APPENDIX D

RECTANGULAR BEAM SUMMARIES—STRANDS A&B

BEAM NAME: RA-6-5-1 END: NORTH DATE: 08/04/2005

TEST PARAMETERS	
Concrete Compressive Strength	8500 psi
Embedment Length(L _e)	73 in.
Span	162 in.
Failure Mode	Flexure
Maximum Load	22.9 kips
Maximum Moment	790 kip-in
Deflection @ Failure	2.1 in.
Rebound after complete unloading	2.0 in.
Average Transfer Length (L _t) @ release	19.2 in.
@ time of testing	33.7 in.
Average NASP P.O value for strand 0.5 in. "A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 1.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. From this point till failure deflection increments were set to 0.1 in.

First flexural crack was observed at 13.7 kips at deflection of 0.3 in. Two pairs of symmetrically located cracks were seen at this load and deflection.

As the load reached 22.5 kips (1.9 in deflection), cracks lying between two point loads bifurcated near the top. Cracks were also audible from this and subsequent increments up to failure.

Concrete crushing failure was noted at 22.9 kips. (deflection = 2.1 in.). the beam was continued to be loaded till the deflection reached 3.0 in. End slip at both ends remained 0.000 in. throughout loading and unloading cycles.

Cracking pattern included 11 cracks in the central 66 in. span. First flexural crack was noted at 52 in. from the North support. No inclined flexural crack was observed.





Cracking pattern for Beam RA-6-5-1 being loaded at North end

BEAM NAME: RA-6-5-1 END: SOUTH DATE: 08/04/2005

TEST PARAMETERS	
Concrete Compressive Strength	8500 psi
Embedment Length(L _e)	58 in.
Span	132 in.
Failure Mode	Flexure
Maximum Load	29.6 kips
Maximum Moment	800 kip-in
Deflection @ Failure	2.1 in.
Rebound after complete unloading	1.9 in.
Average Transfer Length (L _t) @ release	18.2 in.
@ time of testing	30.0 in.
Average NASP P.O value for strand 0.5 in. "A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 1.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. From this point till failure deflection increments were set to 0.1 in.

First flexural crack was observed at 17.5 kips at deflection of 0.4 in. Two pairs of symmetrically located cracks were observed at the subsequent increment (load = 18.2 kips, deflection = 0.4 in.)

At 26.8 kips (deflection = 1.2 in.), concrete already crushed during North end testing started falling off, resulting in slight fluctuation of load. Cracking was audible at 29.1 kips (deflection = 1.9 in.)

Concrete crushing failure was noted at 29.6 kips (deflection = 2.1 in.) at the top surface of the concrete. Beam was loaded till deflection reached 3.5 in and then completely unloaded.

End-slip readings at both ends remained 0.000in. Cracking pattern included 9 cracks in the middle 50 in. span. First flexural crack was located at Stn. 44. No inclined flexural crack was observed.





Cracking pattern for Beam RA-6-5-1 being loaded at South end

BEAM NAME: RA-6-5-2 END: NORTH DATE: 08/05/2005

TEST PARAMETERS	
Concrete Compressive Strength	8500 psi
Embedment Length(L _e)	58 in.
Span	120 in.
Failure Mode	Flexure
Maximum Load	33.2 kips
Maximum Moment	772 kip-in
Deflection @ Failure	1.5 in.
Rebound after complete unloading	1.4 in.
Average Transfer Length (L _t) @ release	16.5 in.
@ time of testing	28.0 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips

TEST SUMMARY

Before starting the test it was discovered that the region of concrete below the strands at the North end was damaged and the strands were exposed from under up to about 2.25 in. (East) and 3.75 in (West). Support point was fixed at 11 in. (instead of 4 in.) from the North end. To adjust the symmetry the constant moment region was changed from 24 in. to 27 in. and the total span was kept 120 in.



Damage caused during transportation at the North end (bottom).

Load was applied in approximately 3 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to failure.

First flexural crack was observed at 20.0 kips at deflection of 0.1 in. First flexural cracks were formed in two pairs located symmetrically about the two point loads.

