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# PERFORMANCE EVALUATION OF TYPE II AND TYPE IIA BOX BEAM END TERMINALS VOLUME II: APPENDICES

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16. Abstract (Limit: 200 words) <p>Two types of guide rail end terminals were constructed and evaluated according to the American Association of State Highway and Transportation Officials' (AASHTO's) <i>Manual for Assessing Safety Hardware</i> (MASH). The guide rail end terminals are used with weak-post, box beam guide rail systems by the New York State Department of Transportation (NYSDOT).</p> <p>Nine full-scale vehicle crash tests were performed in accordance with either Test Level 3 (TL-3) or Test Level 2 (TL-2) requirements using both standard and modified impact locations and test conditions for the 1100C [1,100-kg (2,425-lb)] passenger car and the 2270P [2,268-kg (5,000-lb)] pickup truck. One test was run on the Type II box beam end terminal, six tests were performed on the Type IIA end terminal on flat ground, and two tests were performed on the Type IIA end terminal installed in a ditch. The Volume I report contains the research results and discussion. The Volume II report contains the appendices.</p>			
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### **DISCLAIMER STATEMENT**

The contents of this report reflect the views and opinions of the authors who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the New York State Department of Transportation, the United States Department of Transportation, nor the Federal Highway Administration. This report does not constitute a standard, specification, regulation, product endorsement, nor an endorsement of manufacturers.

### **UNCERTAINTY OF MEASUREMENT STATEMENT**

The Midwest Roadside Safety Facility (MwRSF) has determined the uncertainty of measurements for several parameters involved in standard full-scale crash testing and non-standard testing of roadside safety features. Information regarding the uncertainty of measurements for critical parameters is available upon request by the sponsor and the Federal Highway Administration.

The Independent Approving Authority (IAA) for the data contained herein was Mr. Scott K. Rosenbaugh.

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## TABLE OF CONTENTS

	Page
TECHNICAL REPORT DOCUMENTATION PAGE .....	i
DISCLAIMER STATEMENT .....	ii
UNCERTAINTY OF MEASUREMENT STATEMENT .....	ii
ACKNOWLEDGMENTS .....	iii
TABLE OF CONTENTS.....	iv
LIST OF FIGURES .....	v
INTRODUCTION .....	1
APPENDIX A Vehicle Center of Gravity Determination .....	2
APPENDIX B Type II Box Beam Terminal System Details - English Units, Test No. NYBBT-1.....	12
APPENDIX C Test Summary Sheets in English Units .....	26
APPENDIX D Occupant Compartment Deformation Data.....	36
APPENDIX E Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-1 .....	69
APPENDIX F Type IIA Box Beam Terminal System Details - English Units, Test No. NYBBT-2.....	84
APPENDIX G Type IIA Box Beam Terminal System Details - Metric and English Units, Test No. NYBBT-3 .....	97
APPENDIX H Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-2 .....	122
APPENDIX I Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-3.....	136
APPENDIX J Modified Type IIA Box Beam Terminal System Details - Metric and English Units, Test No. NYBBT-4 .....	145
APPENDIX K Static Soil Tests.....	170
APPENDIX L Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-4 .....	178
APPENDIX M Modified Type IIA Box Beam Terminal System Details - Metric and English Units, Test No. NYBBT-5 .....	194
APPENDIX N Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-5 .....	219
APPENDIX O Modified Type IIA Box Beam Terminal in Ditch System Details - English Units, Test No. NYBBT-6 .....	235
APPENDIX P Modified Type IIA Box Beam Terminal in Ditch System Details -Metric and English Units, Test No. NYBBT-7 .....	251
APPENDIX Q Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-6 .....	282
APPENDIX R Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-7 .....	298
APPENDIX S Modified Type IIA Box Beam Terminal System Details -English Units, Test No. NYBBT-8.....	322
APPENDIX T Modified Type IIA Box Beam Terminal System Details - Metric and English Units, Test No. NYBBT-9.....	339
APPENDIX U Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-8 .....	372
APPENDIX V Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-9 .....	388
APPENDIX W Material Specifications.....	404

## LIST OF FIGURES

	Page
Figure A-1. Vehicle Mass Distribution, Test No. NYBBT-1 .....	3
Figure A-2. Vehicle Mass Distribution, Test No. NYBBT-2 .....	4
Figure A-3. Vehicle Mass Distribution, Test No. NYBBT-3 .....	5
Figure A-4. Vehicle Mass Distribution, Test No. NYBBT-4 .....	6
Figure A-5. Vehicle Mass Distribution, Test No. NYBBT-5 .....	7
Figure A-6. Vehicle Mass Distribution, Test No. NYBBT-6 .....	8
Figure A-7. Vehicle Mass Distribution, Test No. NYBBT-7 .....	9
Figure A-8. Vehicle Mass Distribution, Test No. NYBBT-8 .....	10
Figure A-9. Vehicle Mass Distribution, Test No. NYBBT-9 .....	11
Figure B-1. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	13
Figure B-2. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	14
Figure B-3. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	15
Figure B-4. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	16
Figure B-5. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	17
Figure B-6. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	18
Figure B-7. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	19
Figure B-8. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	20
Figure B-9. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	21
Figure B-10. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	22
Figure B-11. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	23
Figure B-12. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	24
Figure B-13. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1 .....	25
Figure C-1. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-1 .....	27
Figure C-2. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-2 .....	28
Figure C-3. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-3 .....	29
Figure C-4. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-4 .....	30
Figure C-5. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-5 .....	31
Figure C-6. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-6 .....	32
Figure C-7. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-7 .....	33
Figure C-8. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-8 .....	34
Figure C-9. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-9 .....	35
Figure D-1. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-1 .....	37
Figure D-2. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-2 .....	38
Figure D-3. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-3 .....	39
Figure D-4. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-4 .....	40

Figure D-5. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-4 .....41  
Figure D-6. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-4 .....42  
Figure D-7. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-4 .....43  
Figure D-8. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-4 .....44  
Figure D-9. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-5 .....45  
Figure D-10. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-5 .....46  
Figure D-11. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-5 .....47  
Figure D-12. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-5 .....48  
Figure D-13. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-5 .....49  
Figure D-14. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-6 .....50  
Figure D-15. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-6 .....51  
Figure D-16. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-7 .....52  
Figure D-17. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-7 .....53  
Figure D-18. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-7 .....54  
Figure D-19. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-7 .....55  
Figure D-20. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-7 .....56  
Figure D-21. Floorpan Deformation Data - Set 1, Test No. NYBBT-8 .....57  
Figure D-22. Floorpan Deformation Data - Set 2, Test No. NYBBT-8 .....58  
Figure D-23. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-8 .....59  
Figure D-24. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-8 .....60  
Figure D-25. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-8 .....61  
Figure D-26. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-8 .....62  
Figure D-27. Floorpan Deformation Data - Set 1, Test No. NYBBT-9 .....63  
Figure D-28. Floorpan Deformation Data - Set 2, Test No. NYBBT-9 .....64  
Figure D-29. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-9 .....65  
Figure D-30. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-9 .....66  
Figure D-31. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-9 .....67  
Figure D-32. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-9 .....68  
Figure E-1. Graph of Longitudinal Deceleration (EDR-3), Test No. NYBBT-1 .....70  
Figure E-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No.  
NYBBT-1 .....71  
Figure E-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-1 .....72  
Figure E-4. Graph of Lateral Deceleration (EDR-3), Test No. NYBBT-1 .....73  
Figure E-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-1 .....74  
Figure E-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-1 .....75  
Figure E-7. Graph of Longitudinal Deceleration (EDR-4), Test No. NYBBT-1 .....76  
Figure E-8. Graph of Longitudinal Occupant Impact Velocity (EDR-4), Test No.  
NYBBT-1 .....77  
Figure E-9. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-1 .....78  
Figure E-10. Graph of Lateral Deceleration (EDR-4), Test No. NYBBT-1 .....79  
Figure E-11. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-1 .....80  
Figure E-12. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-1 .....81  
Figure E-14. Graph of Roll Angular Displacement (Video Analysis), Test No. NYBBT-1 .....83  
Figure F-1. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....85  
Figure F-2. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....86  
Figure F-3. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....87

Figure F-4. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....88  
Figure F-5. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....89  
Figure F-6. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....90  
Figure F-7. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....91  
Figure F-8. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....92  
Figure F-9. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....93  
Figure F-10. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....94  
Figure F-11. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....95  
Figure F-12. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2 .....96  
Figure G-1. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....98  
Figure G-2. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....99  
Figure G-3. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....100  
Figure G-4. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....101  
Figure G-5. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....102  
Figure G-6. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....103  
Figure G-7. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....104  
Figure G-8. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....105  
Figure G-9. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....106  
Figure G-10. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....107  
Figure G-11. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....108  
Figure G-12. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3 .....109  
Figure G-13. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....110  
Figure G-14. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....111  
Figure G-15. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....112  
Figure G-16. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....113  
Figure G-17. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....114  
Figure G-18. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....115  
Figure G-19. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....116  
Figure G-20. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....117  
Figure G-21. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....118  
Figure G-22. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....119  
Figure G-23. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....120  
Figure G-24. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3 .....121  
Figure H-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-2 .....123  
Figure H-2. Graph of Longitudinal Occupant Velocity (EDR-3), Test No. NYBBT-2 .....124  
Figure H-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-2 .....125  
Figure H-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-2 .....126  
Figure H-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-2 .....127  
Figure H-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-2 .....128  
Figure H-7. Graph of Longitudinal Occupant Deceleration (EDR-4), Test No. NYBBT-2 .....129  
Figure H-8. Graph of Longitudinal Occupant Velocity (EDR-4), Test No. NYBBT-2 .....130  
Figure H-9. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-2 .....131  
Figure H-10. Graph of Lateral Occupant Deceleration (EDR-4), Test No. NYBBT-2 .....132  
Figure H-11. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-2 .....133  
Figure H-12. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-2 .....134  
Figure H-13. Graph of Yaw Angular Displacement (DTS), Test No. NYBBT-2 .....135

Figure I-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-3 .....137  
Figure I-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-3....138  
Figure I-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-3 .....139  
Figure I-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-3 .....140  
Figure I-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-3.....142  
Figure I-7. Graph of Roll Angular Displacement (Video Analysis), Test No. NYBBT-3 .....143  
Figure I-8. Graph of Yaw Angular Displacement (Video Analysis), Test No. NYBBT-3 .....144  
Figure J-1. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....146  
Figure J-2. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....147  
Figure J-3. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....148  
Figure J-4. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....149  
Figure J-5. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....150  
Figure J-6. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....151  
Figure J-7. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....152  
Figure J-8. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....153  
Figure J-9. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....154  
Figure J-10. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....155  
Figure J-11. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....156  
Figure J-12. Modified Type IIA Box Beam Terminal System Details (Metric), Test No.  
NYBBT-4.....157  
Figure J-13. Modified Type IIA Box Beam Terminal System Details (English), Test No.  
NYBBT-4.....158  
Figure J-14. Modified Type IIA Box Beam Terminal System Details (English), Test No.  
NYBBT-4.....159  
Figure J-15. Modified Type IIA Box Beam Terminal System Details (English), Test No.  
NYBBT-4.....160  
Figure J-16. Modified Type IIA Box Beam Terminal System Details (English), Test No.  
NYBBT-4.....161  
Figure J-17. Modified Type IIA Box Beam Terminal System Details (English), Test No.  
NYBBT-4.....162  
Figure J-18. Modified Type IIA Box Beam Terminal System Details (English), Test No.  
NYBBT-4.....163  
Figure J-19. Modified Type IIA Box Beam Terminal System Details (English), Test No.  
NYBBT-4.....164

Figure J-20. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4.....165

Figure J-21. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4.....166

Figure J-22. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4.....167

Figure J-23. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4.....168

Figure J-24. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4.....169

Figure K-1. Soil Strength, Initial Calibration Tests.....171

Figure K-2. Static Soil Test, Test No. NYBBT-4.....172

Figure K-3. Static Soil Test, Test No. NYBBT-5.....173

Figure K-4. Static Soil Test, Test No. NYBBT-6.....174

Figure K-5. Static Soil Test, Test No. NYBBT-7.....175

Figure K-6. Static Soil Test, Test No. NYBBT-8.....176

Figure K-7. Static Soil Test, Test No. NYBBT-9.....177

Figure L-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-4.....179

Figure L-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-4.....180

Figure L-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-4.....181

Figure L-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-4.....182

Figure L-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-4.....183

Figure L-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-4.....184

Figure L-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-4.....185

Figure L-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-4.....186

Figure L-9. Graph of Longitudinal Occupant Velocity (DTS), Test No. NYBBT-4.....187

Figure L-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-4.....188

Figure L-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-4.....189

Figure L-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-4.....190

Figure L-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-4.....191

Figure L-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-4.....192

Figure L-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-4.....193

Figure M-1. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....195

Figure M-2. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....196

Figure M-3. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....197

Figure M-4. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....198

Figure M-5. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....199

Figure M-6. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....200

Figure M-7. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....201

Figure M-8. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....202

Figure M-9. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....203

Figure M-10. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....204



Figure M-11. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....	205
Figure M-12. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5.....	206
Figure M-13. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	207
Figure M-14. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	208
Figure M-15. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	209
Figure M-16. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	210
Figure M-17. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	211
Figure M-18. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	212
Figure M-19. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	213
Figure M-20. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	214
Figure M-21. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	215
Figure M-22. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	216
Figure M-23. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	217
Figure M-24. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5.....	218
Figure N-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-5 .....	220
Figure N-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-5.....	221
Figure N-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-5 .....	222
Figure N-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-5 .....	223
Figure N-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-5 .....	224
Figure N-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-5 .....	225
Figure N-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-5 .....	226
Figure N-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-5 .....	227
Figure N-9. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-5 .....	228
Figure N-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-5 .....	229
Figure N-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-5.....	230
Figure N-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-5 .....	231
Figure N-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-5 .....	232
Figure N-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-5.....	233
Figure N-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-5.....	234

Figure O-1. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	236
Figure O-2. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	237
Figure O-3. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	238
Figure O-4. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	239
Figure O-5. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	240
Figure O-6. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	241
Figure O-7. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	242
Figure O-8. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	243
Figure O-9. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	244
Figure O-10. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	245
Figure O-11. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	246
Figure O-12. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	247
Figure O-13. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	248
Figure O-14. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	249
Figure O-15. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6.....	250
Figure P-1. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	252
Figure P-2. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	253
Figure P-3. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	254
Figure P-4. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	255
Figure P-5. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	256
Figure P-6. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	257
Figure P-7. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	258
Figure P-8. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7.....	259

Figure P-9. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7 .....260

Figure P-10. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7 .....261

Figure P-11. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7 .....262

Figure P-12. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7 .....263

Figure P-13. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7 .....264

Figure P-14. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7 .....265

Figure P-15. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7 .....266

Figure P-16. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....267

Figure P-17. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....268

Figure P-18. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....269

Figure P-19. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....270

Figure P-20. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....271

Figure P-21. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....272

Figure P-22. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....273

Figure P-23. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....274

Figure P-24. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....275

Figure P-25. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....276

Figure P-26. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....277

Figure P-27. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....278

Figure P-28. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....279

Figure P-29. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....280

Figure P-30. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7 .....281

Figure Q-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-6 .....283

Figure Q-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-6.....284

Figure Q-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-6.....285

Figure Q-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-6.....286

Figure Q-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-6 .....287

Figure Q-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-6 .....288

Figure Q-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-6 .....289

Figure Q-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-6 .....290

Figure Q-9. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-6.....291

Figure Q-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-6.....292

Figure Q-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-6.....293

Figure Q-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-6 .....294

Figure Q-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-6 .....295

Figure Q-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-6.....296

Figure Q-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-6.....297

Figure R-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-7.....299

Figure R-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-7.....300

Figure R-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-7 .....301

Figure R-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-7 .....302

Figure R-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-7.....303

Figure R-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-7 .....304

Figure R-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-7 .....305

Figure R-8. Graph of Longitudinal Occupant Deceleration (EDR-4), Test No. NYBBT-7.....306

Figure R-9. Graph of Longitudinal Occupant Impact Velocity (EDR-4), Test No. NYBBT-7.....307

Figure R-10. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-7 ...308

Figure R-11. Graph of Lateral Occupant Deceleration (EDR-4), Test No. NYBBT-7 .....309

Figure R-12. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-7.....310

Figure R-13. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-7 .....311

Figure R-14. Graph of Roll, Pitch, and Yaw Angular Displacement (EDR-4), Test No. NYBBT-7.....312

Figure R-15. Graph of Acceleration Severity Index (EDR-4), Test No. NYBBT-7 .....313

Figure R-16. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-7 .....314

Figure R-17. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-7 ...315

Figure R-18. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-7.....316

Figure R-19. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-7.....317

Figure R-20. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-7 .....318

Figure R-21. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-7 .....319

Figure R-22. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-7.....320

Figure R-23. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-7 .....321

Figure S-1. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....323

Figure S-2. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	324
Figure S-3. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	325
Figure S-4. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	326
Figure S-5. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	327
Figure S-6. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	328
Figure S-7. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	329
Figure S-8. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	330
Figure S-9. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	331
Figure S-10. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	332
Figure S-11. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	333
Figure S-12. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	334
Figure S-13. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	335
Figure S-14. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	336
Figure S-15. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	337
Figure S-16. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8.....	338
Figure T-1. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	340
Figure T-2. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	341
Figure T-3. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	342
Figure T-4. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	343
Figure T-5. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	344
Figure T-6. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	345
Figure T-7. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	346
Figure T-8. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	347

Figure T-9. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	348
Figure T-10. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	349
Figure T-11. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	350
Figure T-12. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	351
Figure T-13. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	352
Figure T-14. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	353
Figure T-15. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	354
Figure T-16. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9.....	355
Figure T-17. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	356
Figure T-18. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	357
Figure T-19. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	358
Figure T-20. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	359
Figure T-21. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	360
Figure T-22. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	361
Figure T-23. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	362
Figure T-24. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	363
Figure T-25. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	364
Figure T-26. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	365
Figure T-27. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	366
Figure T-28. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	367
Figure T-29. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	368
Figure T-30. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	369
Figure T-31. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....	370

Figure T-32. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9.....371

Figure U-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-8 .....373

Figure U-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-8.....374

Figure U-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-8.....375

Figure U-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-8.....376

Figure U-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-8 .....377

Figure U-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-8 .....378

Figure U-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-8 .....379

Figure U-8. Graph of Longitudinal Occupant Deceleration (EDR-4), Test No. NYBBT-8 .....380

Figure U-9. Graph of Longitudinal Occupant Impact Velocity (EDR-4), Test No. NYBBT-8.....381

Figure U-10. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-8.....382

Figure U-11. Graph of Lateral Occupant Deceleration (EDR-4), Test No. NYBBT-8.....383

Figure U-12. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-8 .....384

Figure U-13. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-8 .....385

Figure U-14. Graph of Roll, Pitch, and Yaw Angular Displacement (EDR-4), Test No. NYBBT-8.....386

Figure U-15. Graph of Acceleration Severity Index (EDR-4), Test No. NYBBT-8 .....387

Figure V-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-9 .....389

Figure V-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-9.....390

Figure V-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-9.....391

Figure V-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-9.....392

Figure V-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-9 .....393

Figure V-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-9 .....394

Figure V-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-9 .....395

Figure V-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-9 .....396

Figure V-9. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-9.....397

Figure V-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-9.....398

Figure V-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-9.....399

Figure V-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-9 .....400

Figure V-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-9 .....401

Figure V-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-9.....402

Figure V-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-9.....403

## **INTRODUCTION**

Two weak-post, box beam guide rail end terminals were evaluated to standards set by the Manual for Assessing Safety Hardware (MASH). New York State Department of Transportation (NYSDOT) requested that the first full-scale test, test no. NYBBT-1, be conducted on the Type II box beam end terminal. The Type II box beam end terminal CAD details are provided in Appendix B. NYSDOT requested eight full-scale tests, test nos. NYBBT-2 through NYBBT-9, on a modified version of the Type I terminal, now referred to as the Type IIA. The Type IIA end terminal design was modified during the study, which is outlined in Table 24 of Volume I. The Type IIA box beam end terminal CAD details are provided in Appendices F, G, J, M, O, P, S, and T.

The contents of Volume II are meant to be supplementary data for Volume I. Volume I contains the research equipment, methods, full-scale test documentation, and a discussion of the results of the research conducted for full-scale test nos. NYBBT-1 through NYBBT-9. Volume II contains the appendices of the report. The appendices include calculations to determine the longitudinal center of gravity of each vehicle, full sets of system drawings for each of the full-scale tests, English-unit full-scale test summary pages, vehicle deformation data, accelerometer and angular data presented graphically, material specifications, and mill certifications.



**APPENDIX A Vehicle Center of Gravity Determination**

NYBBT-1		Vehicle: 2002 Kia Rio		
		Vehicle CG Determination		
VEHICLE	Equipment	Weight	Long CG	HOR M
+	Unbalasted Car	2429	37.71058	91598.99
+	Brake receivers/wires	5	134	670
+	Brake Frame	10	26	260
+	Brake Cylinder	29	63	1827
+	Strobe Battery	6	57	342
+	Hub	17	0	0
+	CG Plate (EDRs)	8	35	280
-	Battery	-24	-9	216
-	Oil	-6	8	-48
-	Interior	-51	44	-2244
-	Fuel	-68	88	-5984
-	Coolant	-8	-18	144
-	Washer fluid	0	0	0
BALLAST	Water	72	78	5616
	Misc.		0	0
	Misc.		0	0
				92677.99
TOTAL WEIGHT		2419		38.31252

wheel base 95.25

NCHRP 350 Targets	CURRENT	Difference
Test Inertial Weight	2420 (+/-)55	2419
Long CG	39 (+/-)4	38.31
		-1.0
		-0.68748

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	763	733
Rear	458	475
FRONT	1496	
REAR	933	
TOTAL	2429	

Dummy = 166lbs.

