on the #2 Lighting Bridge and focused 'straight in' to the downstage edge of the stage, (45 feet). All units used the highest wattage lamp recommended by the manufacturer. All units were powered by a thyrister dimmer with a measured output of 115 volts A.C. (measured with a 'Fluke' RMS multimeter). All fixtures were focused with a hard edge (on the shutter plane), zoomed to 15 degrees (or as close as possible) and adjusted for the most even, useful, symmetrical field. (ie even distribution with no hot spots).

FROM THE STAGE

3.) First we evaluated the pools of light from the stage - from the point of view of a lighting designer during a focus session. We noted the 'visual' qualities of each beam (in respect to the field being: even, smooth, and symmetrical - or not). We also noted which fixtures seemed to be the 'best'. in comparison with the reference Patt 293 (very even cosine distribution).

4.) Next we took light meter readings. The central beam illumination of each fixture was measured and recorded. All central intensity readings were taken on axis and at four points around and immediately adjacent to the central axis - all at head height (5'-6" above floor). The highest illuminance reading (fc) found by this method was recorded for each fixture. Illuminance readings were taken incident (90 deg) to the source. The meter used was a Sekonic L28c (checked with a

Sperry SLM-110), at a lens to meter distance of 45.0 feet.)

FROM THE AUDIENCE

5.) Finally we evaluated and compared all fixtures 'visually' - from the audience point of view (in the auditorium). We noted which 'looked' the best, 'seemed' to have the best light output and 'appeared' to have the most useful field. (The results were both surprising and alarming).

6.) THE RESULTS

As we looked at the difference in the fixtures from both the stage and the auditorium, it became apparent that the qualities that we liked the best from the stage - were not the qualities that we liked the best from the audience. Further and even more important, fixtures that were physically brighter (measured with a light meter) often when viewed from the audience actually appeared less bright than their counterparts.

We were astonished to note that not one of the new lighting fixtures performed as well as the old Strand Patt 293 - in respect to light output. The 293's produce about 130 FC at 45 feet. Of all the fixtures tested most ranged from about 65-120 FC. We attribute the efficient performance of the Patt 293 partially to its' large diameter lens (and large physical size).

After extensive testing and evaluations on a number of different occasions, Denis and I finally came up with the three finalists. They were the Robert Juliat (2Kw), the ETC Source-4 (750 w.) and the Selecon Pacific (1Kw). Details are as follows:

The Robert Juliet SX711 (2000w) was actually the brightest of all and almost matched the performance of the old Patt 293. (115 FC compared to 130 FC). It had terrific optics and a great looking beam. It had three big disadvantages however and was rejected due to: (1) it had a fan, (2) it had awful red halation around the beam edge and (3) it was very expensive (The theatre could only afford half of what was needed). We also expected better light output than produced.

The ETC 1530 Zoom (750w) was a surprisingly good performer from the light output point of view. It produced 120 FC (compared to the 293's 130 FC). The ETC however had very poor light distribution, with an asymmetrical and uneven beam. It was considered to be unsuitable for this reason. The ETC also had another big disadvantage, when set at 15 degrees, (the smallest), the beam was clearly more like 16-18 degrees, so it was also rejected because it was just too big, for our applications, even at it's smallest setting. It made no sense to buy a zoom and always keep it at it's smallest setting with a beam that is still too large for most FOH lighting applications.

Although the Selecon Pacific 12-28 Zoomspot (1000w) was the third 'brightest' of all fixtures tested, - it actually 'appeared' slightly brighter than both the Robert Juliat and the ETC. This was due to its' very even smooth beam and slightly 'cooler' color temperature. Although the 12-28 only produced 90 FC (at 15 degrees) it even seemed as bright as the Patt 293's 130 FC, when evaluated at a distance. The beam characteristics were beautiful and were very close to an ideal cosine distribution. We liked everything about this luminaire. Clearly this was the winner. See complete details below:

7.) AND THE WINNER IS.....



The Selecon, Pacific 12-28 (from New Zealand) proved to be an exceptional luminaire and an outstanding performer in all

respects, optically and mechanically. Compact in size and lightweight, the Pacific seems to be well designed, well constructed, and well suited to the needs of professional theatre lighting. The fixture uses a unique flat 'cold' mirror design (dichroic) to remove much of the UV and IR from the beam. The heat from the base down lamp is directed upwards, through the mirror and then into a large external 'heat sink'. The result is a visibly 'cooler' beam, and a cooler fixture.

We also compared the Pacific 12-28 to a Strand 6x16 1000 watt axial Leko as we wanted to see how it performed when set to a wider beam spread setting.. We mounted both fixtures in the #1 Lighting Bridge and focused them to the stage about 25 feet away. Each fixture was adjusted for optimum performance with an even beam and a sharp edge. The size of the Pacific was adjusted to match the size of the 6x16 (23 degrees.) Although the Strand 6x16 produced higher light meter readings (145 vs 80 FC), the Pacific had a better looking beam and was clearly the better overall performer.