Cracking was audible at 29.1 kips (deflection = 0.6 in.). Beyond this load, at all further increments cracking was audible. Concrete crushing was noted at the load of 33.2 kips (deflection 1.4 in.) at the top surface of concrete. Crushing of concrete was violent with considerable spalling of concrete.

Deflection was further incremented up to 2.5 in. After this load was attained, the beam was unloaded completely. End-slip readings at both ends remained 0.000 in. throughout the loading and unloading cycles.

Cracking pattern demonstrated 9 cracks in the middle 50 in. span with average crack spacing = 6.3 in. Width of central crack at maximum deflection (2.5 in.) was $3/8^{\text{th}}$ in. First flexural crack was observed at Stn. 43 from the North end.





Cracking pattern for Beam RA-6-5-2 being loaded at North end

BEAM NAME: RA-6-5-2 END: SOUTH DATE: 08/05/2005

TEST PARAMETERS	
Concrete Compressive Strength	8500 psi
Embedment Length(L _e)	46 in.
Span	120 in.
Failure Mode	Flexure
Maximum Load	37.0 kips
Maximum Moment	777 kip-in
Deflection @ Failure	1.5 in.
Average Transfer Length (L _t) @ release	15.0 in.
@ time of testing	23.5 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 3.0 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up failure.

First flexural crack was observed at 22.7 kips at deflection of 0.3 in. First flexural cracks were observed in two pairs located symmetrically about the two point loads. Central crack was formed at the net increment (Load = 23.8 kips. deflection = 0.4 in.).

Concrete crushing failure was noticed at the load of 37.0 kips and deflection 1.5 in. Crushed concrete became loose and started falling apart rapidly at the deflection of 1.9 in.

Deflection increments were continued up to strand fracture. Fracture was observed at the deflection of 3.3 in.

Cracking pattern included 9 cracks in middle 59 in span with average crack spacing = 6.6 in. First flexural crack was located at Stn. 37 from the South end.





Cracking pattern for Beam RA-6-5-2 being loaded at South end

BEAM NAME: RA-6A-5-1 END: NORTH DATE: 08/05/2005

TEST PARAMETERS	
Concrete Compressive Strength	11420 psi
Embedment Length(L _e)	73 in.
Span	162 in.
Failure Mode	Flexure
Maximum Load	22.3 kips
Maximum Moment	769 kip-in.
Deflection @ Failure	2.4 in.
Rebound after complete unloading	2.1 in.
Average Transfer Length (L _t) @ release	17.7 in.
@ time of testing	26.5 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips.

TEST SUMMARY

Load was applied in approximately 1.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. From this point till failure deflection increments were set to 0.1 in.

First flexural crack was observed at 12.8 kips at deflection of 0.3 in. First flexural cracks occurred in two pairs located symmetrically about the two point loads.

Cracks in the region between the two point loads started bifurcating near the top surface at the load of 20.2 kips (deflection = 1.2 in.) Audible cracks were observed at 22.1 kips (deflection = 2.3 in.) and finally concrete crushing failure occurred at 22.4 kips (deflection = 2.4 in.)

Deflection increments were continued till the total deflection reached the value of 3.5 in. The beam was completely unloaded after this deflection was attained. End- Slip for loading and unloading cycles remained 0.00 in. at both ends.

The cracking pattern included 11 cracks in the middle 74 in. span. With average crack spacing = 7.4 in. First flexural crack was observed at Stn. 47. from the North end.





Cracking pattern for Beam RA-6A-5-1 being loaded at North end

BEAM NAME: RA-6A-5-1 END: SOUTH DATE: 08/08/2005

TEST PARAMETERS	
Concrete Compressive Strength	11420 psi
Embedment Length(L _e)	58 in.
Span	132 in.
Failure Mode	Flexure
Maximum Load	28.5 kips
Maximum Moment	770 kip-in
Deflection @ Failure	1.7 in.
Rebound after complete unloading	1.7 in.
Average Transfer Length (L _t) @ release	17.7 in.
@ time of testing	28.6 in.
Average NASP P.O value for strand 0.5in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 1.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to failure.

First flexural crack was observed at 18.0 kips at deflection of 0.4 in. First flexural cracks were formed as a pair symmetrically located cracks about the two point loads. The second pair of cracks was observed just at the next increment (load = 18.5 kips. 0.4 in.).