Actual test inertial weight		
	Left	Right
Front	724	724
Rear	475	474
FRONT	1448	
REAR	949	
TOTAL	2397	

Figure A-1. Vehicle Mass Distribution, Test No. NYBBT-1

NYBBT-2		Vehicle: 2003 Kia Rio		
Vehicle CG Determination				
VEHICLE	Equipment	Weight	Long CG	HOR M
+	Unbalasted Car	2343	35.85595	84010.5
+	Brake receivers/wires	5	130.5	652.5
+	Brake Frame	13	29.5	383.5
+	Brake Cylinder	22	65	1430
+	Strobe Battery	6	65.5	393
+	Hub	17	0	0
+	CG Plate (EDRs)	8	35	280
-	Battery	-34	-9	306
-	Oil	-6	8	-48
-	Interior	-43	44	-1892
-	Fuel	-17	78	-1326
-	Coolant	-9	-18	162
-	Washer fluid	-5	0	0
BALLAST	Water	88	78	6864
	Misc.		0	0
	Misc.		0	0
TOTAL WEIGHT		2388		91215.5
				38.19745

wheel base 95.25

NCHRP 350 Targets	CURRENT	Difference
Test Inertial Weight	2420 (+/-)55	2388 -32.0
Long CG	39 (+/-)4	38.20 -0.80255

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	719	742
Rear	463	419
FRONT	1461	
REAR	882	
TOTAL	2343	

Dummy = 166lbs.

Actual test inertial weight		
	Left	Right
Front	696	726
Rear	480	493
FRONT	1422	
REAR	973	
TOTAL	2395	

Figure A-2. Vehicle Mass Distribution, Test No. NYBBT-2

NYBBT-3		Vehicle: 2003 Kia Rio		
Vehicle CG Determination				
VEHICLE	Equipment	Weight	Long CG	HOR M
+	Unbalasted Car	2358	35.50668	83724.75
+	Brake receivers/wires	5	130.5	652.5
+	Brake Frame	10	29.5	295
+	Brake Cylinder	22	65	1430
+	Strobe Battery	6	65.5	393
+	Hub	17	0	0
+	CG Plate (EDRs)	8	35	280
-	Battery	-37	-9	333
-	Oil	-8	8	-64
-	Interior	-41	44	-1804
-	Fuel	-10	78	-780
-	Coolant	-9	-18	162
-	Washer fluid	-8	0	0
BALLAST	Water	97	78	7566
	Misc.		0	0
	Misc.		0	0
				92188.25
TOTAL WEIGHT		2410		38.25239

wheel base 95.25

NCHRP 350 Targets	CURRENT	Difference
Test Inertial Weight	2420 (+/-)55	2410 -10.0
Long CG	39 (+/-)4	38.25 -0.74761

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	734	745
Rear	444	435
FRONT	1479	
REAR	879	
TOTAL	2358	

Dummy = 166lbs.

Actual test inertial weight		
	Left	Right
Front	758	767
Rear	503	565
FRONT	1525	
REAR	1068	
TOTAL	2593	

Figure A-3. Vehicle Mass Distribution, Test No. NYBBT-3

NYBBT-4		Vehicle: 2002 Dodge Ram 1500QC				
Vehicle CG Determination						
VEHICLE	Equipment	Weight	Long CG	Vert CG	HOR M	Vert M
+	Unbalasted Truck	5097	60.75	28.95	309642.8	147558.2
+	Brake receivers/wires	5	116	51	580	255
+	Brake Frame	5	34	31	170	155
+	Brake Cylinder	22	74	29	1628	638
+	Strobe Battery	6	74	30	444	180
+	Hub	27	0	15	0	405
+	CG Plate (EDRs)	8	54	32	432	256
-	Battery	-43	-7	45	301	-1935
-	Oil	-12	8	19	-96	-228
-	Interior	-54	44	24	-2376	-1296
-	Fuel	-165	111	20	-18315	-3300
-	Coolant	-21	-18	35	378	-735
-	Washer fluid	-9	-15	35	135	-315
BALLAST	Water	115	111	20	12765	2300
	Misc. (DTS equip)	20	74	27	1480	540
	Misc.		0	0	0	0
					307168.8	144478.2
	TOTAL WEIGHT	5001			61.42147	28.88985

wheel base 140.25

NCHRP 350 Targets		CURRENT	Difference
Test Inertial Weight	5000	5001	1.0
Long CG	62	61.42	-0.57853
Vert CG	28	28.89	0.88985

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	1469	1377
Rear	1127	1124
FRONT	2846	
REAR	2251	
TOTAL	5097	

Actual test inertial weight		
	Left	Right
Front	1415	1360
Rear	1146	1083
FRONT	2775	
REAR	2229	
TOTAL	5004	

Figure A-4. Vehicle Mass Distribution, Test No. NYBBT-4

NYBBT-5		Vehicle: 2002 Dodge Ram 1500QC				
Vehicle CG Determination						
VEHICLE	Equipment	Weight	Long CG	Vert CG	HOR M	Vert M
+	Unbalasted Truck	5072	59.75	28.02	303052	142117.4
+	Brake receivers/wires	5	116	51	580	255
+	Brake Frame	5	34	31	170	155
+	Brake Cylinder	22	74	29	1628	638
+	Strobe Battery	6	74	30	444	180
+	Hub	27	0	15	0	405
+	CG Plate (EDRs)	8	54	32	432	256
-	Battery	-51	-7	45	357	-2295
-	Oil	-8	8	19	-64	-152
-	Interior	-55	44	24	-2420	-1320
-	Fuel	-158	111	20	-17538	-3160
-	Coolant	-18	-18	35	324	-630
-	Washer fluid	-7	-15	35	105	-245
BALLAST	Steel Plates	132	109	33.5	14388	4422
	Misc. (DTS equip)	20	74	27	1480	540
	Misc.		0	0	0	0
					302938	141166.4
	TOTAL WEIGHT	5000			60.5876	28.23329

wheel base 140.25

NCHRP 350 Targets		CURRENT	Difference
Test Inertial Weight	5000	5000	0.0
Long CG	62	60.59	-1.41240
Vert CG	28	28.23	0.23329

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	1465	1444
Rear	1078	1085
FRONT	2909	
REAR	2163	
TOTAL	5072	

Actual test inertial weight		
	Left	Right
Front	1386	1442
Rear	1095	1095
FRONT	2828	
REAR	2190	
TOTAL	5018	

Figure A-5. Vehicle Mass Distribution, Test No. NYBBT-5

NYBBT-6		Vehicle: 2002 Kia Rio		
Vehicle CG Determination				
VEHICLE	Equipment	Weight	Long CG	HOR M
+	Unbalasted Car	2386	35.05	83629.5
+	Brake receivers/wires	5	130.5	652.5
+	Brake Frame	10	29.5	295
+	Brake Cylinder	22	65	1430
+	Strobe Battery	6	65.5	393
+	Hub	17	0	0
+	CG Plate (EDRs)	8	35	280
-	Battery	-36	-9	324
-	Oil	-6	8	-48
-	Interior	-40	44	-1760
-	Fuel	-18	78	-1404
-	Coolant	-9	-18	162
-	Washer fluid	-5	0	0
BALLAST	Water	60	78	4680
	Misc.		0	0
	DTS	20	65	1300
TOTAL WEIGHT		2420		89934
				37.16281

wheel base 95.25

NCHRP 350 Targets	CURRENT	Difference
Test Inertial Weight	2420 (+/-)55	2420 0.0
Long CG	39 (+/-)4	37.16 -1.83719

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	817	691
Rear	391	487
FRONT	1508	
REAR	878	
TOTAL	2386	

Dummy = 166lbs.

Actual test inertial weight		
	Left	Right
Front	740	723
Rear	493	468
FRONT	1463	
REAR	961	
TOTAL	2424	

Figure A-6. Vehicle Mass Distribution, Test No. NYBBT-6

NYBBT-7		Vehicle: 2002 Dodge Ram 1500QC				
Vehicle CG Determination						
VEHICLE	Equipment	Weight	Long CG	Vert CG	HOR M	Vert M
+	Unbalasted Truck	5069	61.45	28.14	311490.1	142641.7
+	Brake receivers/wires	5	116	51	580	255
+	Brake Frame	5	34	31	170	155
+	Brake Cylinder	22	74	29	1628	638
+	Strobe Battery	6	76	32	456	192
+	Hub	27	0	15	0	405
+	CG Plate (EDRs)	8	54	32	432	256
-	Battery	-43	-7	45	301	-1935
-	Oil	-12	8	19	-96	-228
-	Interior	-72	44	24	-3168	-1728
-	Fuel	-154	111	20	-17094	-3080
-	Coolant	-13	-18	35	234	-455
-	Washer fluid	0	-15	35	0	0
BALLAST	Water	137	111	20	15207	2740
	Misc. (DTS equip)	15	74	27	1110	405
	Misc.		0	0	0	0
TOTAL WEIGHT		5000			311250.1	140261.7
					62.25001	28.05233

wheel base 140.25

NCHRP 350 Targets		CURRENT	Difference
Test Inertial Weight	5000	5000	0.0
Long CG	62	62.25	0.25001
Vert CG	28	28.05	0.05233

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	1441	1407
Rear	1107	1114
FRONT	2848	
REAR	2221	
TOTAL	5069	

Actual test inertial weight		
	Left	Right
Front	1424	1366
Rear	1096	1126
FRONT	2790	
REAR	2222	
TOTAL	5012	

Figure A-7. Vehicle Mass Distribution, Test No. NYBBT-7



Test: **NYBBT-8** Vehicle: **Rio Sedan (1100C)**

Vehicle CG Determination				
VEHICLE	Equipment	Weight	Long CG	HOR M
+	Unbalasted Car	2434	34.87	84867.75
+	Brake receivers/wires	6	129.5	777
+	Brake Frame	7	27	189
+	Brake Cylinder	22	63	1386
+	Strobe Battery	6	63	378
+	Hub	17	0	0
+	CG Plate (EDRs)	9	39.5	355.5
+	DTS	23	62	1426
-	Battery	-29	-8.5	246.5
-	Oil	-6	-3	18
-	Interior	-49	49	-2401
-	Fuel	-38	84.5	-3211
-	Coolant	-9	-16.5	148.5
-	Washer fluid	-8	-16	128
BALLAST	Water	38	84.5	3211
	Misc.			0
	Misc.			0
TOTAL WEIGHT		2423		87519.25
				36.1202

wheel base 95.25

MASH targets		CURRENT	Difference
Test Inertial Weight	2420 (+/-)55	2423	3.0
Long CG	39 (+/-)4	36.12	-2.87980

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	780	763
Rear	460	431
FRONT	1543	
REAR	891	
TOTAL	2434	

Dummy = 166lbs.

Actual test inertial weight (from scales)		
	Left	Right
Front	748	755
Rear	463	472
FRONT	1503	
REAR	935	
TOTAL	2438	

Figure A-8. Vehicle Mass Distribution, Test No. NYBBT-8

NYBBT-9		Vehicle: Ram 1500 (2270P)				
Vehicle CG Determination						
VEHICLE	Equipment	Weight	Long CG	Vert CG	HOR M	Vert M
+	Unbalasted Truck(Curb)	5033	61.89627	28.7766	311523.9	144832.6
+	Brake receivers/wires	9	108	52.5	972	472.5
+	Brake Frame	5	36	24.5	180	122.5
+	Brake Cylinder (Nitrogen)	28	75	28	2100	784
+	Strobe/Brake Battery	5	71	29	355	145
+	Hub	20	0	15	0	300
+	CG Plate (EDRs)	8	72	29.5	576	236
-	Battery	-46	-8	40	368	-1840
-	Oil	-8	5.5	17	-44	-136
-	Interior	-68	49	23	-3332	-1564
-	Fuel	-160	114.5	19.5	-18320	-3120
-	Coolant	-18	-17.25	32.5	310.5	-585
-	DTS	22	71	29	1562	638
-	Washer fluid	-6	-18	32.5	108	-195
BALLAST	Water	169	114.5	19.5	19350.5	3295.5
	Misc.		71	30	0	0
	Misc.				0	0
TOTAL WEIGHT		4993			315709.9	143386.1
					63.23051	28.71743

wheel base	140.25	Calculated Test Inertial Weight		
MASH Targets	Targets	CURRENT	Difference	
Test Inertial Weight	5000	4993	-7.0	
Long CG	62	63.23	1.23051	
Vert CG	28	28.72	0.71743	

Note, Long. CG is measured from front axle of test vehicle

Curb Weight		
	Left	Right
Front	1430	1382
Rear	1109	1112
FRONT	2812	
REAR	2221	
TOTAL	5033	

Actual test inertial weight (from scales)		
	Left	Right
Front	1374	1379
Rear	1101	1135
FRONT	2753	
REAR	2236	
TOTAL	4989	