The Pacific series includes the 12-28 Zoom, a 23-50 Zoom and 20, 30, 40, 50 or 90 degree fixed units. Selecon provides a standard three (3) year warrantee on all Pacific series products. The Selecon Pacific series has been well accepted in Europe and Asia now for over a year. The Selecon Pacific series is available in 575 or 1000 watt versions for the North American market (600 and 1000 w./230v, Europe and Asia). The Pacific series has just recently received CSA approval for use in Canada.

We especially liked the color coded lens knobs, under the lens barrel. This allows one to easily identify the beam spread of any unit, from the floor below. Lamp housings are also color coded indicating either a 575 or 1000 watt lamp. We also liked the rotatable barrel.

We could find no real problems with the Pacific 12-28 Zoomspot. The fixture is easy to adjust and align. Although the Gobo and Color Frame sizes are yet another size for the electricians department to stock, this should not be a problem to all except the most electrically challenged members of the theatre's IATSE crews.

Selecon products are sold and supported in Canada by [Johnson Systems Inc.](#) and by Jack Frost. Ltd. (Thanks Shaun, Matthew and Paul). We were very impressed with the quality of product and technical information that both Selecon and Johnson Systems Inc. provided. Selecon also has a web site: [Selecon, New Zealand](#) and CD-ROM product information.

We believe that this high performance luminaire with it's versatile zoom range of 12-28 degrees, will prove to be an ideal luminaire for all FOH lighting at the Manitoba Theatre Centre. M.T.C. now plans to purchase 60 new Selecon Pacific 12-28 zooms (1000 watts).

8.) SUMMARY OF TEST RESULTS

1.) Altman 1K-L8 (14-24) (1000 watts)	rejected - poor construction
2.) Altman Shakespeare (15-35) (750 watts)	rejected - poor overall performance
3.) ETC Source-4 (15-30) (750 watts)	rejected - poor uneven light distribution
4.) Robert Juliat 611 SX (11-26) (1000 watts)	rejected - poor performance with BTR lamp
5.) Robert Juliat 711 SX (10-25) (2000 watts)	rejected - due to cost and fan.

6.) Selecon, Pacific (12-28) (1000 watts)	The Winner!
7.) Strand SL1532 (15-32 (575 watts)	rejected - 575 watt max. nice, but output low
8.) Strand Cantata (11-26) (1000 watts)	rejected - only average performance.

Please see DETAILED TEST RESULTS at the end of this document.

9.) DETAILED TEST RESULTS

ALTMAN 1KL-8

Luminaire: ALTMAN 1KL-8, ZOOM
 Degrees: 14-24
 Lamp: FEL 1000 watts
 Measured at: 14 degrees
 FC: not acceptable! - poor low light output
 Actual CI: not measured, very poor
 Claimed CI: 490,000
 Field: weak, uneven
 Mechanics: poor construction, sticky shutters, ruff slides.
 Notes: smoked! (due to new manufacture?)
 Rating: 0 Stars, poor overall performance.

rejected - poor performance

ALTMAN S1535

Luminaire: ALTMAN S-1535, SHAKESPEARE ZOOM
 Degrees: 15-35
 Lamp: EHF-750 watts
 Measured at: 15 degrees
 FC: average to poor light output
 Actual CI: not measured
 Claimed CI: 351,000 at 15 degrees
 Field: weak, uneven, impossible to align.
 Mechanics: poor construction, sticky shutters, ruff slides.
 Notes: Rejected due to uneven field & poor alignment
 Rating: 2 Stars, poor overall performance.

rejected - poor performance

ETC SOURCE-4 15-30

Luminaire: ETC SOURCE-4 15-30, ZOOM
 Degrees: 15-30
 Lamp: HPL-750/115V/300 hrs.
 Measured at: 15 degrees (actual degrees 16-18)
 FC: 120 fc
 Actual CI: 243,000 at 15 deg.
 Claimed CI: 355,000 at 15 deg.
 Field: uneven, spotty and splashy.
 Mechanics: hard to optically align, very bizarre yoke.
 Notes: Very good light output, but very uneven field.
 Rating: 4 Stars, good light, but hot uneven field.

we liked the output but hated the distribution (and poor alignment)

ROBERT JULIAT 611 SX

Luminaire: ROBERT JULIAT 611 SX, ZOOM
 Degrees: 11-26
 Lamp: BTR - 1000
 Measured at: 14 degrees (to better match other fixtures)
 FC: 65 fc (80 FC at 11.5 degrees)
 Actual CI: 131,625 at 14 deg.
 Claimed CI: 243,000 at 11.5 deg.
 Field: very nice and even.
 Mechanics: excellent.
 Notes: nice zoom range,
 Rating: 3 Stars, due to much lower than expected output

 Much lower than expected output. Only BTR is available for NA 120 volt.