At the load of 28.1 kips (deflection = 1.0 in.) the cracks became clearly audible. Cracking sound became louder at the load of 28.5 kips (deflection = 1.6 in.).

Finally concrete crushing failure was observed at the load of 28.6 kips (deflection = 1.7 in.). The deflection was continued to be incremented up to total deflection of 2.7 in.

Pattern of cracking included 9 cracks in the middle 66 in. span with average crack spacing of 8.25 in. The first flexural crack was located at Stn. 39 from the South end.





Cracking pattern for Beam RA-6A-5-1 being loaded at South end.

BEAM NAME: RA-6A-5-2 END: NORTH DATE: 08/08/2005

TEST PARAMETERS	
Concrete Compressive Strength	11420 psi
Embedment Length(L _e)	58 in.
Span	132 in.
Failure Mode	Flexure
Maximum Load	29.2 kips
Maximum Moment	788 kip-in
Deflection @ Failure	1.9 in.
Rebound after complete unloading	1.8 in.
Average Transfer Length (L _t) @ release	24.5 in.
@ time of testing	31.8 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 1.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to failure and beyond failure if was set to 0.1 in.

First flexural crack was observed at 16.5 kips at deflection of 0.3 in.

Cracks became audible at the load of 27.8 kips. (deflection = 1.3 in.). Flexural cracking was heard for a longer time at the load of 29.2 kips. (deflection = 1.8 in.)

Concrete crushing failure was observed at the load of 29.8 kips (deflection = 1.9 in.). Deflection was incremented up to total deflection of 2.8 in.

Cracking pattern included 8 cracks in middle 50 in span. First flexural crack was noted at Stn. 42 from the North end. End-slip at both the ends remained at 0.00 in. No inclined flexural cracks were observed.





Cracking pattern for Beam RA-6A-5-2 being loaded at North end

BEAM NAME: RA-6A-5-2 END: SOUTH DATE: 08/08/2005

TEST PARAMETERS	
Concrete Compressive Strength	11420 psi
Embedment Length(L_e)	46 in.
Span	120 in.
Failure Mode	Flexure
Maximum Load	37.5 kips
Maximum Moment	788 kip-in
Deflection @ Failure	1.7 in.
Rebound after complete unloading	1.6 in.
Average Transfer Length (L _t) @ release	22.0 in.
@ time of testing	29.4 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 1.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. From this point deflection increments were set to 0.1 in.

First flexural crack was observed at 20.6 kips at deflection of 0.2 in. Cracks became audible at the load of 29.6 kips (deflection = 0.6 in.)

At 33.1 kips. (deflection = 0.9 in.) a sudden inclined flexural crack was noticed at Stn. 26 from the South end.

Concrete crushing failure was observed at 38.1 kips. (deflection = 1.7 in) at the top surface. Concrete started spalling with every further deflection increment. Also it was noticed that only one of the central flexural crack was widening with each increment (final width at the highest deflection of 2.7 in. = $3/8^{\text{th}}$ in.)

Cracking pattern included 11 flexural cracks in the middle 60 in. span. With average crack spacing of 6 in. Inclined flexural crack was observed at Stn. 26 from the South end.

Maximum end-slip = 0.01 in. End-slip at the North end remained 0.000 in.





Cracking pattern for Beam RA-6A-5-2 being loaded at South end.

BEAM NAME: RA-8-5-1 END: NORTH DATE: 08/09/2005

TEST PARAMETERS	
Concrete Compressive Strength	13490 psi
Embedment Length(L _e)	58 in.
Span	132 in.
Failure Mode	Flexure
Maximum Load	30.7 kips
Maximum Moment	829 kip-in
Deflection @ Failure	1.7 in.
Deflection @ strand fracture	2.6 in.
Average Transfer Length (L_t) @ release	13.3 in.
@ time of testing	24.9 in.
Average NASP P.O value for strand 0.5in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 2.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. From this point deflection increments were set to 0.1 in.

First flexural crack was observed at 18.5 kips at deflection of 0.2 in. Initially three cracks were noted at two point loads and at approximately midpoint of the two load points.