Figure A-9. Vehicle Mass Distribution, Test No. NYBBT-9

**APPENDIX B Type II Box Beam Terminal System Details - English Units, Test No.**

**NYBBT-1**

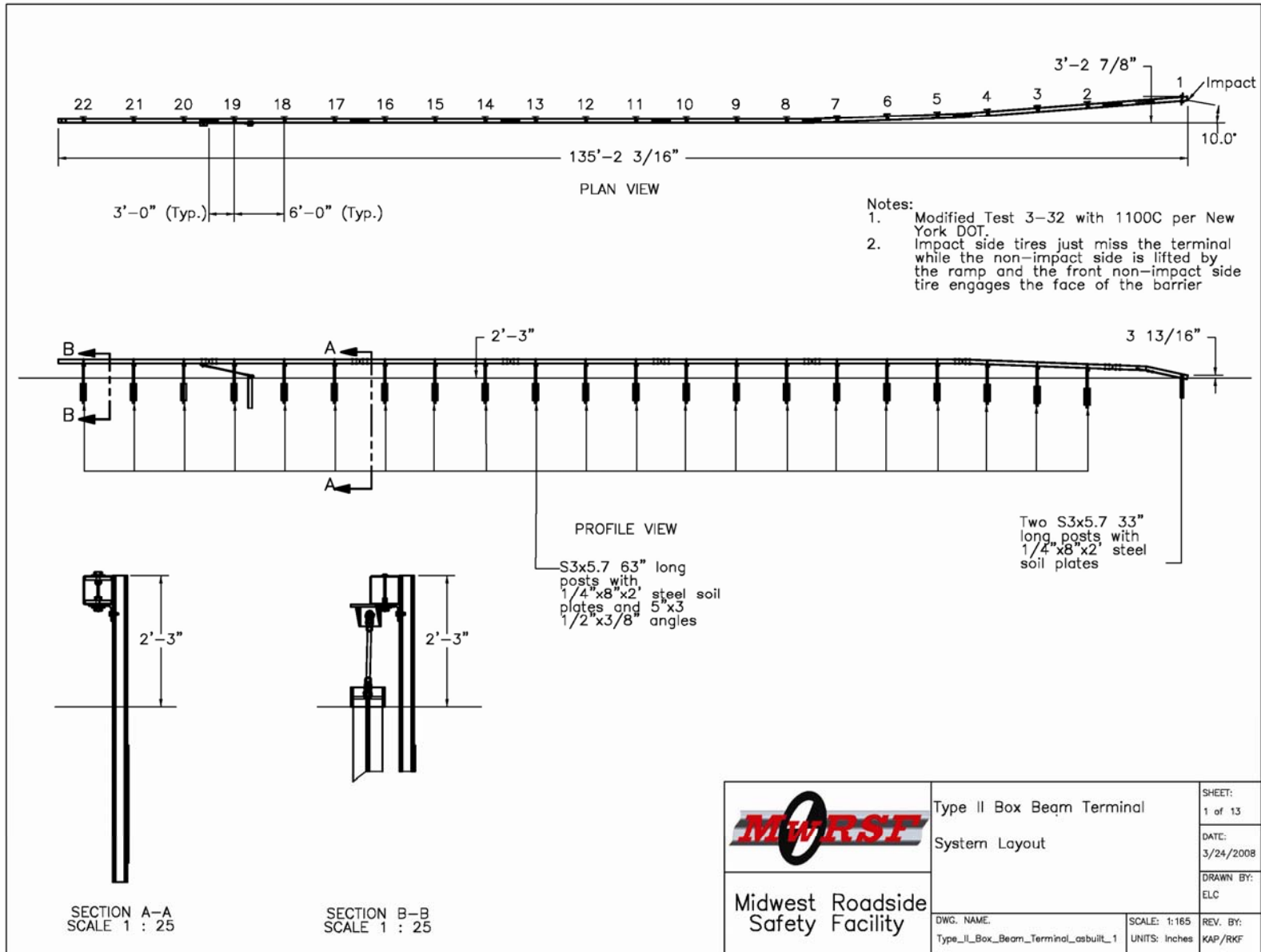


Figure B-1. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

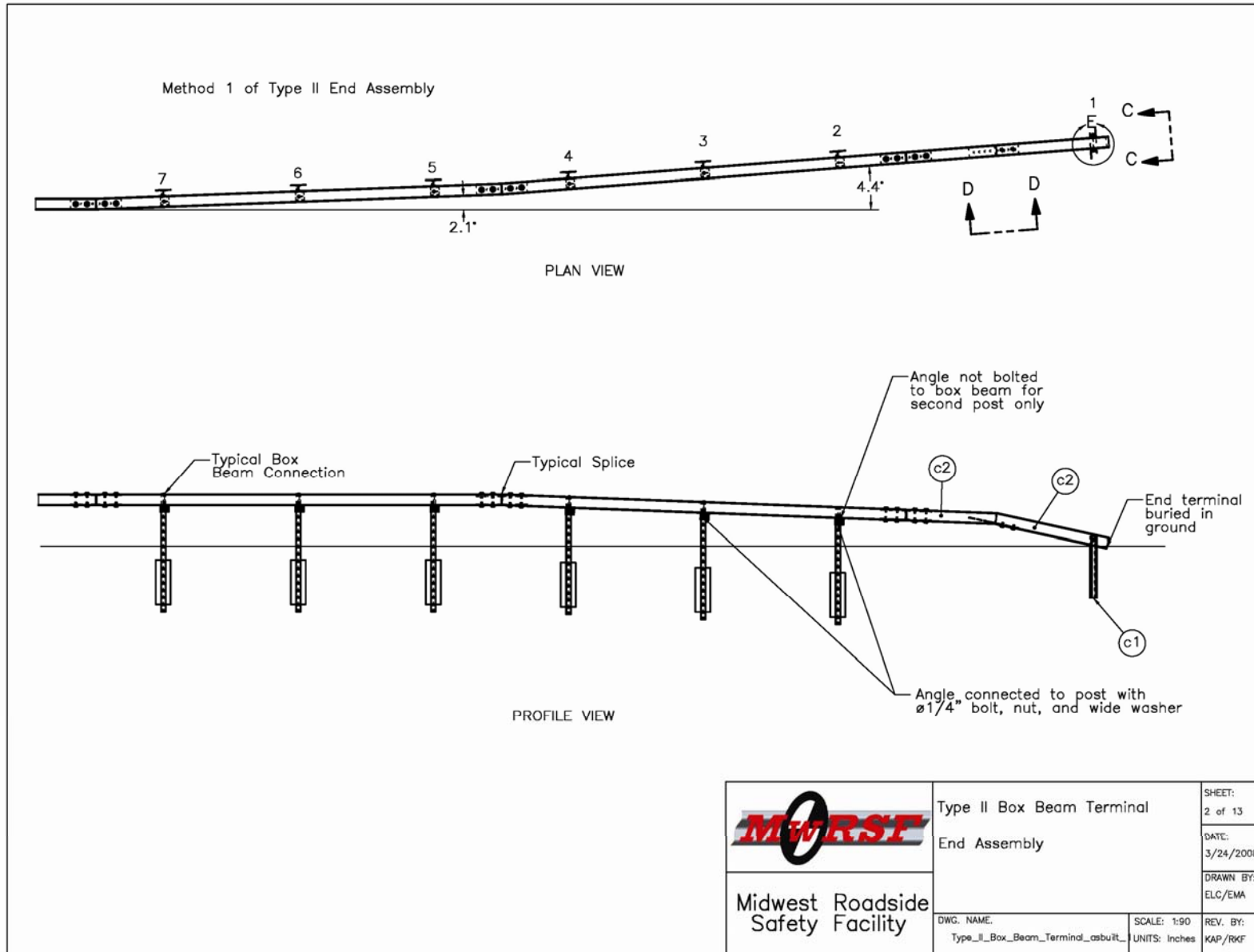


Figure B-2. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

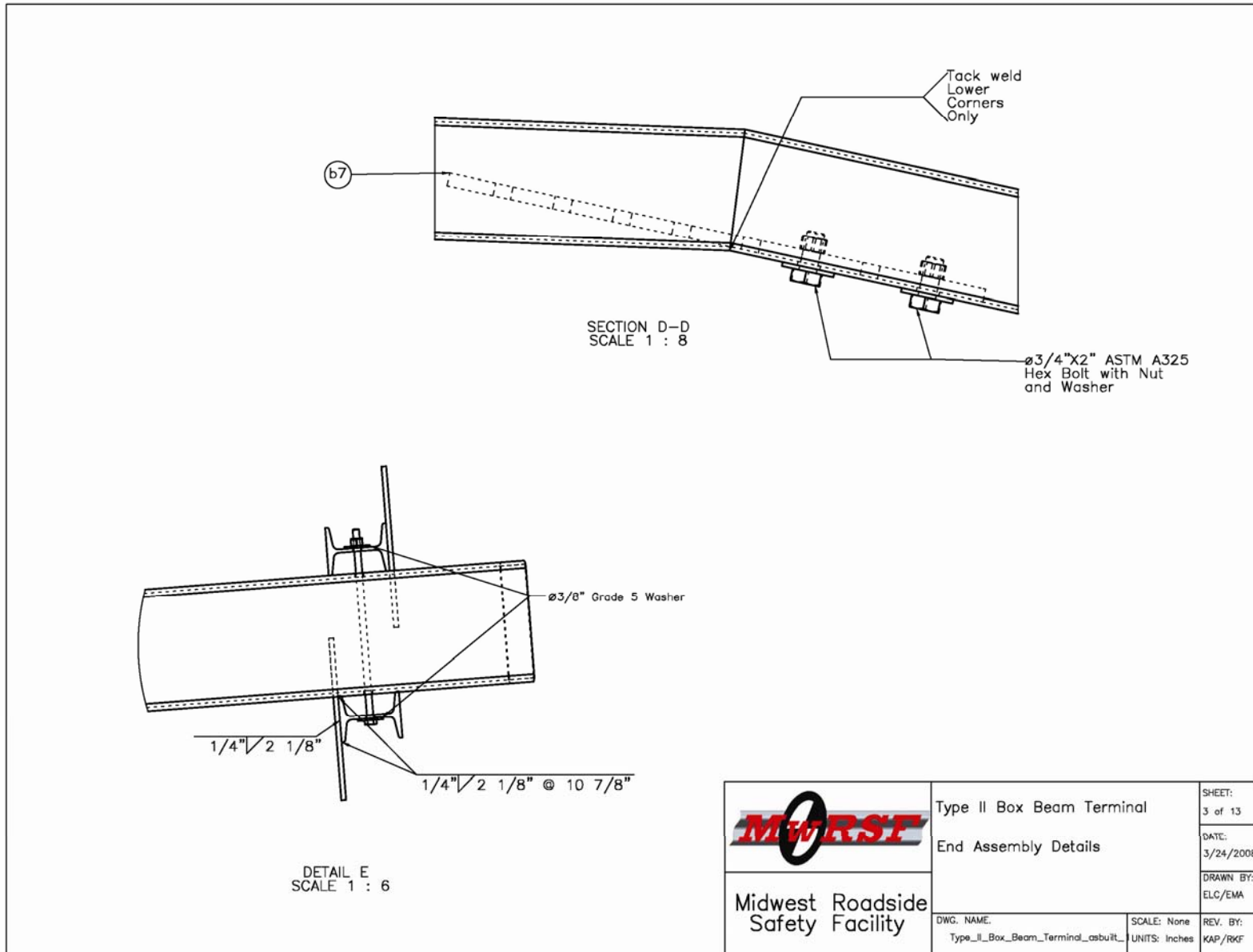


Figure B-3. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

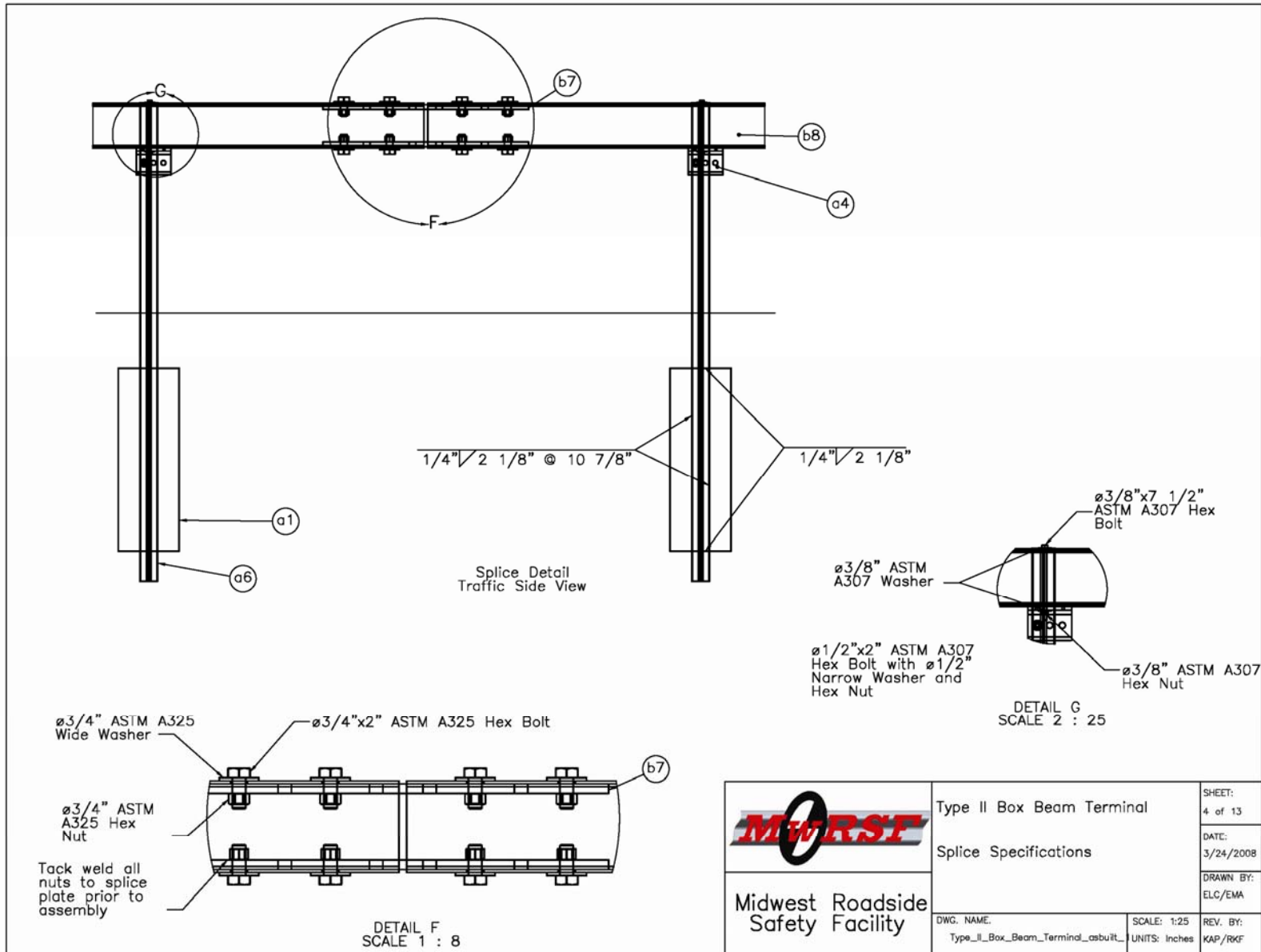


Figure B-4. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

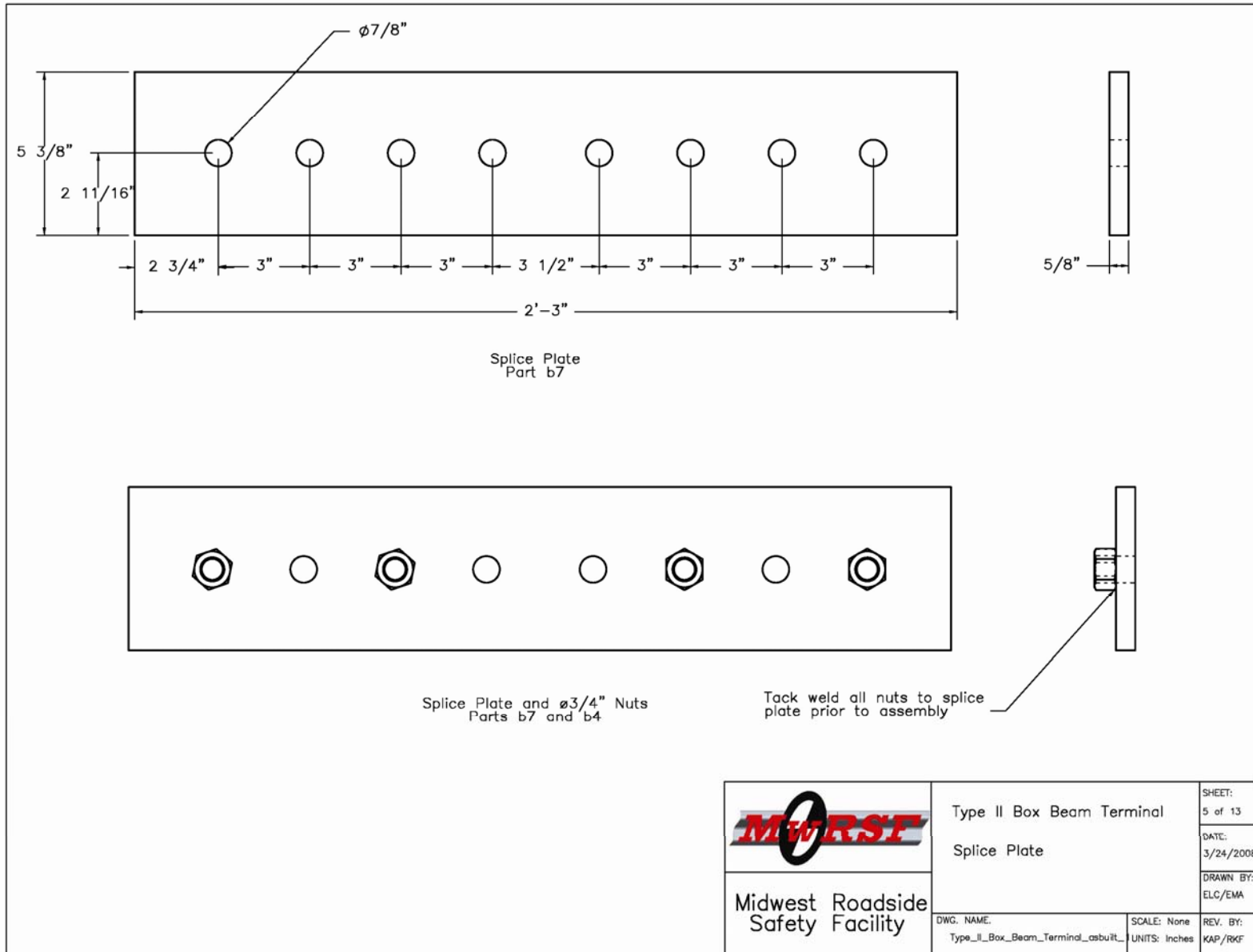


Figure B-5. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1



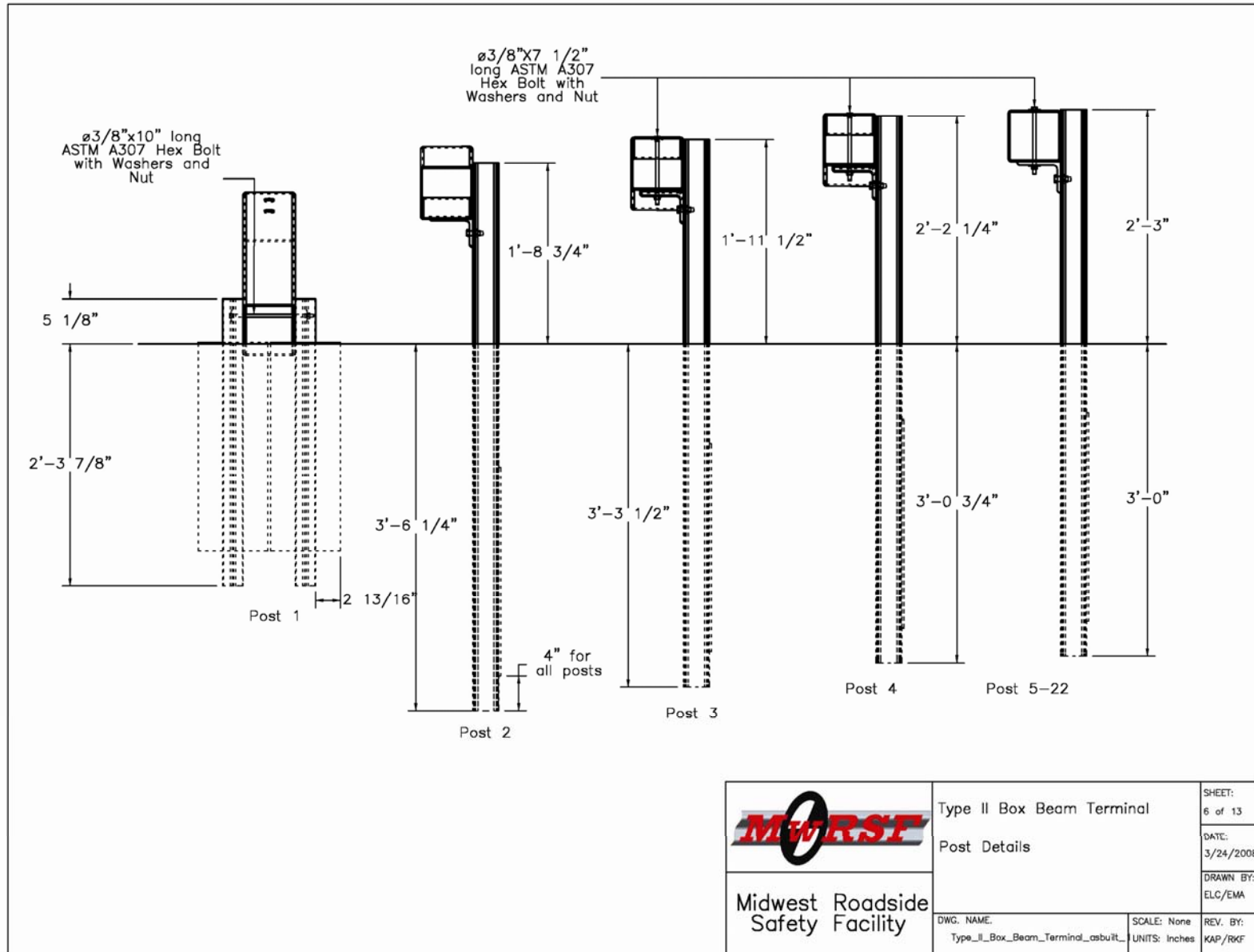


Figure B-6. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

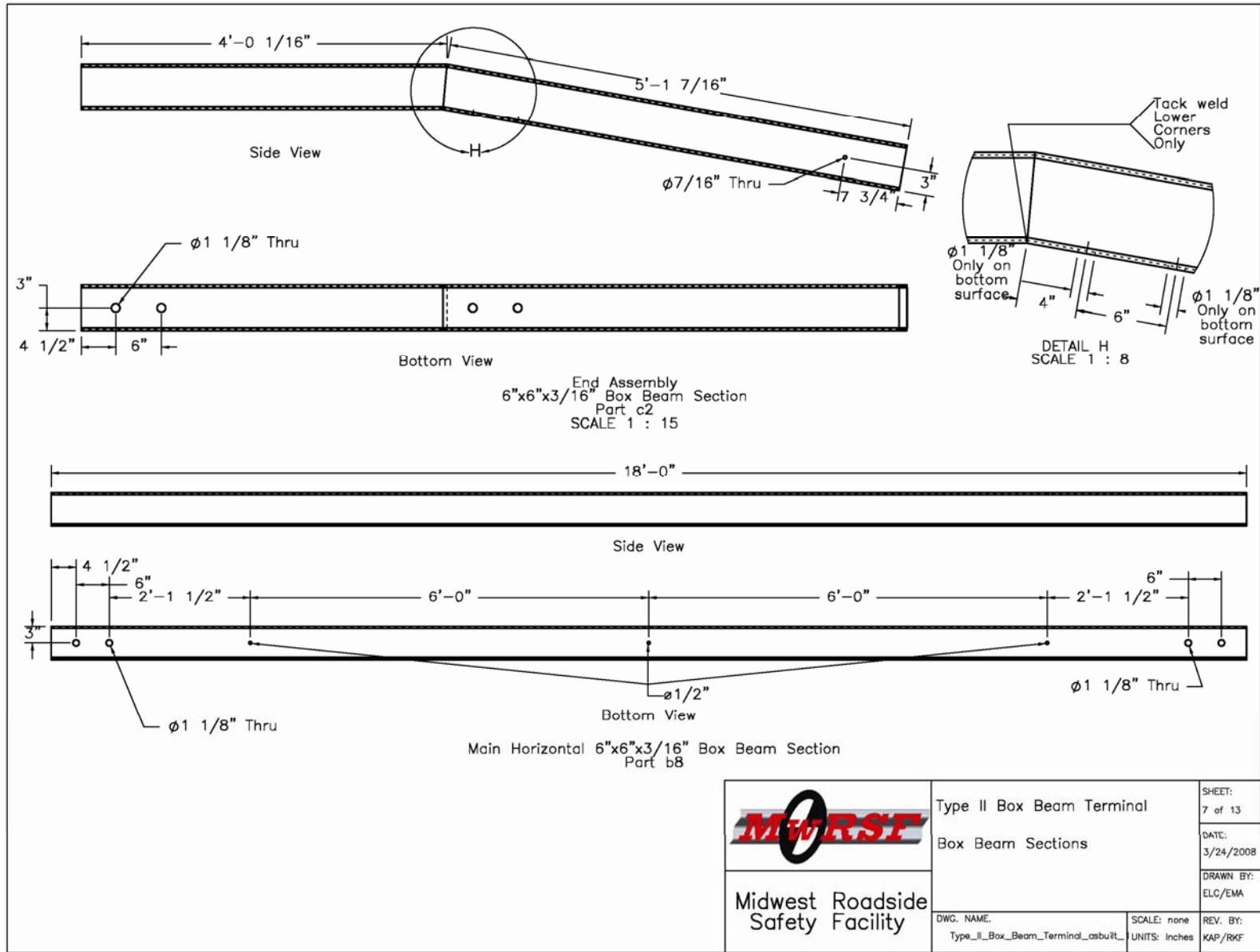


Figure B-7. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

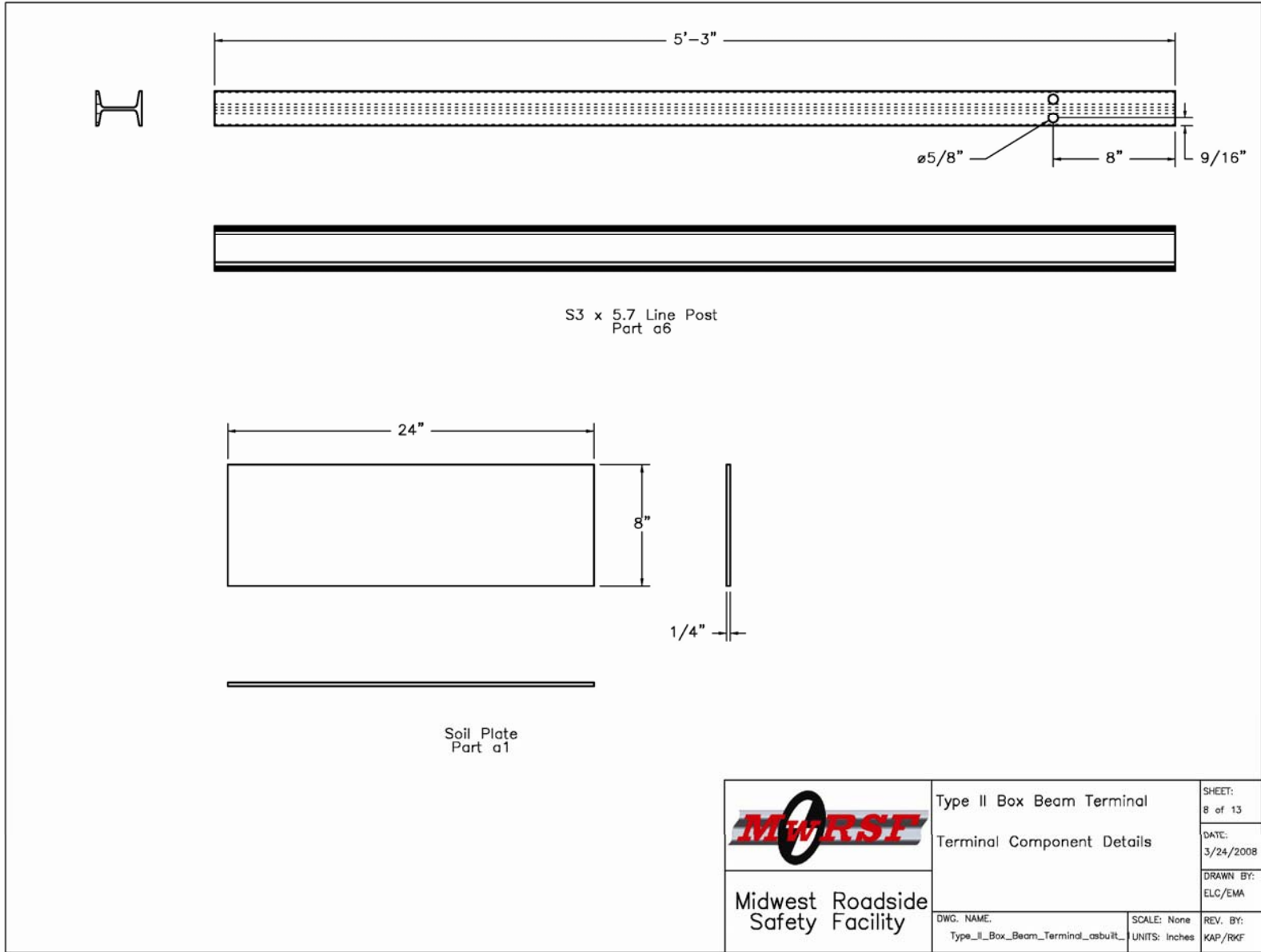


Figure B-8. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

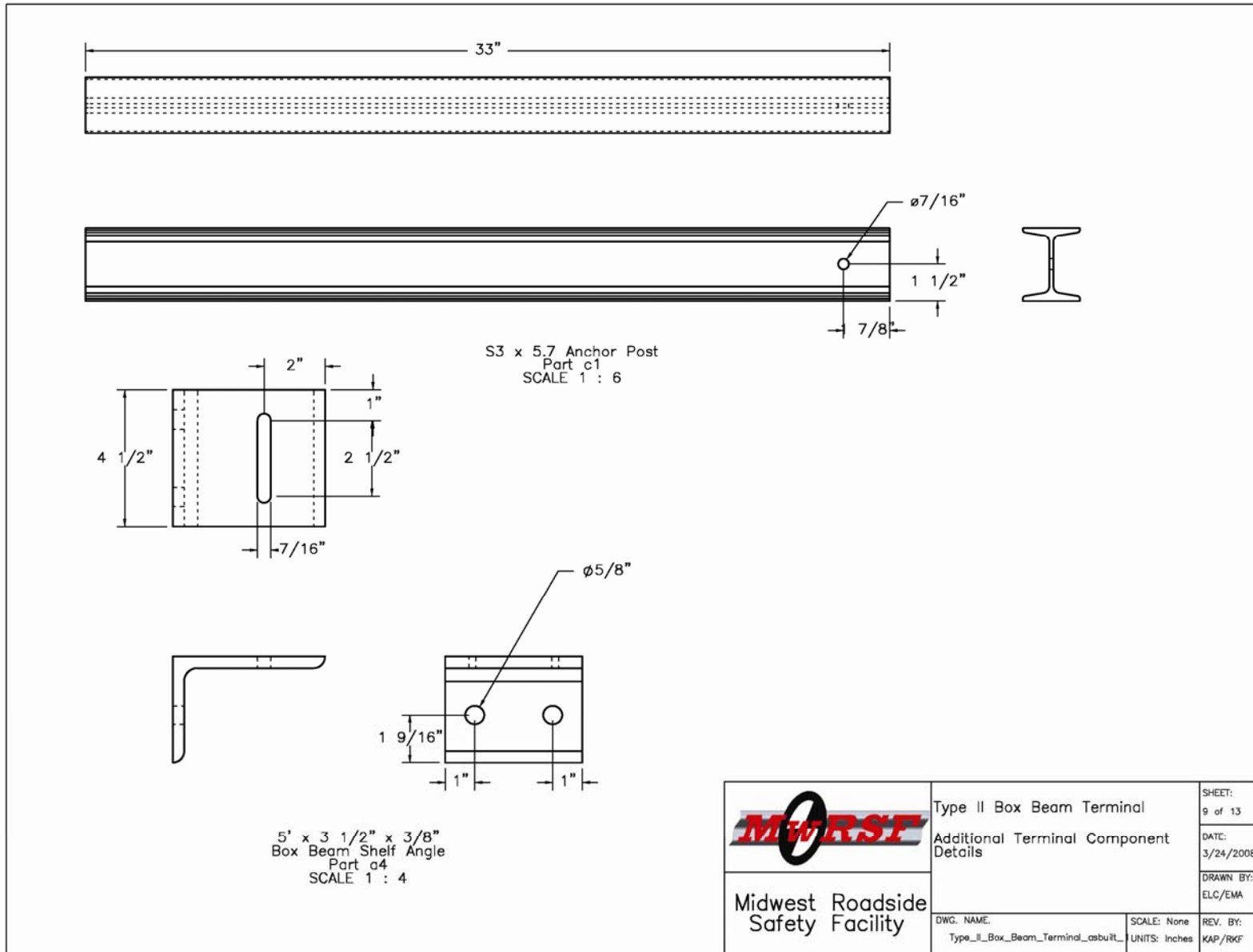


Figure B-9. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

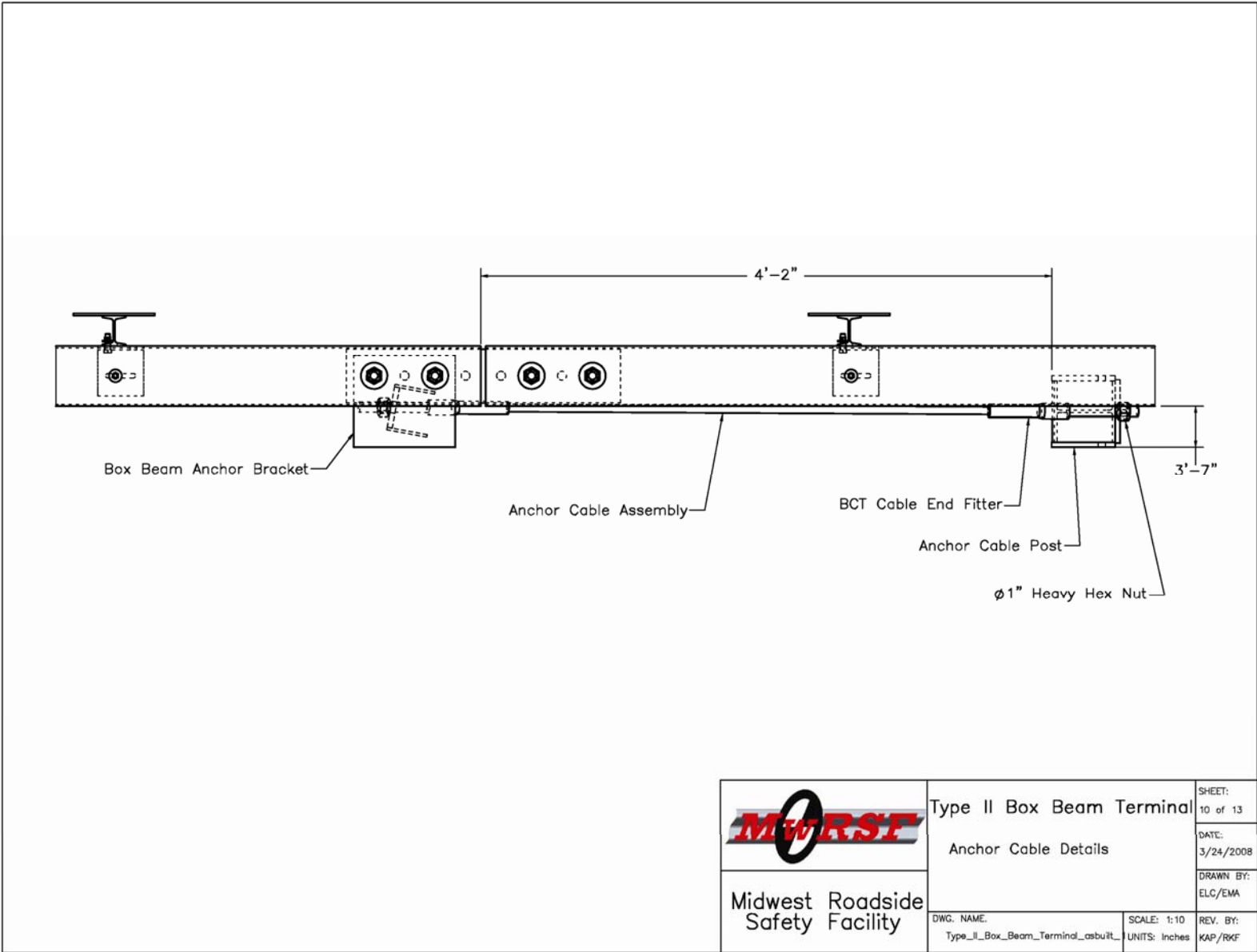


Figure B-10. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

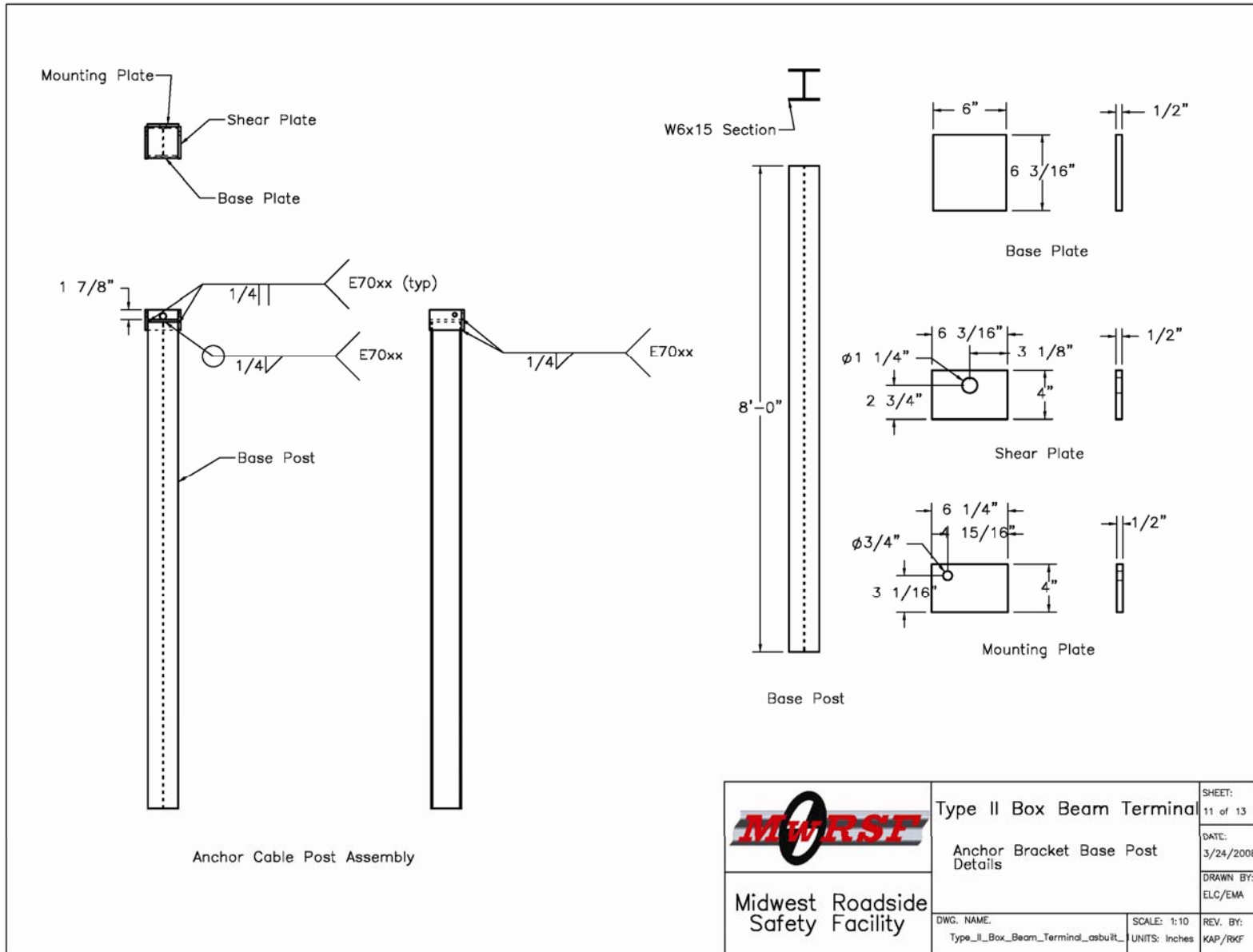


Figure B-11. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

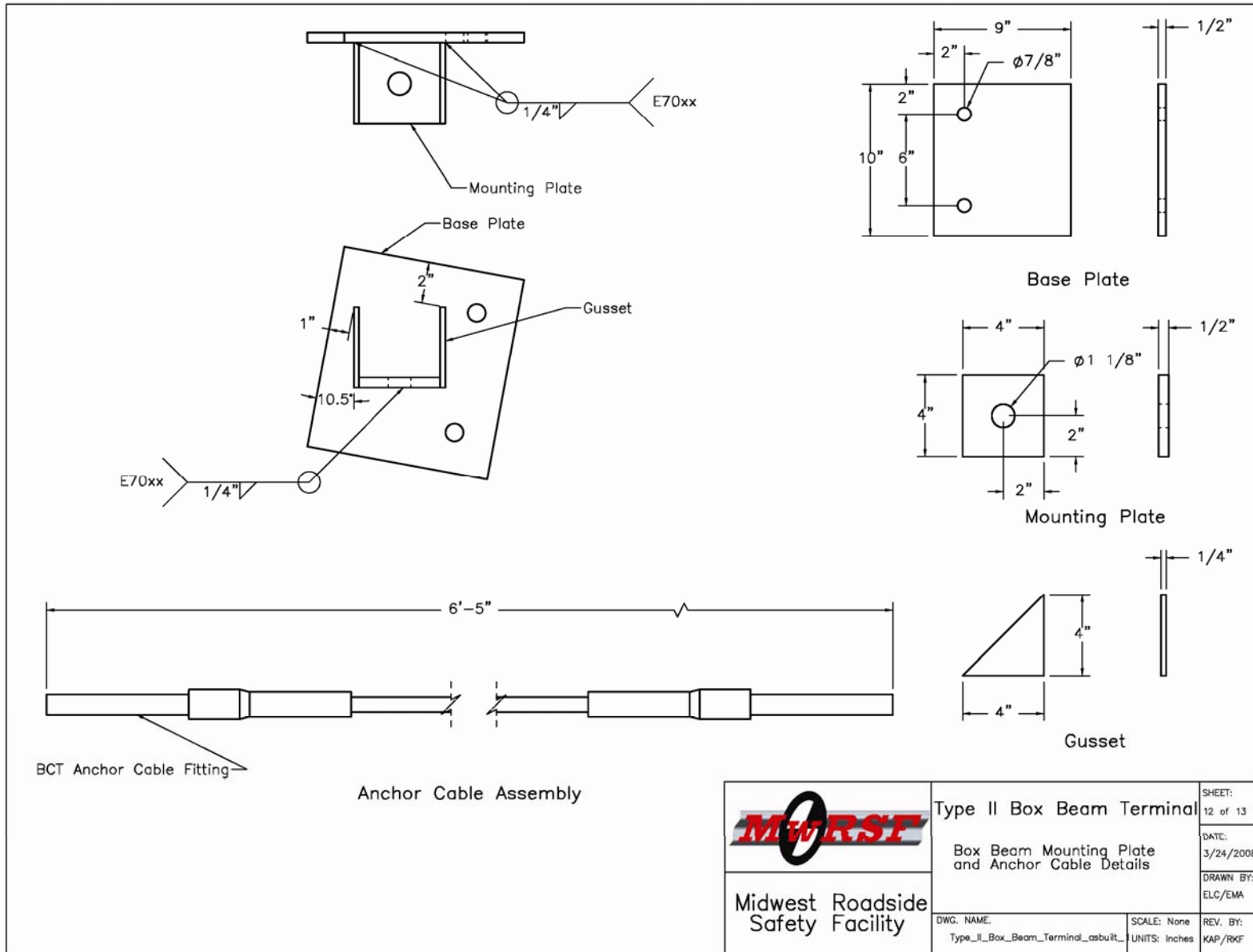



Figure B-12. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1

 Midwest Roadside Safety Facility	Type II Box Beam Terminal Box Beam Mounting Plate and Anchor Cable Details	SHEET: 12 of 13
	DWG. NAME: Type_II_Box_Beam_Terminal_asbuilt	SCALE: None UNITS: Inches

Type II Box Beam Terminal			
Item No.	Quantity	Description	Material Specification
a1	23	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	19	ø 1/2" coarse thread 2" long hex bolt	ASTM A307
a3	7	ø 1/2" hex nut	ASTM A307
a4	21	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	19	ø 1/2" narrow washer	ASTM A307
a6	21	S3 x 5.7 63" long post	A36 Steel
b1	20	ø 3/8" coarse thread 7 1/2" long hex bolt	ASTM A307
b2	33	ø 3/8" hex nut	ASTM A307
b3	42	ø 3/8" wide washer	ASTM A307
b4	50	ø 3/4" hex nut	ASTM A325
b5	58	ø 3/4" wide washer	ASTM A325
b6	58	ø 3/4" coarse thread 2" long hex bolt	ASTM A325
b7	15	26 3/4" x 5 5/16" x 5/8" splice plate	A36 Steel
b8	7	6" x 6" x 3/16" 18' long box beam	ASTM A500 Grade B
c1	2	S3 x 5.7 33" long post	A36 Steel
c2	1	6" x 6" x 3/16" box beam end assembly	ASTM A500 Grade B
c4	1	ø 5/16" coarse thread 9 3/8" long hex bolt	ASTM A307
c5	2	ø 1/4" hex nut	ASTM A307
c6	2	ø 1/4" x 1 1/2" long hex bolt	ASTM A307
c7	4	ø 1/4" wide washer	ASTM A307
d1	1	Box beam cable anchor	A36 steel, galvanized
d2	1	Lower end post	A36 steel, galvanized
d3	2	BCT Anchor Cable End	A36 steel, galvanized
d4	1	Anchor cable	3 x 7 galvanized cable
d5	2	7/8" diameter hex nut	ASTM A307

 <b>Midwest Roadside Safety Facility</b>	Type II Box Beam Terminal	SHEET: 13 of 13
	Bill of Materials	DATE: 3/24/2008
DWG. NAME: Type_II_Box_Beam_Terminal_csbuilt	SCALE: None UNITS: Inches	DRAWN BY: ELC/EMA
		REV. BY: KAP/RKF

Figure B-13. Type II Box Beam Terminal System Details (English), Test No. NYBBT-1



**APPENDIX C Test Summary Sheets in English Units**



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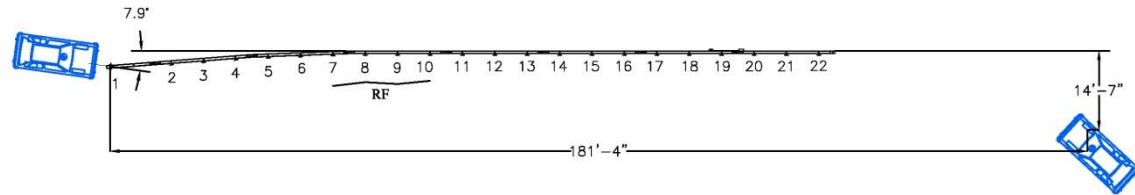
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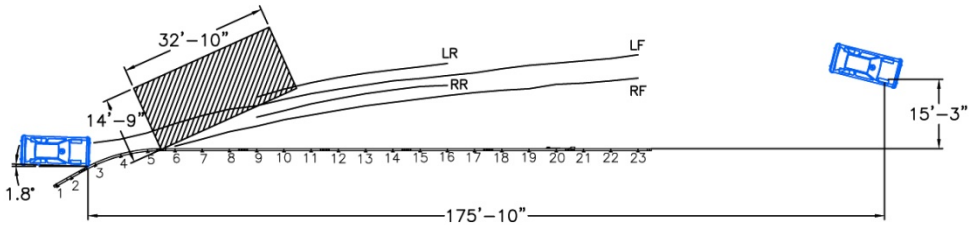
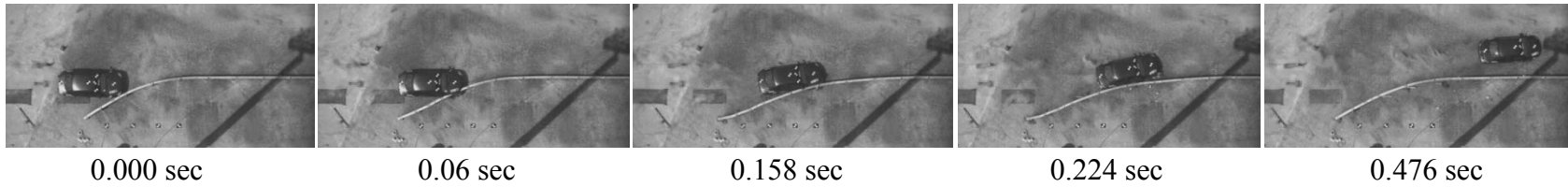
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- Test Agency ..... MwRSF
- Test Number ..... NYBBT-1
- Date ..... 8/14/07
- MASH Test Designation ..... Modified 3-32
- Appurtenance ..... Type II End Terminal
- Total Length ..... 135 ft
- Key Element - Steel Box Beam
  - Size ..... 6 in. x 6 in. x 3/16 in.
  - Length ..... 18 ft
  - Top Mounting Height ..... 27 in.
- Key Elements - Steel Post
  - Post No. 1 ..... S3x5.7 by 33 in. long
  - Post Nos. 2-22 ..... S3x5.7 by 63 in. long
- Type of Soil ..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation ..... 1100C
  - Make and Model ..... 2002 Kia Rio
  - Curb ..... 2,428 lb