The CP70 (1K), and the CP90 (1.2K) are available in Europe.

ROBERT JULIAT 711 SX

 Luminaire: ROBERT JULIAT 711 SX, ZOOM
 Degrees: 10-25
 Lamp: CP72 2K, 400 hrs, 3200K
 Measured at: 15 degrees
 FC: 115 fc
 Actual CI: 232,875 at 15 deg.
 Claimed CI: 607,500 at 17 deg.
 Field: very nice and even - with major red halation.
 Mechanics: excellent - however contains a fan! (very quite)
 Notes: a great unit, but very expensive (\$2500 + tax)
 Rating: 4 Stars only - high cost, halation and fan.

 We DID NOT like the very noticeable RED edging halation.

SELECON, PACIFIC 1228

 Luminaire: SELECON, PACIFIC ZOOMSPOT 12-28
 Degrees: 12-28
 Lamp: BP1000
 Measured at: 15 degrees
 FC: 90 fc
 Actual CI: 182,250 at 15 deg.
 Claimed CI: 396,000 at 12 deg.
 Field: nice and even, easy to align, min. red halation.
 Mechanics: very nice everything, shutters rotate, gobo: "M"
 Notes: heat sink gets VERY HOT!
 Rating: 4.5 Stars, very nice optics and mechanics

 we liked everything!

STRAND SL1532

 Luminaire: STRAND SL15-32 ZOOM
 Degrees: 15-32
 Lamp: 575-GLC-120, 400 hrs.
 Measured at: 16 degrees (as no sharp edge at 15 degrees)
 Actual CI: 151,875 at 16 deg.
 Claimed CI: 237,000 at 15 deg.
 FC: 75 fc
 Field: nice and even.
 Mechanics: lighter, smaller, yoke too short, easy to align
 Notes: Strand claims better performance with new units
 Rating: 2 Stars, lightweight construction & lower output

 rejected - lower than required performance.

STRAND CANTATA-1126

Luminaire:	STRAND CANTATA 11-26 ZOOM
Degrees:	11-26
Lamp:	1000 Watt
Measured at:	15 degrees
Actual CI:	151,875 at 15 deg.
Claimed CI:	Not available
FC:	75 fc
Field:	OK, 'darkish' field, slightly hot center.
Mechanics:	well constructed, rotatable shutters.
Notes:	an older design - now not supported in NA
Rating:	3 Stars, due to lower output than needed.

rejected - lower than required performance.

STRAND PATT 293 - (reference luminaire)

Luminaire:	STRAND PATT 293 - fixed focal length.
Degrees:	15 (fixed f.l.)
Lamp:	2kw
Measured at:	15 degrees
FC:	130 fc
Actual CI:	263,000 - (calculated from measurements)
Claimed CI:	445,000 - (manufacturer's reported data)
Field:	very nice and even, excellent.
Mechanics:	30 years old, hard to maintain and align
Notes:	Best light output of all fixtures tested.

reference luminaire (12 existing)

NOTES ON TABLES

- 1.) Ratings: 1-5 stars - fixtures rated for this application only. This means that a fixture with a 2 star rating may be perfectly suited for another lighting application.
- 2.) CI: = central intensity measured in Candela.
- 3.) These tests were performed (and repeated) over several weeks in the summer of 1999 by Bill Williams (lighting designer) and Denis Crymble (Head Electrician at MTC), together having over 60 years of combined experience with similar equipment.

10.) OTHER PURCHASES

As part of this lighting upgrade, M.T.C. was also able to purchase a few new 'onstage' luminaires. They have over 200 onstage luminaires, some are quite old and all are a real mixture with no more than 30 of any one type. (Current units are from: Altman, Century, Colortran and Strand.)

It was decided that the best immediate investment would be to increase the inventory of Altman Shakespeare luminaires. M.T.C. owned 24 of these fixtures AND had 96 lenses.

48 New Shakespeare bodies were added, providing a total Shakespeare inventory of 72 fixtures as follows: 24 x 20 degree, 24 x 30 degree and 24 at 40 (or 50) degrees. This contract was awarded to a local bidder (also the low bidder for this item).

It will be only a matter of time before M.T.C. must start to replace some of their older onstage

luminaires. We believe that the Selecon zooms and fixed focal length fixtures would be ideally suited for this application. This could just about be the designer's and electrician's dream come true!

11.) ACKNOWLEDGMENTS

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