Cracks became audible at the load of 27.0 kips (deflection = 0.8 in.).

At the load of 30.7 kips at deflection of 1.7 in. concrete crushing failure was observed along with the first East strand end-slip of 0.01 in. End-slip of the West strand remained 0.000 in. Also end-slip at the South end remained 0.000 in.

Deflection increments were continued until both the strands fractured at the total deflection of 2.6 in. End-slip of east strand at North end remained 0.01 in. while all other end-slip readings were 0.000 in.

The cracking pattern included 8 flexural cracks in the middle 58 in. span with average crack spacing = 8.3 in. No inclined flexural crack was noticed. First flexural crack was at Stn. 39 from the North end.





Cracking pattern for Beam RA-8-5-1 being loaded at North end

BEAM NAME: RA-8-5-1 END: SOUTH DATE: 08/10/2005

TEST PARAMETERS	
Concrete Compressive Strength	13490 psi
Embedment Length(L _e)	46 in.
Span	120 in.
Failure Mode	Flexure
Maximum Load	39.6 kips
Maximum Moment	832 kip-in
Deflection @ Failure	1.9 in.
Rebound after complete unloading	1.4 in.
Average Transfer Length (L _t) @ release	13.3 in.
@ time of testing	24.91 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 1.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. From this point deflection increments were set to 0.1 in.

First flexural crack was observed at 25 kips at deflection of 0.3 in. Initially three cracks were noted, all within the two load points and located symmetrically about the midpoint. At the same load and deflection, a sudden jerk was observed and it was similar to one occurring when end-slip occurs. End-slip reading at the South end remained 0.000 and the reading at the North end could not be recorded as the strands had fractured during the North end testing.

A crack similar to an inclined flexural crack was observed suddenly at 32.3 kips. (deflection = 0.7 in.) at 15 in. from the North support, crossing the originally existing cracks formed during North end testing. (This crack marked with dotted line in the photograph)

Cracking was clearly audible at 37.9 kips (deflection = 1.4 in.) Concrete crushing failure was observed with a bang at 39.6 kips (deflection = 1.9 in.). Concrete at the top surface between the two point supports was completely crushed and fell out as the load reached its peak.

End-slip at the South end remained 0.000 in. throughout the loading cycle. Cracking pattern at the South end shows 9 cracks in the middle 53 in. span with average crack spacing = 6.6 in. No inclined flexural crack was visible at the South side.





Cracking pattern at South end for Beam RA-8-5-1 (South side being tested)



Cracking pattern at the North Support for Beam RA-8-5-1 (South side being tested)

BEAM NAME: RA-10-5-1 END: NORTH DATE: 08/10/2005

TEST PARAMETERS	
Concrete Compressive Strength	14470 psi
Embedment Length(L _e)	58 in.
Span	132 in.
Failure Mode	Flexure
Maximum Load	29.2 kips
Maximum Moment	788 kip-in
Deflection @ Failure	1.7 in.
Rebound after complete unloading	1.5 in.
Average Transfer Length (L _t) @ release	24.3 in.
@ time of testing	24.3 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 2.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. deflection increments were set to 0.1 in.

First flexural crack was observed at 19.3 kips at deflection of 0.2 in. First flexural cracks were formed as two pairs symmetrically located about the midpoint.

No significant changes were noticed till the load reached 29.1 kips (deflection = 1.6 in.). At this point the cracks were clearly audible. Concrete crushing failure was noticed at 29.2 kips. (deflection = 1.7 in.)

Cracking pattern shows 9 cracks in the middle 56 in. with average crack spacing of 7 in. The first flexural crack was at Stn. 43. No inclined flexural crack was visible.

End-slip at both ends remained 0.000 in. throughout the loading and unloading cycles.





Cracking pattern for Beam RA-10-5-1 being loaded at North end

BEAM NAME: RA-10-5-1 END: SOUTH DATE: 08/10/2005

TEST PARAMETERS	
Concrete Compressive Strength	14470 psi
Embedment Length(L _e)	46 in.
Span	120 in.
Failure Mode	Flexure
Maximum Load	37.9 kips
Maximum Moment	796 kip-in
Deflection @ Failure	1.7 in.
Rebound after complete unloading	1.5 in.
Average Transfer Length (L _t) @ release	9.69 in.
@ time of testing	13.14 in.
Average NASP P.O value for strand 0.5 in."A"	20.95 kips

TEST SUMMARY

Load was applied in approximately 3.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to 2.0 in. From this point deflection increments were set to 0.1 in.