  - Test Inertial ..... 2,396 lb
  - Gross Static ..... 2,586 lb
- Impact Conditions
  - Speed ..... 61.9 mph
  - Angle (trajectory) ..... 7.9 degrees
  - Target Impact Location ..... on upstream end of terminal
  - Actual Impact Location ..... 2 1/2 in. downstream from end of terminal
- Exit Conditions
  - Speed ..... 61.5 mph
  - Angle ..... 10.6 degrees
  - Exit Box Criterion ..... NA
- Post-Impact Trajectory
  - Vehicle Stability ..... Unsatisfactory
  - Stopping Distance ..... 181 ft - 4 in. downstream  
14 ft - 7 in. laterally behind traffic-side face



- Occupant Impact Velocity (EDR-3)
  - Longitudinal ..... -8.46 ft/s < 40 ft/s
  - Lateral ..... -7.02 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal ..... 11.19 g's < 20.49 g's
  - Lateral ..... 11.91 g's < 20.49 g's
- Occupant Impact Velocity (EDR-4)
  - Longitudinal ..... -4.17 ft/s < 40 ft/s
  - Lateral ..... -7.60 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-4)
  - Longitudinal ..... 10.47 g's < 20.49 g's
  - Lateral ..... 12.49 g's < 20.49 g's
- THIV (EDR-4 - not required) ..... NA
- PHD (EDR-4 - not required) ..... NA
- ASI (EDR-3 - not required) ..... NA
- ASI (EDR-4 - not required) ..... NA
- Test Article Damage ..... Moderate
- Test Article Deflections
  - Permanent Set ..... 1 3/16 in.
  - Dynamic ..... 2 11/16 in.
  - Working Width ..... NA
- Vehicle Damage ..... Extensive
  - VDS<sup>12</sup> ..... 01-L&T-5
  - CDC<sup>13</sup> ..... 01-FDA09
  - Maximum Deformation ..... NA
- Angular Displacement
  - Roll ..... NA
  - Pitch ..... NA
  - Yaw ..... 188 degrees

Figure C-1. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-1



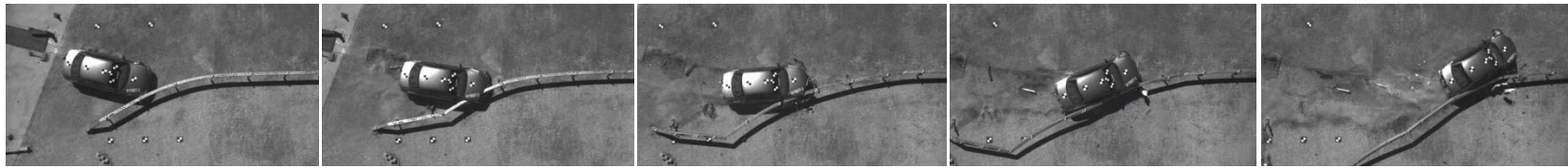
28

- Test Agency ..... MwRSF
- Test Number ..... NYBBT-2
- Date ..... 8/15/07
- MASH Test Designation ..... Modified 3-30
- Appurtenance ..... Type IIA End Terminal
- Total Length ..... 132 ft
- Key Element - Steel Box Beam
  - Size ..... 6 in. x 6 in. x 3/16 in.
  - Length ..... 18 ft
  - Top Mounting Height ..... 27 in.
- Key Elements - Steel Post
  - Post No. 1 ..... S3x5.7 by 33 in. long
  - Post Nos. 2-22 ..... S3x5.7 by 63 in. long
- Type of Soil ..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation ..... 1100C
  - Make and Model ..... 2002 Kia Rio
  - Curb ..... 2,343 lb
  - Test Inertial ..... 2,395 lb
  - Gross Static ..... 2,553 lb
- Impact Conditions
  - Speed ..... 63.2 mph
  - Angle (trajectory) ..... 1.6 degrees
  - Target Impact Location ..... left 1/4-point aligned w/ centerline tangent box beam
  - Actual Impact Location ..... 16 1/2 in. upstream of post no. 3
- Exit Conditions
  - Speed ..... 48.7 mph
  - Angle ..... 15.7 degrees
  - Exit Box Criterion ..... Passed
- Post-Impact Trajectory
  - Vehicle Stability ..... Satisfactory
  - Stopping Distance ..... 175 ft - 10 in. downstream
  - 15 ft - 3 in. laterally away traffic-side face

- Occupant Impact Velocity (EDR-3)
  - Longitudinal ..... -14.38 ft/s < 40 ft/s
  - Lateral ..... -14.75 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal ..... -8.54 g's < 20.49 g's
  - Lateral ..... -4.78 g's < 20.49 g's
- Occupant Impact Velocity (EDR-4)
  - Longitudinal ..... -12.47 ft/s < 40 ft/s
  - Lateral ..... -14.73 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-4)
  - Longitudinal ..... -7.26 g's < 20.49 g's
  - Lateral ..... -3.91 g's < 20.49 g's
- THIV (DTS - not required)\* ..... 20.67 ft/s
- PHD (DTS - not required)\* ..... 8.99 g's
- ASI (EDR-3 - not required) ..... NA
- ASI (EDR-4 - not required) ..... NA
- Test Article Damage ..... Moderate
- Test Article Deflections
  - Permanent Set ..... 7 1/2 in.
  - Dynamic ..... 24 1/8 in.
  - Working Width ..... 109 13/16 in.
- Vehicle Damage ..... Moderate
  - VDS<sup>12</sup> ..... 01-RFQ-3
  - CDC<sup>13</sup> ..... 01-FZEW3
  - Maximum Deformation ..... NA
- Angular Displacement
  - Roll ..... NA
  - Pitch ..... NA
  - Yaw ..... -15 degrees

Figure C-2. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-2

\* THIV and PHD values are calculated using angular data from the DTS and accelerometer traces from the EDR-3.



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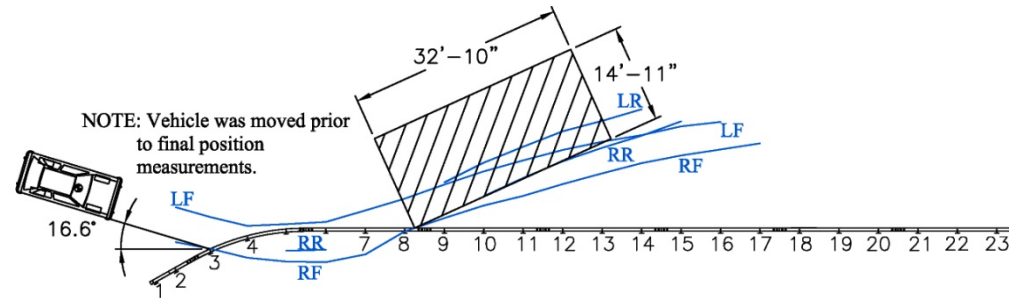
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- Test Agency..... MwRSF
- Test Number..... NYBBT-3
- Date ..... 9/7/07
- MASH Test Designation..... 3-34
- Appurtenance..... Type IIA End Terminal
- Total Length..... 132 ft
- Key Element - Steel Box Beam
  - Size..... 6 in. x 6 in. x 3/16 in.
  - Length..... 18 ft
  - Top Mounting Height..... 27 in.
- Key Elements - Steel Post
  - Post No. 1..... S3x5.7 by 33 in. long
  - Post Nos. 2-23..... S3x5.7 by 63 in. long
- Type of Soil..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation..... 1100C
  - Make and Model..... 2002 Kia Rio
  - Curb..... 2,358 lb
  - Test Inertial..... 2,428 lb
  - Gross Static..... 2,593 lb
- Impact Conditions
  - Speed..... 63.7 mph
  - Angle (trajectory)..... 16.6 degrees
  - Target Impact Location..... Centerline of post no. 3
  - Actual Impact Location..... 3/4 in. upstream of post no. 3
- Exit Conditions
  - Speed..... 35.9 mph
  - Angle..... 19.5 degrees
  - Exit Box Criterion..... Passed
- Post-Impact Trajectory
  - Vehicle Stability..... Satisfactory
  - Stopping Distance..... NA
- Occupant Impact Velocity (EDR-3)
  - Longitudinal..... -17.16 ft/s < 40 ft/s
  - Lateral..... 14.57 ft/s < 40 ft/s

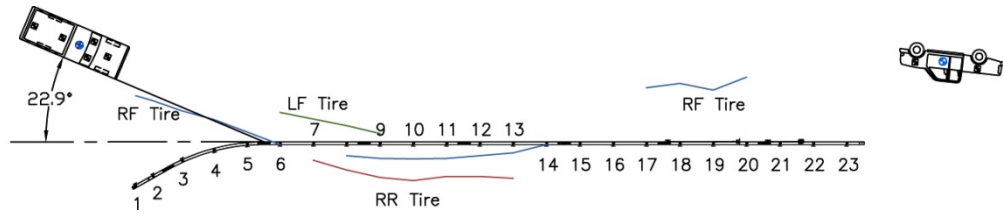
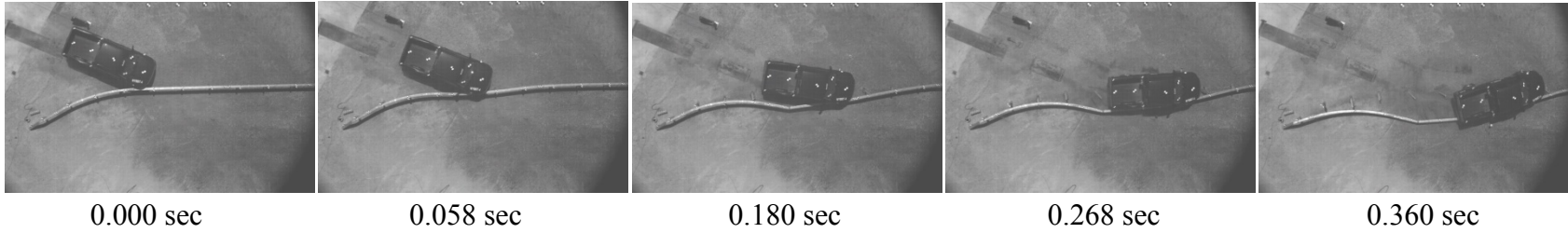
29



- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal..... -9.02 g's < 20.49 g's
  - Lateral..... 6.53 g's < 20.49 g's
- THIV (EDR-3 - not required)\*..... 20.96 ft/s
- PHD (EDR-3 - not required)\*..... 10.95 g's
- ASI (EDR-3 - not required)..... NA
- Test Article Damage..... Moderate
- Test Article Deflections
  - Permanent Set..... 246 in.
  - Dynamic..... NA
  - Working Width..... 287 7/8 in.
- Vehicle Damage..... Moderate
  - VDS<sup>12</sup>..... 01-RFQ-6
  - CDC<sup>13</sup>..... 01-RYEW2
  - Maximum Deformation..... NA
- Angular Displacement
  - Roll..... 3 degrees
  - Pitch..... NA
  - Yaw..... -46 degrees

Figure C-3. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-3

\* The THIV and PHD values were calculated using high-speed video analysis and EDR-3 accelerometer data.



30

- Test Agency ..... MwRSF
- Test Number ..... NYBBT-4
- Date ..... 7/11/08
- MASH Test Designation ..... 3-35
- Appurtenance ..... Modified Type IIA End Terminal
- Total Length ..... 132 ft
- Key Element - Steel Box Beam
  - Size ..... 6 in. x 6 in. x 3/16 in.
  - Length ..... 18 ft
  - Top Mounting Height ..... 27 in.
- Key Elements - Steel Post
  - Post Nos. 1-3 ..... S3x5.7 by 84 in. long
  - Post Nos. 4-23 ..... S3x5.7 by 63 in. long
- Type of Soil ..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation ..... 2270P
  - Make and Model ..... 2002 Dodge Ram 1500 Quad Cab Pickup
  - Curb ..... 5,097 lb
  - Test Inertial ..... 5,004 lb
  - Gross Static ..... 5,176 lb
- Impact Conditions
  - Speed ..... 62.1 mph
  - Angle (trajectory) ..... 22.9 degrees
  - Target Impact Location ..... Midspan between post nos. 5 and 6
  - Actual Impact Location ..... 33 1/2 in. upstream of post no. 6
- Exit Conditions
  - Speed ..... NA
  - Angle ..... NA
  - Exit Box Criterion ..... NA
- Post-Impact Trajectory
  - Vehicle Stability ..... Unsatisfactory
  - Stopping Distance ..... NA

- Occupant Impact Velocity (EDR-3)
  - Longitudinal ..... -10.32 ft/s < 40 ft/s
  - Lateral ..... 13.32 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal ..... -7.12 g's < 20.49 g's
  - Lateral ..... 11.90 g's < 20.49 g's
- Occupant Impact Velocity (DTS)
  - Longitudinal ..... -9.23 ft/s < 40 ft/s
  - Lateral ..... 13.53 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (DTS)
  - Longitudinal ..... -6.38 g's < 20.49 g's
  - Lateral ..... 11.32 g's < 20.49 g's
- THIV (DTS - not required) ..... 17.52 ft/s
- PHD (DTS - not required) ..... 11.42 g's
- ASI (EDR-3 - not required) ..... 0.84
- ASI (DTS - not required) ..... 0.79
- Test Article Damage ..... Extensive
- Test Article Deflections
  - Permanent Set ..... 282 1/4 in.
  - Dynamic ..... NA
  - Working Width ..... NA
- Vehicle Damage ..... Extensive
  - VDS<sup>12</sup> ..... 01-R&T-4
  - CDC<sup>13</sup> ..... 01-RDAO9
- Maximum Deformation ..... 1 1/4 in. at right-center floorboard
- Angular Displacement (Note: Angular data was not available after 3.8 seconds)
  - Roll ..... 193 degrees
  - Pitch ..... 90 degrees
  - Yaw ..... 132 degrees

Figure C-4. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-4



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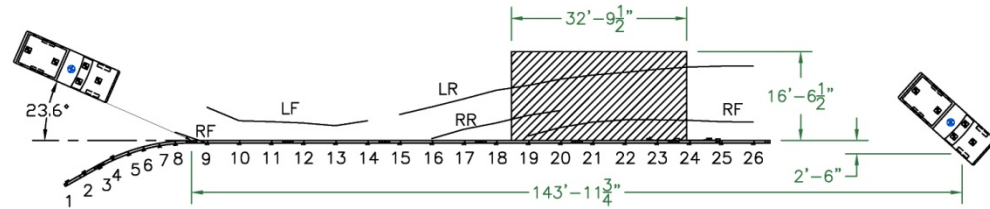
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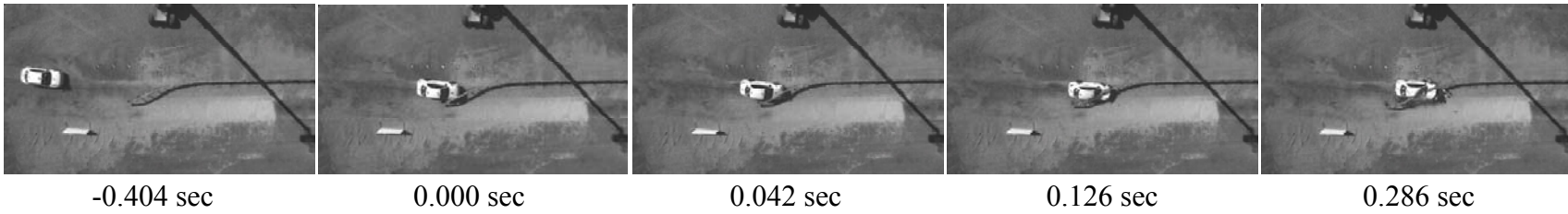
- Test Agency ..... MwRSF
- Test Number ..... NYBBT-5
- Date ..... 7/31/08
- MASH Test Designation ..... 3-35
- Appurtenance ..... Modified Type IIA End Terminal
- Total Length ..... 132 ft
- Key Element - Steel Box Beam
  - Size ..... 6 in. x 6 in. x 3/16 in.
  - Length ..... 18 ft
  - Top Mounting Height ..... 27 in.
- Key Elements - Steel Post
  - Post Nos. 1, 2, 4 ..... S3x5.7 by 84 in. long
  - Post Nos. 3, 5-26 ..... S3x5.7 by 63 in. long
- Type of Soil ..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation ..... 2270P
  - Make and Model ..... 2002 Dodge Ram 1500 Quad Cab Pickup
  - Curb ..... 5,128 lb
  - Test Inertial ..... 5,018 lb
  - Gross Static ..... 5,190 lb
- Impact Conditions
  - Speed ..... 62.1 mph
  - Angle (trajectory) ..... 23.6 degrees
  - Target Impact Location ..... Midspan between post nos. 8 and 9
  - Actual Impact Location ..... 34 in. upstream of post no. 9
- Exit Conditions
  - Speed ..... 50.4 mph
  - Angle ..... 4 degrees
  - Exit Box Criterion ..... Pass
- Post-Impact Trajectory
  - Vehicle Stability ..... Satisfactory
  - Stopping Distance ..... 143 ft - 11 3/4 in. downstream
  - ..... 2 ft - 6 in. laterally behind traffic-side face
- Occupant Impact Velocity (EDR-3)
  - Longitudinal ..... -9.21 ft/s < 40 ft/s
  - Lateral ..... 13.52 ft/s < 40 ft/s



- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal ..... -4.85 g's < 20.49 g's
  - Lateral ..... 5.49 g's < 20.49 g's
- Occupant Impact Velocity (DTS)
  - Longitudinal ..... -9.12 ft/s < 40 ft/s
  - Lateral ..... 13.68 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (DTS)
  - Longitudinal ..... -4.56 g's < 20.49 g's
  - Lateral ..... 6.51 g's < 20.49 g's
- THIV (DTS - not required) ..... 15.42 ft/s
- PHD (DTS - not required) ..... 6.57 g's
- ASI (EDR-3 - not required) ..... 0.50
- ASI (DTS - not required) ..... 0.51
- Test Article Damage ..... Moderate
- Test Article Deflections
  - Permanent Set ..... 43 in.
  - Dynamic ..... 68 1/2 in.
  - Working Width ..... 98 5/8 in.
- Vehicle Damage ..... Moderate
  - VDS<sup>12</sup> ..... 01-RFQ-3
  - CDC<sup>13</sup> ..... 01-RDEN2
- Maximum Deformation ..... 1/2 in. at right-front floorboard
- Angular Displacement
  - Roll ..... -19 degrees
  - Pitch ..... -10 degrees
  - Yaw ..... 50 degrees

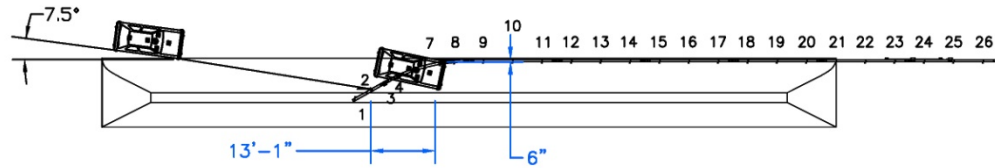
Figure C-5. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-5





32

- Test Agency ..... MwRSF
- Test Number ..... NYBBT-6
- Date ..... 10/3/08
- MASH Test Designation ..... Modified 2-34
- Appurtenance ..... Modified Type IIA End Terminal in Ditch
- Total Length ..... 132 ft
- Key Element - Steel Box Beam
  - Size ..... 6 in. x 6 in. x 3/16 in.
  - Length ..... 18 ft
  - Top Mounting Height ..... 27 in.
- Key Elements - Steel Post
  - Post Nos. 1, 2, 4 ..... S3x5.7 by 84 in. long
  - Post Nos. 3, 5-26 ..... S3x5.7 by 63 in. long
- Type of Soil ..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation ..... 1100C
  - Make and Model ..... 2002 Kia Rio
  - Curb ..... 2,385 lb
  - Test Inertial ..... 2,425 lb
  - Gross Static ..... 2,593 lb
- Impact Conditions
  - Speed ..... 45.7 mph
  - Angle (trajectory) ..... 7.5 degrees
  - Target Impact Location ..... Centerline of post no. 2
  - Actual Impact Location ..... 10 3/4 in. downstream of post no. 2
- Exit Conditions
  - Speed ..... NA
  - Angle ..... NA
  - Exit Box Criterion ..... NA
- Post-Impact Trajectory
  - Vehicle Stability ..... Satisfactory
  - Stopping Distance ..... 13 ft - 1 in. downstream  
6 in. laterally behind traffic-side face



- Occupant Impact Velocity (EDR-3)
  - Longitudinal ..... -28.23 ft/s < 40 ft/s
  - Lateral ..... 9.94 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal ..... -12.50 g's < 20.49 g's
  - Lateral ..... 5.32 g's < 20.49 g's
- Occupant Impact Velocity (DTS)
  - Longitudinal ..... -26.49 ft/s < 40 ft/s
  - Lateral ..... 10.52 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (DTS)
  - Longitudinal ..... -10.91 g's < 20.49 g's
  - Lateral ..... 6.96 g's < 20.49 g's
- THIV (DTS - not required) ..... 26.05 ft/s
- PHD (DTS - not required) ..... 12.58 g's
- ASI (EDR-3 - not required) ..... 0.78
- ASI (DTS - not required) ..... 0.76
- Test Article Damage ..... Moderate
- Test Article Deflections
  - Permanent Set ..... 23 in.
  - Dynamic ..... 26 3/8 in.
  - Working Width ..... NA
- Vehicle Damage ..... Moderate
  - VDS<sup>12</sup> ..... 01-RFQ-6
  - CDC<sup>13</sup> ..... 01-RYAW9
- Maximum Deformation ..... 1/2 in. at right-front floorboard
- Angular Displacement
  - Roll ..... 10 degrees
  - Pitch ..... 4 degrees
  - Yaw ..... 8 degrees

Figure C-6. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-6



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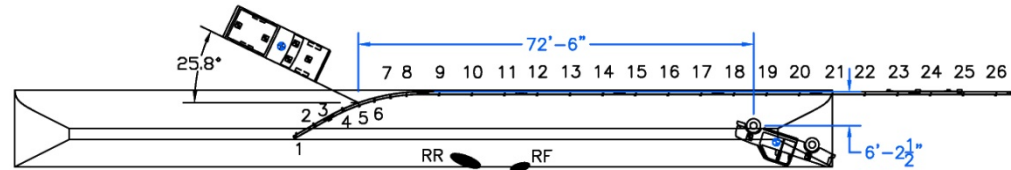
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- Test Agency ..... MwRSF
- Test Number ..... NYBBT-7
- Date ..... 11/03/08
- MASH Test Designation ..... Modified 3-35
- Appurtenance ..... Modified Type IIA End Terminal in Ditch
- Total Length ..... 132 ft
- Key Element - Steel Box Beam
  - Size ..... 6 in. x 6 in. x 3/16 in.
  - Length ..... 18 ft
  - Top Mounting Height ..... 27 in.
- Key Elements - Steel Post
  - Post Nos. 1, 2, 4 ..... S3x5.7 by 84 in. long
  - Post Nos. 3, 5-26 ..... S3x5.7 by 63 in. long
- Type of Soil ..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation ..... 2270P
  - Make and Model ..... 2002 Dodge Ram 1500 Quad Cab Pickup
  - Curb ..... 5,069 lb
  - Test Inertial ..... 5,012 lb
  - Gross Static ..... 5,184 lb
- Impact Conditions
  - Speed ..... 62.6 mph
  - Angle ..... 25.8 degrees
  - Target Impact Location ..... Centerline of post no. 5
  - Actual Impact Location ..... Centerline of post no. 5
- Exit Conditions
  - Speed ..... NA
  - Angle ..... NA
  - Exit Box Criterion ..... NA
- Post-Impact Trajectory
  - Vehicle Stability ..... Satisfactory
  - Stopping Distance ..... 72 ft - 6 in. downstream
  - 6 ft - 2 1/2 in. laterally behind traffic-side face
- Occupant Impact Velocity (EDR-3)
  - Longitudinal ..... -14.82 ft/s < 40 ft/s
  - Lateral ..... 9.39 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal ..... -15.39 g's < 20.49 g's
  - Lateral ..... 12.12 g's < 20.49 g's



- Occupant Impact Velocity (EDR-4)
  - Longitudinal ..... -12.64 ft/s < 40 ft/s
  - Lateral ..... 8.54 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (EDR-4)
  - Longitudinal ..... -13.57 g's < 20.49 g's
  - Lateral ..... 12.80 g's < 20.49 g's
- Occupant Impact Velocity (DTS)
  - Longitudinal ..... -13.44 ft/s < 40 ft/s
  - Lateral ..... 8.96 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (DTS)
  - Longitudinal ..... -14.28 g's < 20.49 g's
  - Lateral ..... 14.45 g's < 20.49 g's
- THIV (EDR-4 - not required) ..... 15.00 ft/s
- PHD (EDR-4 - not required) ..... 13.73 g's
- THIV (DTS - not required) ..... 16.34 ft/s
- PHD (DTS - not required) ..... 14.48 g's
- ASI (EDR-3 - not required) ..... 0.98
- ASI (EDR-4 - not required) ..... 0.97
- ASI (DTS - not required) ..... 1.08
- Test Article Damage ..... Extensive
- Test Article Deflections
  - Permanent Set ..... 190 3/4 in.
  - Dynamic ..... NA
  - Working Width ..... NA
- Vehicle Damage ..... Extensive
  - VDS<sup>12</sup> ..... 01-R&T-5
  - CDC<sup>13</sup> ..... 01-RDAO9
- Maximum Deformation ..... 3/4 in. at right-center floorboard
- Angular Displacement
  - Roll ..... 612 degrees
  - Pitch ..... -58 degrees
  - Yaw ..... -170 degrees

Figure C-7. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-7







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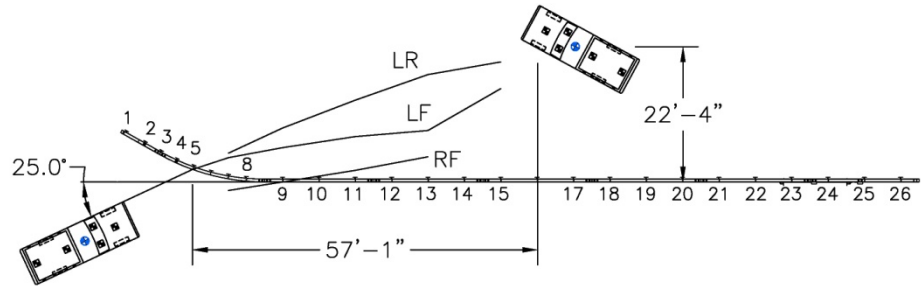
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- Test Agency ..... MwRSF
- Test Number ..... NYBBT-9
- Date ..... 8/6/09
- MASH Test Designation ..... Modified 3-35
- Appurtenance ..... Modified Type IIA End Terminal
- Total Length ..... 132 ft
- Key Element - Steel Box Beam
  - Size ..... 6 in. x 6 in. x 3/16 in.
  - Length ..... 18 ft
  - Top Mounting Height ..... 27 in.
- Key Elements - Steel Post
  - Post Nos. 1, 2, 4 ..... S3x5.7 by 84 in. long
  - Post Nos. 3, 5-26 ..... S3x5.7 by 63 in. long
- Type of Soil ..... Grading B - AASHTO M 147-65 (1990)
- Test Vehicle
  - Type/Designation ..... 2270P
  - Make and Model ..... 2003 Dodge Ram 1500 Quad Cab Pickup
  - Curb ..... 5,033 lb
  - Test Inertial ..... 4,989 lb
  - Gross Static ..... 5,159 lb
- Impact Conditions
  - Speed ..... 63.3 mph
  - Angle ..... 25.0 degrees
  - Target Impact Location ..... Centerline of post no. 5
  - Actual Impact Location ..... 2 in. upstream of centerline of post no. 5
- Exit Conditions
  - Speed ..... 52.1 mph
  - Angle ..... 31.0 degrees
  - Exit Box Criterion ..... NA
- Post-Impact Trajectory
  - Vehicle Stability ..... Satisfactory
  - Stopping Distance ..... 57 ft - 1 in. downstream
  - ..... 22 ft - 4 in. laterally behind traffic-side face
- Occupant Impact Velocity (EDR-3)
  - Longitudinal ..... -14.34 ft/s < 40 ft/s
  - Lateral ..... 9.94 ft/s < 40 ft/s