First flexural crack was observed at 24 kips at deflection of 0.2 in. Initially three cracks were noted in between the two point loads located symmetrically about the midpoint.

Cracks became clearly audible at 34.3 kips (deflection = 0.8 in.) Concrete crushing failure was observed at 37.8 kips (deflection = 1.7 in.) Deflection was further incremented till the total deflection reached 2.0 in.

Cracking pattern included 8 cracks in the middle 55 in. span with average crack spacing of 7.9 in. First flexural crack was located at Stn. 41. No inclined flexural crack was visible.

End-slip at both the ends remained 0.000 in throughout the loading an unloading cycles.





Cracking pattern for Beam RA-10-5-1 being loaded at South end

BEAM NAME: RB-4-5-1 END: NORTH DATE: 07/20/2005

TEST PARAMETERS	
Concrete Compressive Strength	7050 psi
Embedment Length(L _e)	73 in.
Span	162 in.
Failure Mode	Flexure
Maximum Load	22.5 kips
Maximum Moment	776 kip-in
Deflection @ Failure	1.9 in.
Rebound after complete unloading	1.6 in.
Average Transfer Length (L _t) @ release	18.4 in.
@ time of testing	22.1 in.
Average NASP P.O value for strand "B"	20.21 kips

TEST SUMMARY

Load was applied in approximately 2.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to failure.

First flexural cracking was discovered at a load of 16.8 kips while deflection at this point was noted as 0.5 in. The first flexural cracks formed at three locations, one of which was exactly under the point load whereas the other two were approximately equal distance from the central crack. With gradual loading these cracks propagated upward and diagonally towards the top rollers which were acting as two point loads.

At the load of approx 20 kips (deflection 1.0 in.) fourth crack was observed while the first three cracks grew gradually in width and length.

Peak load attained was 22.5 kips (deflection 1.9 in.) at which concrete crushing failure occurred with audible sound. Concrete spalling was clearly observed at the top surface.

Since crack growth was clearly audible, loading was paused for 5 minutes to allow complete cracking under the same load.

As loading was started again, the beam failed to give enough reaction and the load started to reduce in magnitude. Hence it was decided to stop further loading as deflection was increasing while load being decreased.

Since this was the first beam to be tested, the beam was reloaded for observation. At this loading cycle, greater deflection was noted for comparatively smaller loads than the first

cycle. Finally the beam was completely unloaded and readings for end slips and deflection were noted at zero load.

Throughout the loading cycles, the end slips remained at zero indicating strong bond between concrete and the strand so as to allow the beam to gain its complete flexural strength.

Cracking pattern included 11 flexural cracks in the middle 70 in. span with average crack spacing = 7 in. No inclined flexural crack was observed.





Photo Showing cracking pattern for Beam RB-4-5-1 being loaded at North end

BEAM NAME: RB-4-5-1 END: SOUTH DATE: 07/20/2005

TEST PARAMETERS	
Concrete Compressive Strength	7050 psi
Embedment Length(L _e)	58 in.
Span	132 in.
Failure Mode	Flexure
Maximum Load	29.7 kips
Maximum Moment	980 kip-in
Deflection @ Failure	2.0 in.
Rebound after complete unloading	1.6 in.
Average Transfer Length (L _t) @ release	18.5 in.
@ time of testing	20.5 in.
Average NASP P.O value for strand "B"	20.21 kips

TEST SUMMARY

Load was applied in approximately 2.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. up to failure.

First flexural cracking occurred at a load of 18.6 kips while deflection at this point was noted as 0.4 in. The first flexural cracks formed at three spots, one of which was exactly under the point load whereas the other two were approximately equal distance from the central crack. With gradual loading these cracks propagated upward and diagonally towards the top rollers which were acting as two point loads.