- Occupant Ridedown Acceleration (EDR-3)
  - Longitudinal ..... -7.77 g's < 20.49 g's
  - Lateral ..... 4.38 g's < 20.49 g's
- Occupant Impact Velocity (DTS)
  - Longitudinal ..... -14.47 ft/s < 40 ft/s
  - Lateral ..... 9.23 ft/s < 40 ft/s
- Occupant Ridedown Acceleration (DTS)
  - Longitudinal ..... -7.37 g's < 20.49 g's
  - Lateral ..... 4.84 g's < 20.49 g's
- THIV (DTS - not required) ..... 15.89 ft/s
- PHD (DTS - not required) ..... 7.67 g's
- ASI (EDR-3 - not required) ..... 0.82
- ASI (DTS - not required) ..... 0.73
- Test Article Damage ..... Extensive due to gating
- Test Article Deflections
  - Permanent Set ..... 42 1/2 in.
  - Dynamic ..... NA
  - Working Width ..... 58 ft - 5 9/16 in.
- Vehicle Damage ..... Moderate
  - VDS<sup>12</sup> ..... 11-LFQ-3
  - CDC<sup>13</sup> ..... 11-LFEW8
- Maximum Deformation ..... 3/4 in. at the left side of the dashboard
- Angular Displacement
  - Roll ..... -22 degrees
  - Pitch ..... -5 degrees
  - Yaw ..... 236 degrees

35

Figure C-9. Summary of Test Results and Sequential Photographs (English), Test No. NYBBT-9

**APPENDIX D Occupant Compartment Deformation Data**

**Occupant Compartment Deformation Index (OCDI)**

**Test No.** NYBBT-1  
**Vehicle Type:** 2002 Kia Rio Sedan

**OCDI = XXABCDEFGHI**

XX = location of occupant compartment deformation

A = distance between the dashboard and a reference point at the rear of the occupant compartment, such as the top of the rear seat or the rear of the cab on a pickup

B = distance between the roof and the floor panel

C = distance between a reference point at the rear of the occupant compartment and the motor panel

D = distance between the lower dashboard and the floor panel

E = interior width

F = distance between the lower edge of right window and the upper edge of left window

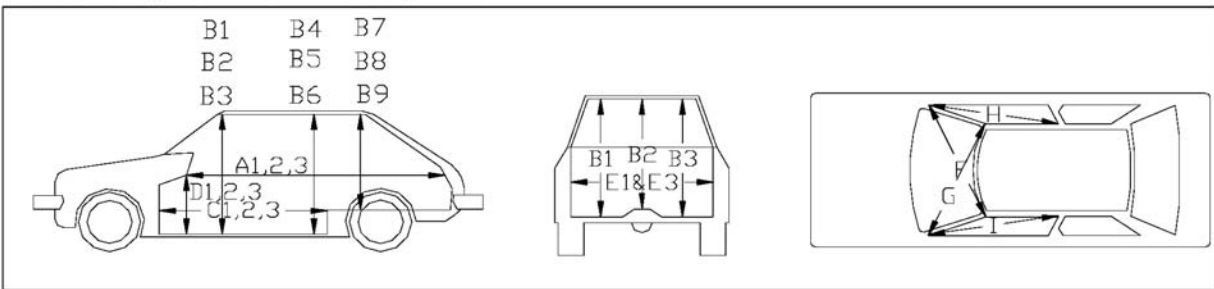
G = distance between the lower edge of left window and the upper edge of right window

H = distance between bottom front corner and top rear corner of the passenger side window

I = distance between bottom front corner and top rear corner of the driver side window

**Severity Indices**

- 0 - if the reduction is less than 3%
- 1 - if the reduction is greater than 3% and less than or equal to 10 %
- 2 - if the reduction is greater than 10% and less than or equal to 20 %
- 3 - if the reduction is greater than 20% and less than or equal to 30 %
- 4 - if the reduction is greater than 30% and less than or equal to 40 %



where,  
1 = Passenger Side  
2 = Middle  
3 = Driver Side

**Location:**

Measurement	Pre-Test (in.)	Post-Test (in.)	Change (in.)	% Difference	Severity Index
A1	50.00	49.75	-0.25	-0.50	0
A2	48.75	48.50	-0.25	-0.51	0
A3	50.00	50.00	0.00	0.00	0
B1	42.25	39.00	-3.25	-7.69	1
B2	37.75	39.00	1.25	3.31	1
B3	42.25	43.25	1.00	2.37	0
C1	55.25	55.00	-0.25	-0.45	0
C2	43.50	43.50	0.00	0.00	0
C3	58.50	58.00	-0.50	-0.85	0
D1	20.25	20.00	-0.25	-1.23	0
D2	20.00	20.00	0.00	0.00	0
D3	19.50	19.50	0.00	0.00	0
E1	52.75	52.75	0.00	0.00	0
E3	53.00	53.00	0.00	0.00	0
F	45.00	44.00	-1.00	-2.22	0
G	46.25	47.00	0.75	1.62	0
H	39.00	39.25	0.25	0.64	0
I	38.25	38.75	0.50	1.31	0

**Note:** Maximum severity index for each variable (A-I) is used for determination of final OCDI value

Final OCDI: XX A B C D E F G H I  
F 0 1 0 0 0 0 0 0 0

Figure D-1. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-1

**Occupant Compartment Deformation Index (OCDI)**

**Test No.** NYBBT-2  
**Vehicle Type:** 2003 Kia Rio Sedan

**OCDI = XXABCDEFGHI**

XX = location of occupant compartment deformation

A = distance between the dashboard and a reference point at the rear of the occupant compartment, such as the top of the rear seat or the rear of the cab on a pickup

B = distance between the roof and the floor panel

C = distance between a reference point at the rear of the occupant compartment and the motor panel

D = distance between the lower dashboard and the floor panel

E = interior width

F = distance between the lower edge of right window and the upper edge of left window

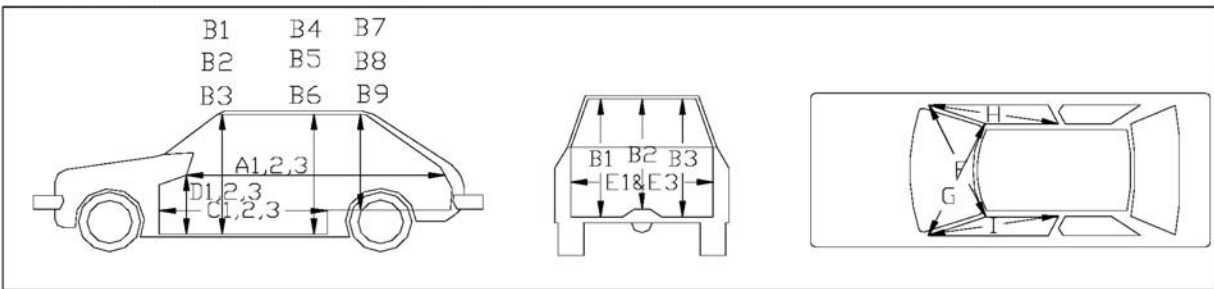
G = distance between the lower edge of left window and the upper edge of right window

H = distance between bottom front corner and top rear corner of the passenger side window

I = distance between bottom front corner and top rear corner of the driver side window

**Severity Indices**

- 0 - if the reduction is less than 3%
- 1 - if the reduction is greater than 3% and less than or equal to 10 %
- 2 - if the reduction is greater than 10% and less than or equal to 20 %
- 3 - if the reduction is greater than 20% and less than or equal to 30 %
- 4 - if the reduction is greater than 30% and less than or equal to 40 %



where,  
1 = Passenger Side  
2 = Middle  
3 = Driver Side

**Location:**

Measurement	Pre-Test (in.)	Post-Test (in.)	Change (in.)	% Difference	Severity Index
A1	48.75	48.75	0.00	0.00	0
A2	47.50	47.50	0.00	0.00	0
A3	50.25	50.25	0.00	0.00	0
B1	42.00	41.50	-0.50	-1.19	0
B2	37.25	37.50	0.25	0.67	0
B3	41.75	41.75	0.00	0.00	0
C1	54.75	54.75	0.00	0.00	0
C2	56.00	56.25	0.25	0.45	0
C3	55.25	55.00	-0.25	-0.45	0
D1	20.00	19.75	-0.25	-1.25	0
D2	18.25	18.25	0.00	0.00	0
D3	22.25	22.25	0.00	0.00	0
E1	51.75	52.00	0.25	0.48	0
E3	54.00	53.50	-0.50	-0.93	0
F	46.50	46.75	0.25	0.54	0
G	46.25	46.50	0.25	0.54	0
H	39.00	39.25	0.25	0.64	0
I	39.00	39.25	0.25	0.64	0

**Note: Maximum severity index for each variable (A-I) is used for determination of final OCDI value**

Final OCDI: XXABCDEFGHI  
F 0 0 0 0 0 0 0 0 0

Figure D-2. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-2

**Occupant Compartment Deformation Index (OCDI)**

**Test No.** NYBBT-3  
**Vehicle Type:** 2003 Kia Rio Sedan

**OCDI = XXABCDEFGHI**

XX = location of occupant compartment deformation

A = distance between the dashboard and a reference point at the rear of the occupant compartment, such as the top of the rear seat or the rear of the cab on a pickup

B = distance between the roof and the floor panel

C = distance between a reference point at the rear of the occupant compartment and the motor panel

D = distance between the lower dashboard and the floor panel

E = interior width

F = distance between the lower edge of right window and the upper edge of left window

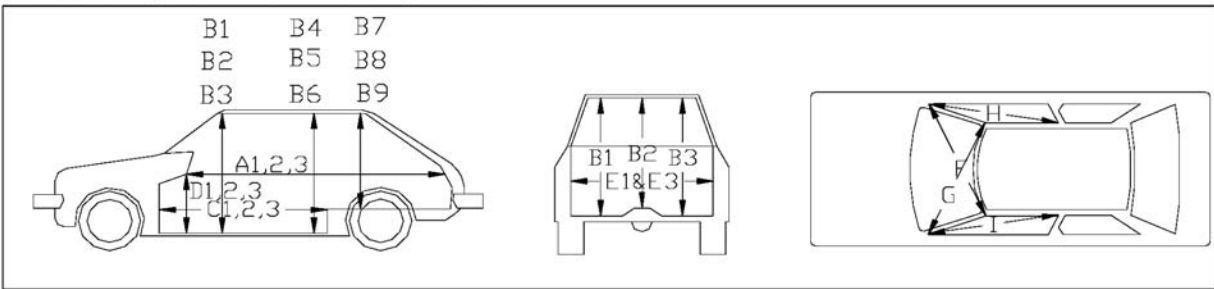
G = distance between the lower edge of left window and the upper edge of right window

H = distance between bottom front corner and top rear corner of the passenger side window

I = distance between bottom front corner and top rear corner of the driver side window

**Severity Indices**

- 0 - if the reduction is less than 3%
- 1 - if the reduction is greater than 3% and less than or equal to 10 %
- 2 - if the reduction is greater than 10% and less than or equal to 20 %
- 3 - if the reduction is greater than 20% and less than or equal to 30 %
- 4 - if the reduction is greater than 30% and less than or equal to 40 %



where,  
1 = Passenger Side  
2 = Middle  
3 = Driver Side

**Location:**

Measurement	Pre-Test (in.)	Post-Test (in.)	Change (in.)	% Difference	Severity Index
A1	49.50	49.50	0.00	0.00	0
A2	48.00	48.25	0.25	0.52	0
A3	51.00	51.00	0.00	0.00	0
B1	41.25	39.00	-2.25	-5.45	1
B2	37.50	27.00	-10.50	-28.00	3
B3	41.50	38.50	-3.00	-7.23	1
C1	59.00	59.00	0.00	0.00	0
C2	42.00	42.00	0.00	0.00	0
C3	57.00	56.75	-0.25	-0.44	0
D1	20.00	20.00	0.00	0.00	0
D2	13.50	13.25	-0.25	-1.85	0
D3	22.25	22.25	0.00	0.00	0
E1	54.00	53.50	-0.50	-0.93	0
E3	53.50	53.50	0.00	0.00	0
F	45.50	47.00	1.50	3.30	1
G	44.00	42.00	-2.00	-4.55	1
H	38.75	39.25	0.50	1.29	0
I	38.50	38.50	0.00	0.00	0

Note: Maximum severity index for each variable (A-I) is used for determination of final OCDI value

Final OCDI: XXABCDEFGHI  
RF 0 3 0 0 0 1 1 0 0

Figure D-3. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-3



VEHICLE PRE/POST CRUSH INFO  
Set-2

TEST: NYBBT-4  
VEHICLE: 2002 Dodge Ram

POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
1	50	13.75	0	50	13.75	-0.25	0	0	-0.25
2	52.75	19	-1.25	52.75	19	-1.25	0	0	0
3	54	27	-0.75	54	27	-0.75	0	0	0
4	51.5	31.25	0	51.5	31.5	0	0	0.25	0
5	44	10.75	-1.25	44	10.75	-1.25	0	0	0
6	45	16.25	-3.5	45	16.25	-3.75	0	0	-0.25
7	46.25	21.5	-7.25	46.5	21.25	-7.5	0.25	-0.25	-0.25
8	46.5	32.25	-6	46.5	32	-6.25	0	-0.25	-0.25
9	38.25	3.25	-3	38.25	3.25	-3	0	0	0
10	40	9.75	-3	40	9.75	-2.75	0	0	0.25
11	42	15.75	-6	42	15.75	-6.25	0	0	-0.25
12	43.25	24.25	-8.5	43.25	24.25	-8.5	0	0	0
13	43.5	32.25	-8.25	43.5	31.75	-8.25	0	-0.5	0
14	32.25	3.25	-3.75	32.25	3.25	-3.5	0	0	0.25
15	32.75	9.75	-3.5	32.75	9.75	-3.5	0	0	0
16	35.75	15.25	-9.5	36.75	15	-9.5	1	-0.25	0
17	37	23.75	-8.75	37	23.5	-8.5	0	-0.25	0.25
18	36.5	32.25	-8	36.5	31.75	-7.75	0	-0.5	0.25
19	28.75	2.25	-3.75	28.75	2.25	-3.5	0	0	0.25
20	28.5	9.5	-3.75	28.5	9.75	-3.75	0	0.25	0
21	30.5	16.25	-9.25	30.5	16	-9.25	0	-0.25	0
22	30	23.75	-8.5	30	23.25	-8.25	0	-0.5	0.25
23	30.25	32	-7.5	30	32	-6.5	-0.25	0	1
24	24	3	-3.25	24	3.25	-3.25	0	0.25	0
25	23.25	9	-3	23.25	9	-2.75	0	0	0.25
26	23.75	14.5	-5	24	14.25	-5.25	0.25	-0.25	-0.25
27	23.75	23.25	-4.25	23.75	23	-4.25	0	-0.25	0
28	23.75	29.5	-3.5	23.75	28.75	-3.25	0	-0.75	0.25
29							0	0	0
30							0	0	0
31							0	0	0
32							0	0	0
33							0	0	0
34							0	0	0
35							0	0	0

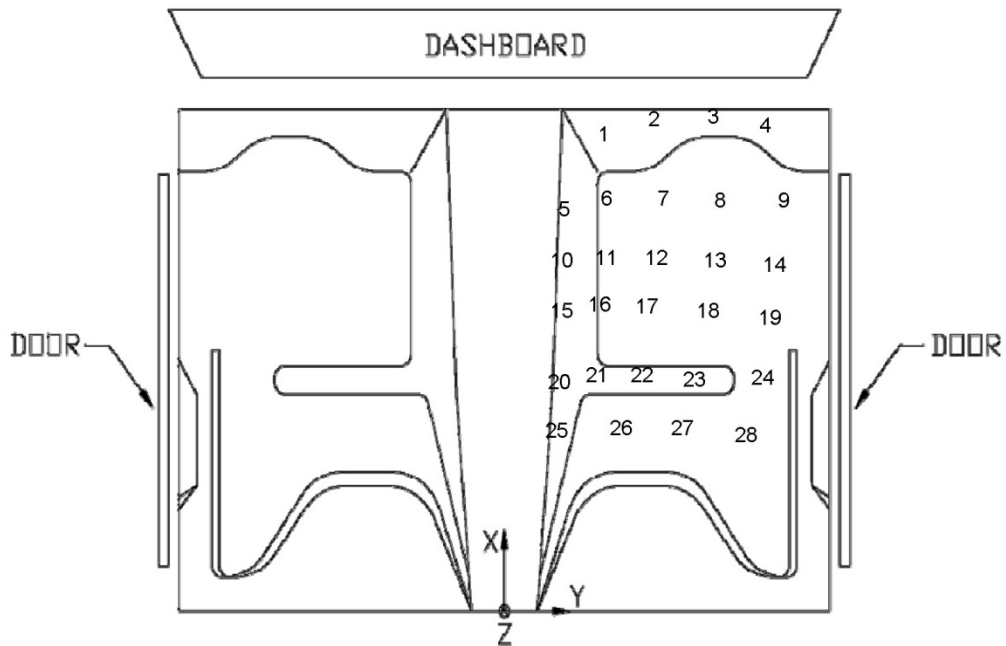


Figure D-5. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-4



**Occupant Compartment Deformation Index (OCDI)**

**Test No.** NYBBT-4  
**Vehicle Type:** 2002 Dodge Ram

**OCDI = XXABCDEFGHI**

XX = location of occupant compartment deformation

A = distance between the dashboard and a reference point at the rear of the occupant compartment, such as the top of the rear seat or the rear of the cab on a pickup

B = distance between the roof and the floor panel

C = distance between a reference point at the rear of the occupant compartment and the motor panel

D = distance between the lower dashboard and the floor panel

E = interior width

F = distance between the lower edge of right window and the upper edge of left window

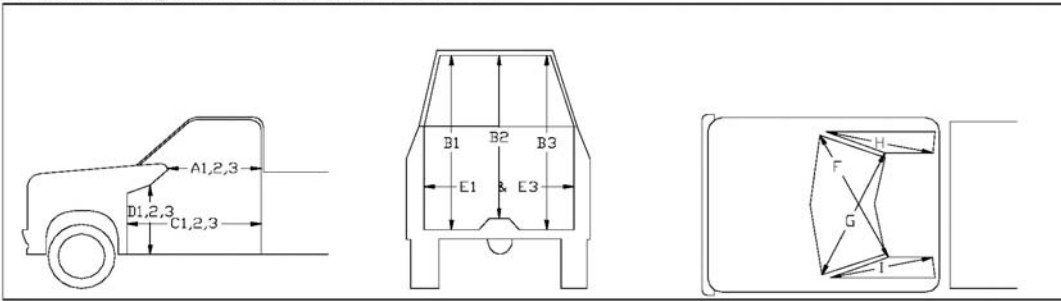
G = distance between the lower edge of left window and the upper edge of right window

H = distance between bottom front corner and top rear corner of the passenger side window

I = distance between bottom front corner and top rear corner of the driver side window

**Severity Indices**

- 0 - if the reduction is less than 3%
- 1 - if the reduction is greater than 3% and less than or equal to 10 %
- 2 - if the reduction is greater than 10% and less than or equal to 20 %
- 3 - if the reduction is greater than 20% and less than or equal to 30 %
- 4 - if the reduction is greater than 30% and less than or equal to 40 %



where,  
1 = Passenger Side  
2 = Middle  
3 = Driver Side

**Location:**

Measurement	Pre-Test (in.)	Post-Test (in.)	Change (in.)	% Difference	Severity Index
A1	57.50	58.50	1.00	1.74	0
A2	50.50	50.50	0.00	0.00	0
A3	58.00	58.00	0.00	0.00	0
B1	47.75	47.75	0.00	0.00	0
B2	42.00	42.25	0.25	0.60	0
B3	47.75	47.50	-0.25	-0.52	0
C1	69.00	69.50	0.50	0.72	0
C2	47.25	47.00	-0.25	-0.53	0
C3	67.25	68.00	0.75	1.12	0
D1	23.00	23.00	0.00	0.00	0
D2	13.00	13.00	0.00	0.00	0
D3	23.25	23.00	-0.25	-1.08	0
E1	65.75	64.50	-1.25	-1.90	0
E3	65.00	64.25	-0.75	-1.15	0
F	58.00	58.50	0.50	0.86	0
G	57.00	57.75	0.75	1.32	0
H	41.00	41.25	0.25	0.61	0
I	39.25	39.50	0.25	0.64	0

**Note:** Maximum severity index for each variable (A-I) is used for determination of final OCDI value

**Final OCDI:** XXABCDEFGHI  
RF 0 0 0 0 0 0 0 0 0

Figure D-6. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-4

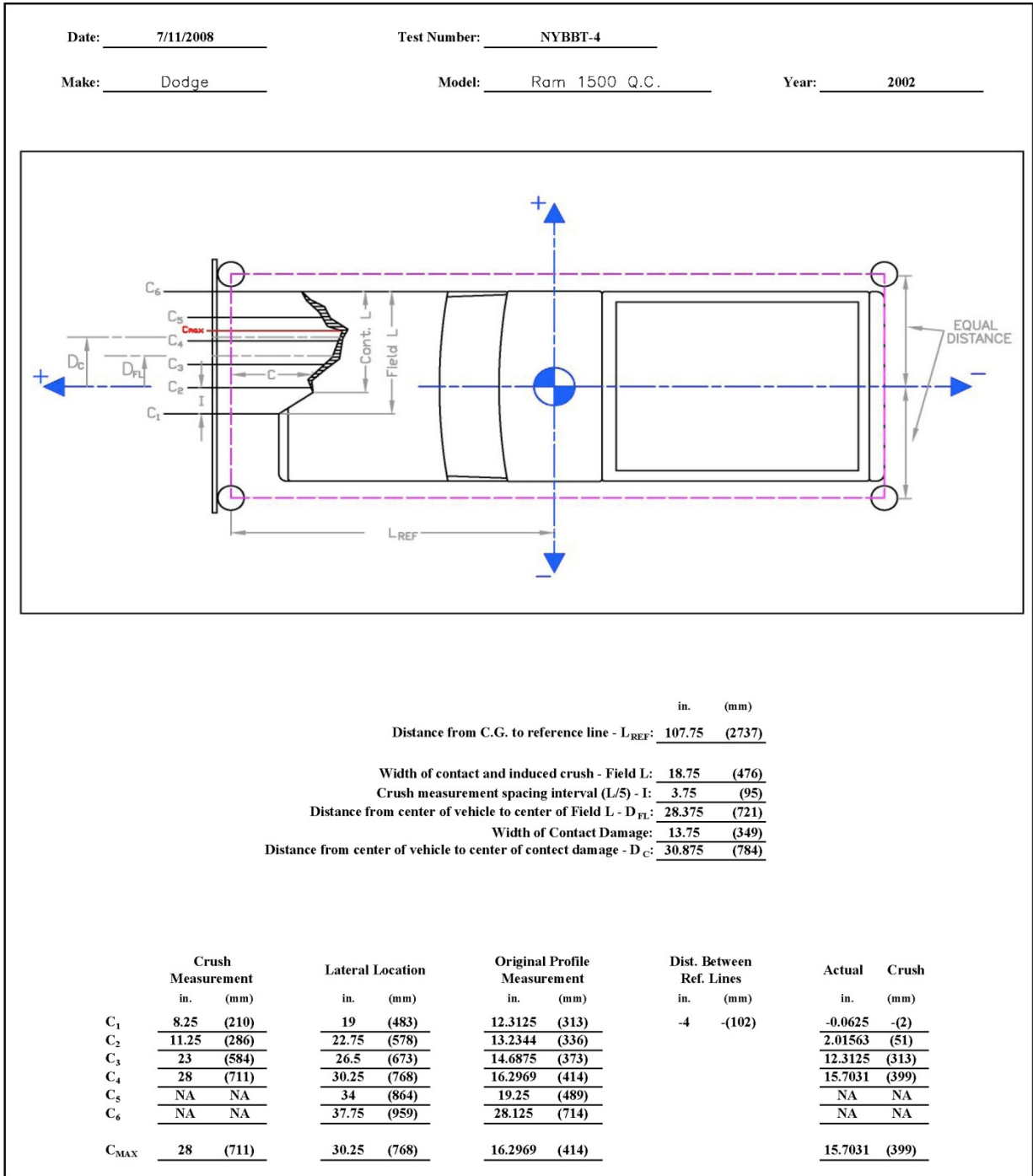


Figure D-7. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-4

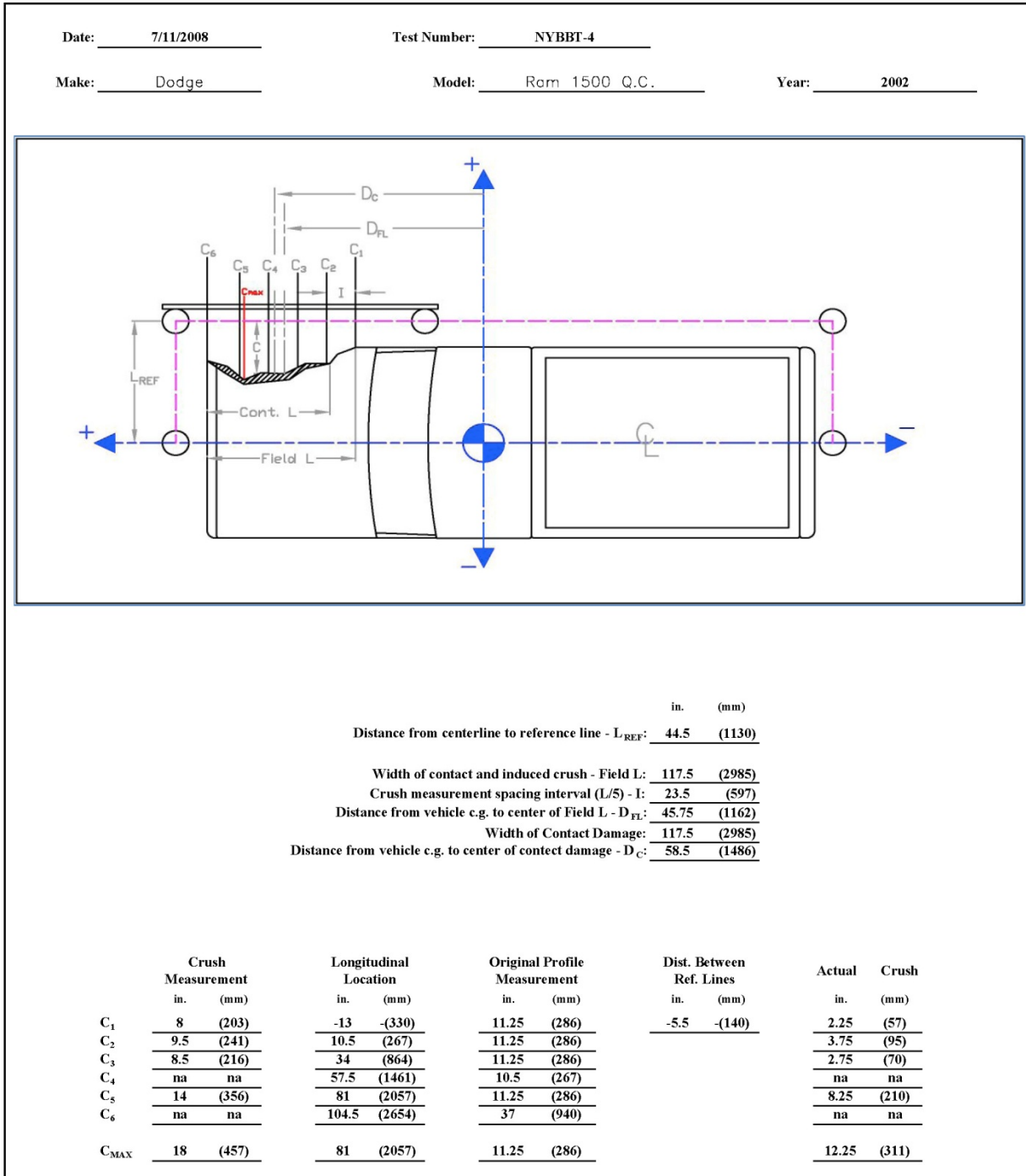


Figure D-8. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-4



VEHICLE PRE/POST CRUSH INFO  
Set-2

TEST: NYBBT-5  
VEHICLE: 2002 Dodge Ram

POINT	X	Y	Z	22.75			2.5		
				X'	Y'	Z'	DEL X	DEL Y	DEL Z
1	46.75	12.25	0	46.75	12.25	0	0	0	0
2	49.25	16.5	-1	49.25	16.75	-1	0	0.25	0
3	52.25	20.5	-4	52.5	20.75	-4	0.25	0.25	0
4	53	27	-3.5	53	27	-3	0	0	0.5
5	51.75	32	-1	51.75	32	-1	0	0	0
6	42.75	10.5	-1.5	42.75	10.5	-1.5	0	0	0
7	43.75	15.75	-3.75	43.75	15.75	-3.75	0	0	0
8	45.5	21	-7.75	45.5	21.25	-7.75	0	0.25	0
9	45.75	27.75	-7.75	45.75	28	-7.5	0	0.25	0.25
10	45.5	33.25	-7.5	45.5	33	-7.25	0	-0.25	0.25
11	38.5	5.25	-2.25	38.25	5.25	-2.5	-0.25	0	-0.25
12	38.75	10.75	-3	38.75	10.75	-3	0	0	0
13	40.5	15.5	-6.5	40.5	15.25	-6.5	0	-0.25	0
14	41.75	21.25	-9.25	41.75	21	-9.25	0	-0.25	0
15	41.75	27.75	-9	41.75	27.5	-8.75	0	-0.25	0.25
16	41.25	32.75	-8.75	41.25	32.75	-8.5	0	0	0.25
17	34.25	5.25	-2.5	34.25	5.25	-2.75	0	0	-0.25
18	34.5	10.75	-3.25	34.5	10.75	-3.25	0	0	0
19	36.75	15.75	-9.25	36.75	15.75	-9.25	0	0	0
20	37	21.5	-9	37	21.5	-8.75	0	0	0.25
21	37.25	27.5	-8.75	37	27.25	-8.5	-0.25	-0.25	0.25
22	36.75	32.5	-8.5	36.75	32.5	-8.25	0	0	0.25
23	29.25	5.25	-2.75	29.25	5.25	-3	0	0	-0.25
24	28.75	11	-3.5	28.75	11	-3.75	0	0	-0.25
25	31.25	15.75	-9	31.25	15.75	-9	0	0	0
26	32	24.5	-8.5	31.75	24.25	-8.25	-0.25	-0.25	0.25
27	31.25	32	-8	31.25	32	-7.75	0	0	0.25
28	23.5	17	-4.5	23.5	17	-4.5	0	0	0
29	23.5	26.5	-4	23.5	26.5	-3.75	0	0	0.25
30							0	0	0
31							0	0	0
32							0	0	0
33							0	0	0
34							0	0	0
35							0	0	0

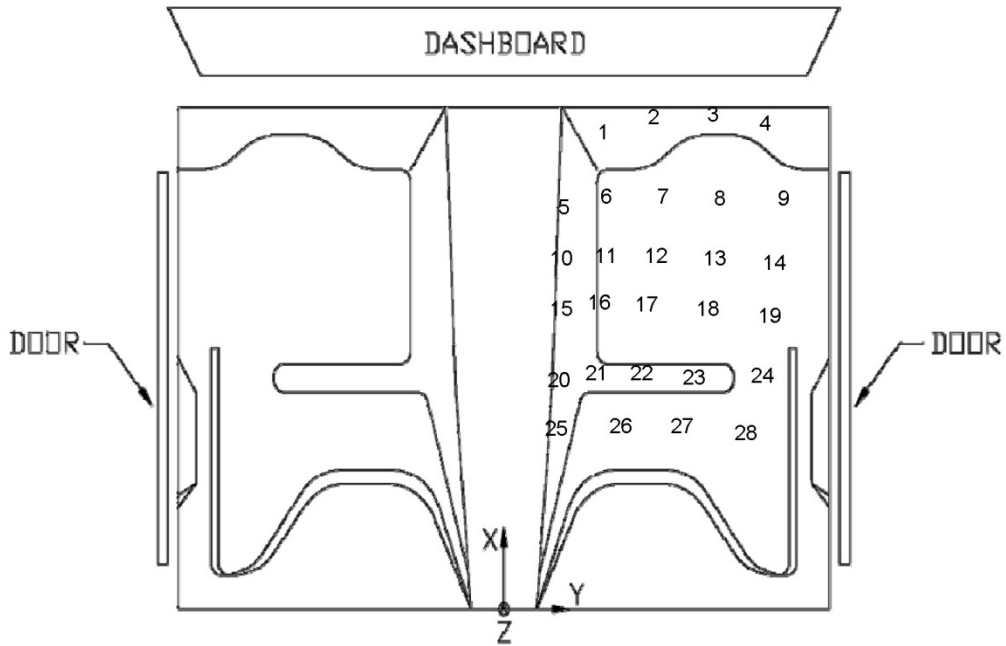


Figure D-10. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-5

**Occupant Compartment Deformation Index (OCDI)**

**Test No.** NYBBT-5  
**Vehicle Type:** 2002 Dodge Ram

**OCDI = XXABCDEFGHI**

XX = location of occupant compartment deformation

A = distance between the dashboard and a reference point at the rear of the occupant compartment, such as the top of the rear seat or the rear of the cab on a pickup

B = distance between the roof and the floor panel

C = distance between a reference point at the rear of the occupant compartment and the motor panel

D = distance between the lower dashboard and the floor panel

E = interior width

F = distance between the lower edge of right window and the upper edge of left window

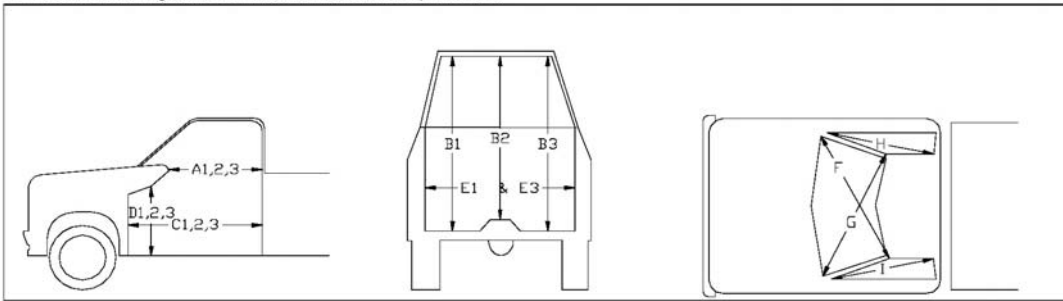
G = distance between the lower edge of left window and the upper edge of right window

H = distance between bottom front corner and top rear corner of the passenger side window

I = distance between bottom front corner and top rear corner of the driver side window

**Severity Indices**

- 0 - if the reduction is less than 3%
- 1 - if the reduction is greater than 3% and less than or equal to 10 %
- 2 - if the reduction is greater than 10% and less than or equal to 20 %
- 3 - if the reduction is greater than 20% and less than or equal to 30 %
- 4 - if the reduction is greater than 30% and less than or equal to 40 %



where,  
1 = Passenger Side  
2 = Middle  
3 = Driver Side

**Location:**

Measurement	Pre-Test (in.)	Post-Test (in.)	Change (in.)	% Difference	Severity Index
A1	56.00	56.75	-0.25	-0.45	0
A2	50.50	50.50	0.00	0.00	0
A3	56.75	56.50	-0.25	-0.44	0
B1	48.50	48.50	0.00	0.00	0
B2	42.00	42.00	0.00	0.00	0
B3	47.75	47.75	0.00	0.00	0
C1	69.50	70.00	0.50	0.72	0
C2	47.00	47.00	0.00	0.00	0
C3	66.25	66.00	-0.25	-0.38	0
D1	23.00	23.00	0.00	0.00	0
D2	13.25	13.25	0.00	0.00	0
D3	22.50	22.50	0.00	0.00	0
E1	65.00	65.00	0.00	0.00	0
E3	65.00	65.00	0.00	0.00	0
F	57.50	57.25	-0.25	-0.43	0
G	58.50	58.50	0.00	0.00	0
H	36.50	36.50	0.00	0.00	0
I	36.75	36.75	0.00	0.00	0

**Note:** Maximum severity index for each variable (A-I) is used for determination of final OCDI value

**Final OCDI:** XXABCDEFGHI  
RF 0 0 0 0 0 0 0 0 0

Figure D-11. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-5

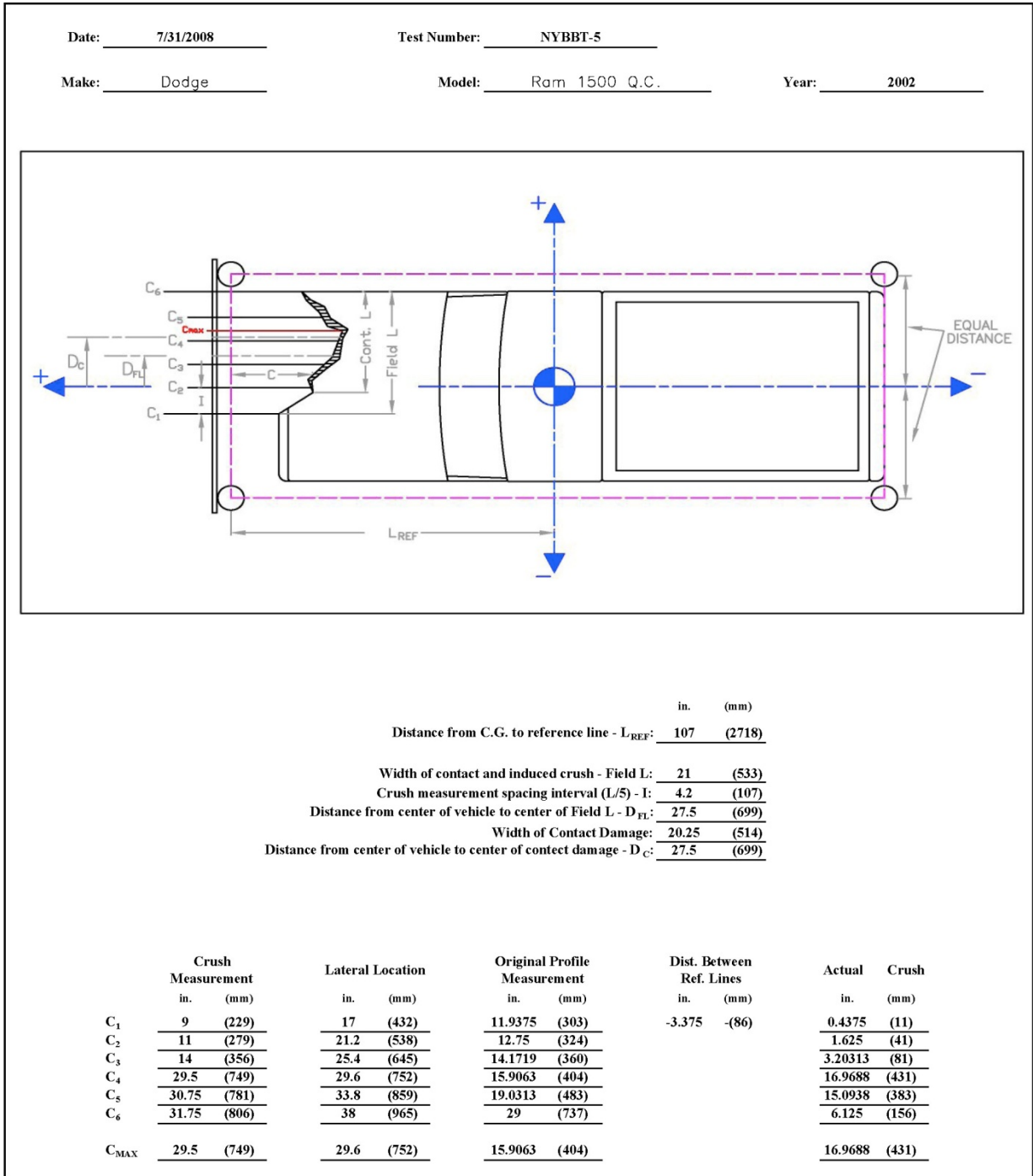


Figure D-12. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-5

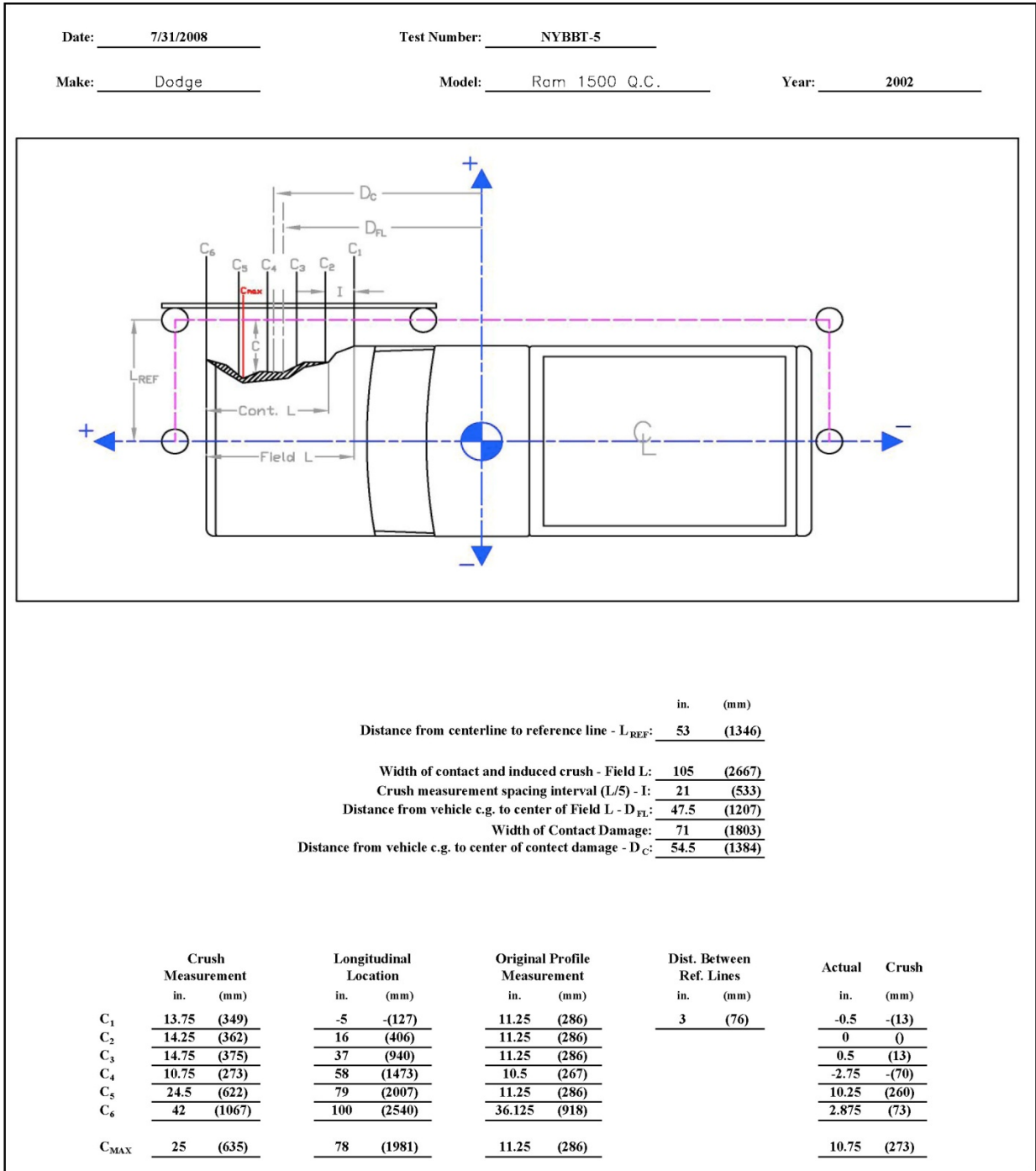


Figure D-13. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-5





**Occupant Compartment Deformation Index (OCDI)**

**Test No.** NYBBT-6  
**Vehicle Type:** 2002 Kia Rio Sedan

**OCDI = XXABCDEFGHI**

XX = location of occupant compartment deformation

A = distance between the dashboard and a reference point at the rear of the occupant compartment, such as the top of the rear seat or the rear of the cab on a pickup