At the load of approx. 23.5 kips (0.6 in. deflection) cracks originated from the already existing cracks due to North end testing and in reverse direction than the original cracks. Further loading up to 26.1 kips (deflection = 0.9 in.) produced audible cracks.

No noticeable changes were observed as the load increased from 26.1 to 29.7 kips. At peak load (29.7 kips) concrete crushing failure occurred with no recordable end slip. At this stage the deflection was noted as 2.0 in.

Load was reduced to zero and the deflection and end slips were again recorded at zero load. End slip reading stayed at zero for entire length of loading and unloading.

Cracking pattern shows 9 cracks in the middle 69 in. span with average crack spacing = 8.6 in. No inclined flexural crack was observed.





Cracking pattern for Beam RB-4-5-1 being loaded at South end

BEAM NAME: RB-4-5-2 END: NORTH DATE: 07/22/2005

TEST PARAMETERS	
Concrete Compressive Strength	7050 psi
Embedment Length(L _e)	73 in.
Span	162 in.
Failure Mode	Flexure
Maximum Load	20.9 kips
Maximum Moment	721 kip-in
Deflection @ Failure	2.5 in.
Rebound after complete unloading	1.9 in.
Average Transfer Length (L _t) @ release	21.1 in.
@ time of testing	22.5 in.
Average NASP P.O value for strand "B"	20.21 kips

TEST SUMMARY

Load was applied in approximately 2.5 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. till deflection of 2.0 in. Increments were set to 0.1 in. from this point up to failure.

First flexural cracking occurred at a load of 10.6 kips while deflection at this point was noted as 0.3 in. The first flexural cracks formed at three spots, one of which was exactly under the point load whereas the other two were approximately equal distance from the central crack. With gradual loading these cracks propagated upward and diagonally towards the top rollers which were acting as two point loads.

At the load of approx 14.5 kips (deflection 0.5 in.) a pair of cracks was observed approximately symmetric about the point loads and beyond the first three cracks.

Peak load attained was 20.9 kips (deflection 2.49 in.) at which concrete crushing failure occurred with audible sound. Concrete spalling was clearly observed at the top surface.

Throughout the loading cycles, the end slips remained at zero indicating strong bond between concrete and the strand so as to allow the beam to gain its complete flexural strength.

Pattern of cracks displayed 10 cracks in the middle 68 in span with average crack spacing = 7.6 in. No inclined flexural crack was observed.





Photo showing cracking pattern for Beam RB-4-5-2 being loaded at North end

BEAM NAME: RB-4-5-2 END: SOUTH DATE: 07/22/2005

TEST PARAMETERS	
Concrete Compressive Strength	7050 psi
Embedment Length(L _e)	58 in.
Span	132 in.
Failure Mode	Flexure
Maximum Load	27.7 kips
Maximum Moment	748 kip-in
Deflection @ Failure	2.2 in.
Rebound after complete unloading	1.7 in.
Average Transfer Length (L _t) @ release	22.5 in.
@ time of testing	23.8 in.
Average NASP P.O value for strand "B"	20.21 kips

TEST SUMMARY

Load was applied in approximately 2 kips increments till first flexural cracking. Beyond this point the deflection was incremented by 0.03 in. till total deflection reached 1.00 in. Further increments of deflection were kept 0.05 in. till deflection of 2.0 in. Increments were set to 0.1 in. from this point up to failure.

First flexural cracking occurred at a load of 14.7kips while deflection at this point was noted as 0.2 in. The first flexural cracks formed at three spots, one of which was exactly under the point load whereas the other two were approximately equal distance from the central crack. With gradual loading these cracks propagated upward and diagonally towards the top rollers which were acting as two point loads.

Except for widening of cracks, no other noticeable changes were observed as the load increased up to 24.8 kips (deflection 0.9 in.) The cracks could be clearly heard at this point.

Peak load attained was 27.7 kips, at this load concrete crushing failure was noticed with deflection noted as 2.2 in.

Load was reduced to zero and the deflection and end slips were again recorded at zero load. End slip reading stayed at zero for entire length of loading and unloading.

There were 7 cracks noticed in the middle 45 in. span with average crack spacing of 7.5 in. No inclined flexural crack w observed.





Photo Showing cracking pattern for Beam RB-4-5-2 being loaded at South end