B = distance between the roof and the floor panel

C = distance between a reference point at the rear of the occupant compartment and the motor panel

D = distance between the lower dashboard and the floor panel

E = interior width

F = distance between the lower edge of right window and the upper edge of left window

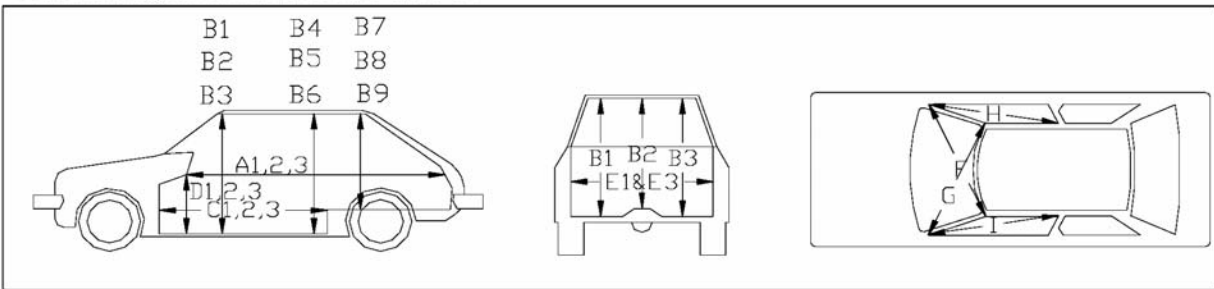
G = distance between the lower edge of left window and the upper edge of right window

H = distance between bottom front corner and top rear corner of the passenger side window

I = distance between bottom front corner and top rear corner of the driver side window

**Severity Indices**

- 0 - if the reduction is less than 3%
- 1 - if the reduction is greater than 3% and less than or equal to 10%
- 2 - if the reduction is greater than 10% and less than or equal to 20%
- 3 - if the reduction is greater than 20% and less than or equal to 30%
- 4 - if the reduction is greater than 30% and less than or equal to 40%



where,  
1 = Passenger Side  
2 = Middle  
3 = Driver Side

**Location:**

Measurement	Pre-Test (in.)	Post-Test (in.)	Change (in.)	% Difference	Severity Index
A1	48.25	48.00	-0.25	-0.52	0
A2	45.50	43.50	-2.00	-4.40	1
A3	50.25	46.75	-3.50	-6.97	1
B1	41.25	41.50	0.25	0.61	0
B2	37.50	34.00	-3.50	-9.33	1
B3	42.00	34.00	-8.00	-19.05	0
C1	60.75	60.25	-0.50	-0.82	0
C2	43.75	43.50	-0.25	-0.57	0
C3	61.25	60.50	-0.75	-1.22	0
D1	20.00	19.25	-0.75	-3.75	1
D2	11.50	10.50	-1.00	-8.70	1
D3	20.00	18.50	-1.50	-7.50	1
E1	52.75	52.75	0.00	0.00	0
E3	53.75	53.75	0.00	0.00	0
F	47.50	NA	#VALUE!	#VALUE!	0
G	48.00	NA	#VALUE!	#VALUE!	0
H	39.75	37.50	-2.25	-5.66	1
I	39.50	39.50	0.00	0.00	0

Note: Maximum severity index for each variable (A-I) is used for determination of final OCDI value

Final OCDI: XXABCDEFGHI  
RF 1 1 0 1 0 0 0 1 0

Figure D-15. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-6



VEHICLE PRE/POST CRUSH INFO  
Set-2

TEST: NYBBT-7  
VEHICLE: 2002 Dodge Ram

POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
1	49.25	13	-0.5	49	13.25	-0.25	-0.25	0.25	0.25
2	52.25	18.25	-1.5	52.25	18	-1	0	-0.25	0.5
3	54.5	23.75	-2.5	54.5	24	-2.5	0	0.25	0
4	52.25	32.5	0	52.25	32.25	0.25	0	-0.25	0.25
5	44	11.5	-2	43.75	11	-1.75	-0.25	-0.5	0.25
6	46.25	16.5	-4	46.25	16.25	-3.75	0	-0.25	0.25
7	51.25	23	-5.75	51.25	23	-5.75	0	0	0
8	50.25	32.25	-3.25	50	31.5	-3	-0.25	-0.75	0.25
9	41.25	9.5	-3	41.25	9.75	-3	0	0.25	0
10	42.75	16	-5.25	42.75	15.75	-5	0	-0.25	0.25
11	45	21.5	-9	45	21	-9.25	0	-0.5	-0.25
12	45	32	-7.75	45	31.5	-7.5	0	-0.5	0.25
13	37.5	6.5	-3.5	37.75	6.5	-3.25	0.25	0	0.25
14	38.75	13.25	-6.25	39	13	-6	0.25	-0.25	0.25
15	41.25	21	-9.75	41.75	21	-9.75	0.5	0	0
16	41.5	27.25	-9.25	41.25	26.75	-9	-0.25	-0.5	0.25
17	41	32.75	-8.5	41	33	-8.5	0	0.25	0
18	32.75	7	-4	32.75	6.75	-3.5	0	-0.25	0.5
19	35.25	14.25	-10	35.5	13.75	-9.75	0.25	-0.5	0.25
20	36.25	21.5	-9.25	36.25	21	-9.25	0	-0.5	0
21	37	28.5	-8.75	36.75	28.5	-8.25	-0.25	0	0.5
22	36.5	33	-8.25	36.25	32.25	-8	-0.25	-0.75	0.25
23	28.75	7.5	-4	28.5	7.5	-3.75	-0.25	0	0.25
24	30.5	15.25	-9.5	30.5	15	-9.25	0	-0.25	0.25
25	31.5	24	-8.5	31.25	24	-8.5	-0.25	0	0
26	32	32.75	-7.75	31.5	32.5	-7.5	-0.5	-0.25	0.25
27	24.25	6.5	-3.25	24.25	6.75	-3	0	0.25	0.25
28	23.75	15	-5	23.75	15	-4.75	0	0	0.25
29	23.75	28.5	-3.75	23.75	28.5	-3.5	0	0	0.25
30							0	0	0
31							0	0	0
32							0	0	0
33							0	0	0
34							0	0	0
35							0	0	0

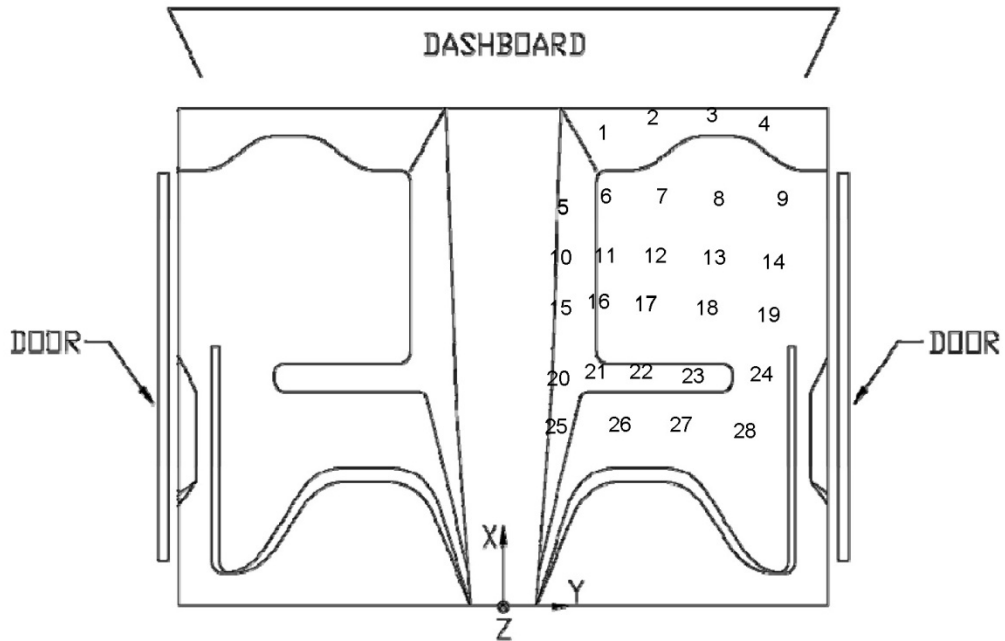


Figure D-17. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-7

**Occupant Compartment Deformation Index (OCDI)**

**Test No.** NYBBT-7  
**Vehicle Type:** 2002 Dodge Ram

**OCDI = XXABCDEFGHI**

XX = location of occupant compartment deformation

A = distance between the dashboard and a reference point at the rear of the occupant compartment, such as the top of the rear seat or the rear of the cab on a pickup

B = distance between the roof and the floor panel

C = distance between a reference point at the rear of the occupant compartment and the motor panel

D = distance between the lower dashboard and the floor panel

E = interior width

F = distance between the lower edge of right window and the upper edge of left window

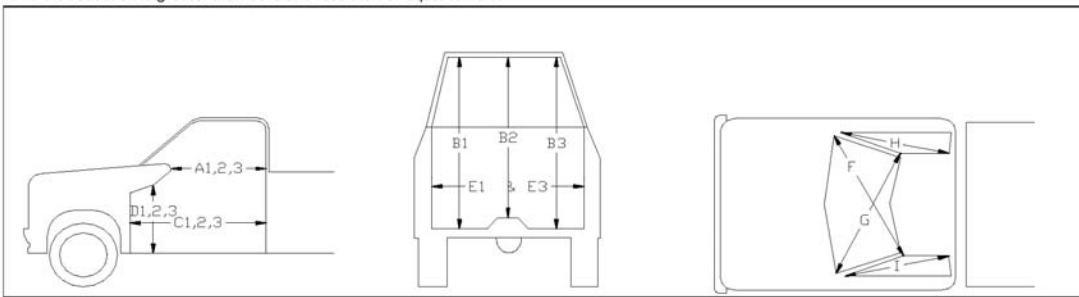
G = distance between the lower edge of left window and the upper edge of right window

H = distance between bottom front corner and top rear corner of the passenger side window

I = distance between bottom front corner and top rear corner of the driver side window

**Severity Indices**

- 0 - if the reduction is less than 3%
- 1 - if the reduction is greater than 3% and less than or equal to 10 %
- 2 - if the reduction is greater than 10% and less than or equal to 20 %
- 3 - if the reduction is greater than 20% and less than or equal to 30 %
- 4 - if the reduction is greater than 30% and less than or equal to 40 %



where,  
1 = Passenger Side  
2 = Middle  
3 = Driver Side

**Location:**

Measurement	Pre-Test (in.)	Post-Test (in.)	Change (in.)	% Difference	Severity Index
A1	58.00	58.00	0.00	0.00	0
A2	53.00	53.00	0.00	0.00	0
A3	58.50	58.50	0.00	0.00	0
B1	47.50	47.00	-0.50	-1.05	0
B2	42.00	42.00	0.00	0.00	0
B3	48.00	47.75	-0.25	-0.52	0
C1	70.50	70.50	0.00	0.00	0
C2	48.00	48.00	0.00	0.00	0
C3	69.00	69.00	0.00	0.00	0
D1	23.00	23.25	0.25	1.09	0
D2	13.25	13.25	0.00	0.00	0
D3	23.00	22.75	-0.25	-1.09	0
E1	65.50	64.50	-1.00	-1.53	0
E3	65.00	64.50	-0.50	-0.77	0
F	59.50	59.50	0.00	0.00	0
G	59.00	59.00	0.00	0.00	0
H	41.50	40.00	-1.50	-3.61	1
I	41.25	41.25	0.00	0.00	0

**Note:** Maximum severity index for each variable (A-I) is used for determination of final OCDI value

**Final OCDI:** XX A B C D E F G H I  
RF 0 0 0 0 0 0 0 1 0

Figure D-18. Occupant Compartment Deformation Index (OCDI), Test No. NYBBT-7

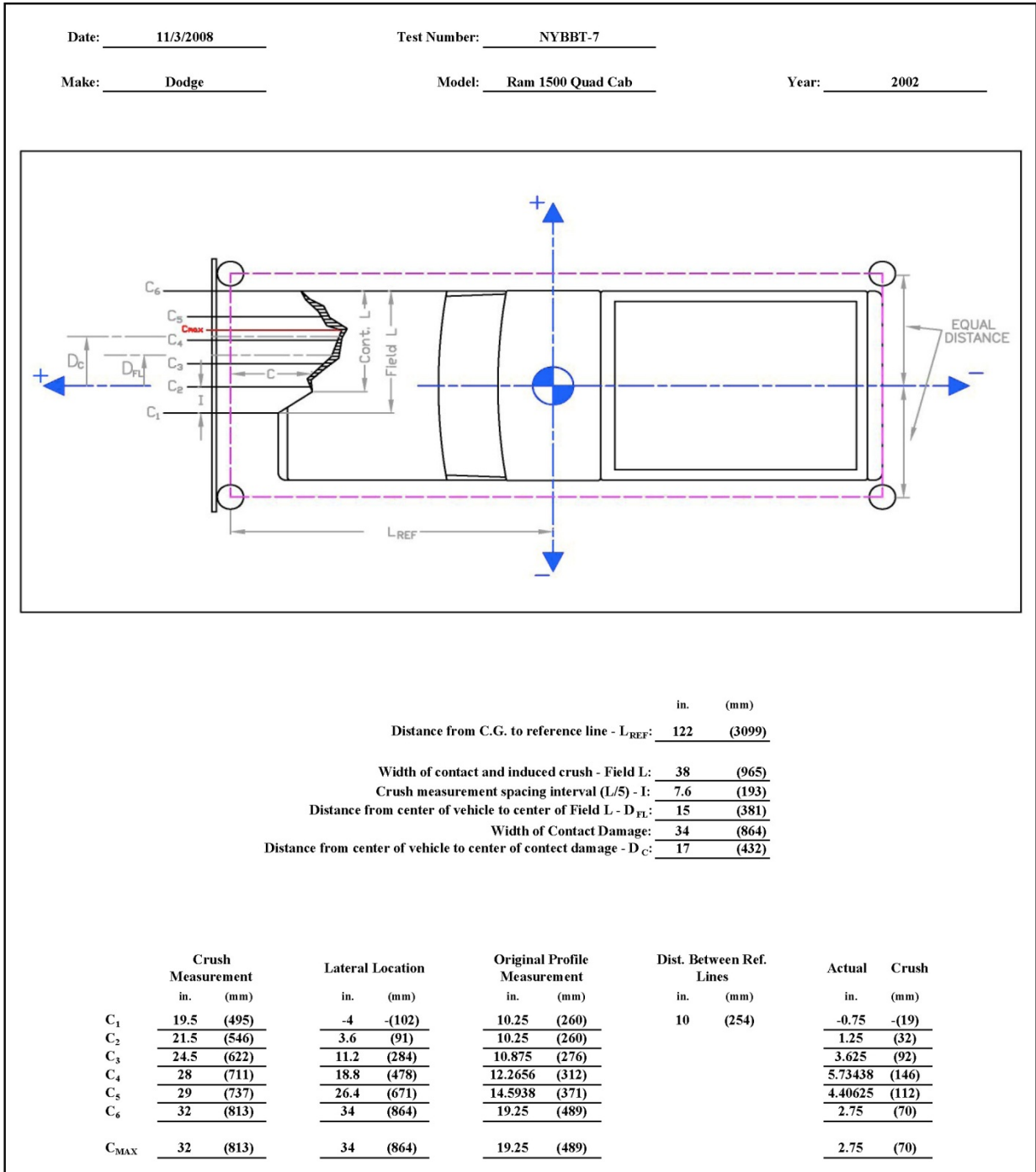


Figure D-19. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-7

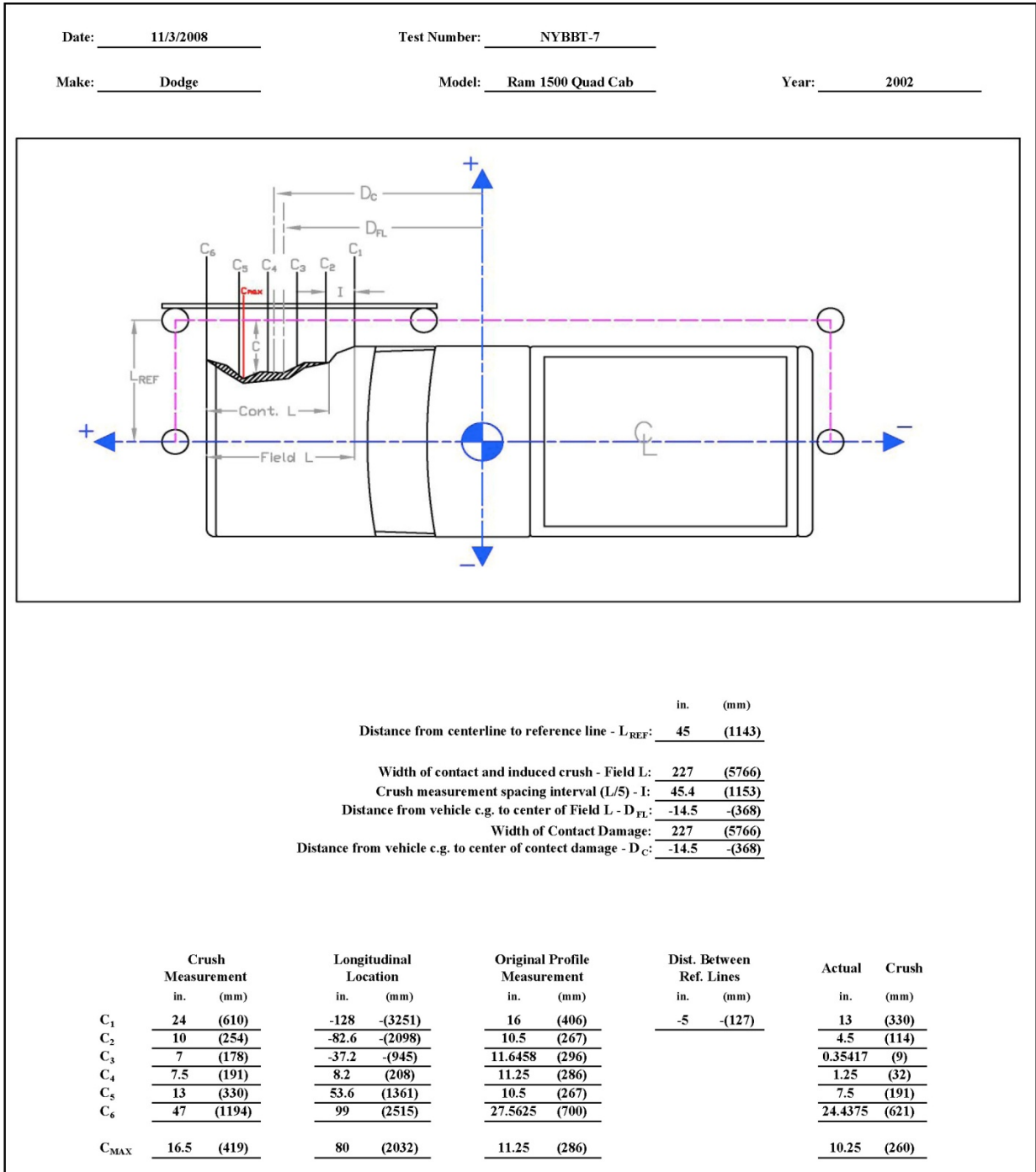


Figure D-20. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-7

VEHICLE PRE/POST CRUSH  
FLOORPAN - SET 1

TEST: NYBBT-8  
VEHICLE: Rio Sedan (1100C)

POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
1	25.75	-23.75	-0.5	25.25	-23.5	-0.5	-0.5	0.25	0
2	28.5	-19	-0.75	27.5	-18.75	-0.5	-1	0.25	0.25
3	31	-16	0	29.5	-15.75	0.25	-1.5	0.25	0.25
4	30.75	-10.5	-1	30.75	-10.5	-1	0	0	0
5	24.5	-24.75	-2.75	24.5	-25	-2.75	0	-0.25	0
6	27.75	-18.75	-3.25	27	-19	-3.25	-0.75	-0.25	0
7	29	-9.75	-4.5	29	-10	-4.25	0	-0.25	0.25
8	24.5	-22.25	-5.25	24.5	-21.5	-5.25	0	0.75	0
9	26	-17.25	-6.5	26	-16.75	-6.5	0	0.5	0
10	26	-11.5	-7	26	-11.25	-6.75	0	0.25	0.25
11	25.5	-6.75	-7.5	25.5	-7	-7.5	0	-0.25	0
12	19.75	-23	-8	19.5	-23	-8	-0.25	0	0
13	20	-15.25	-8	20	-15.25	-8	0	0	0
14	20.5	-7.5	-8.5	20.5	-7.5	-8.25	0	0	0.25
15	16	-21	-8	15.75	-21.25	-7.25	-0.25	-0.25	0.75
16	15.5	-15	-7.75	15.5	-15	-7.75	0	0	0
17	15.5	-10	-8.25	15.5	-10	-8	0	0	0.25
18	10.5	-22.75	-7.75	10.25	-22.5	-7.5	-0.25	0.25	0.25
19	10.5	-17.25	-7.5	10.75	-17.5	-7.5	0.25	-0.25	0
20	10.25	-13	-7.5	10.25	-13	-7.5	0	0	0
21	8.25	-3.5	-3.75	8.25	-3.5	-3.5	0	0	0.25
22	5	-22	-7.75	5	-21.75	-7.25	0	0.25	0.5
23	6.25	-15	-7.25	6.5	-14.75	-7.25	0.25	0.25	0
24	6.5	-7.75	-7.75	6.5	-7.5	-7.75	0	0.25	0
25	5	-3.5	-3.5	5	-3.5	-3.25	0	0	0.25
26	0.5	-24	-3.75	0.5	-24	-3.75	0	0	0
27	0.25	-20.25	-4.5	0.25	-20.5	-4.5	0	-0.25	0
28	0.25	-15	-4.75	0.25	-15	-4.5	0	0	0.25
29	0.25	-6	-3.75	0.25	-6	-3.75	0	0	0
30							0	0	0
31							0	0	0

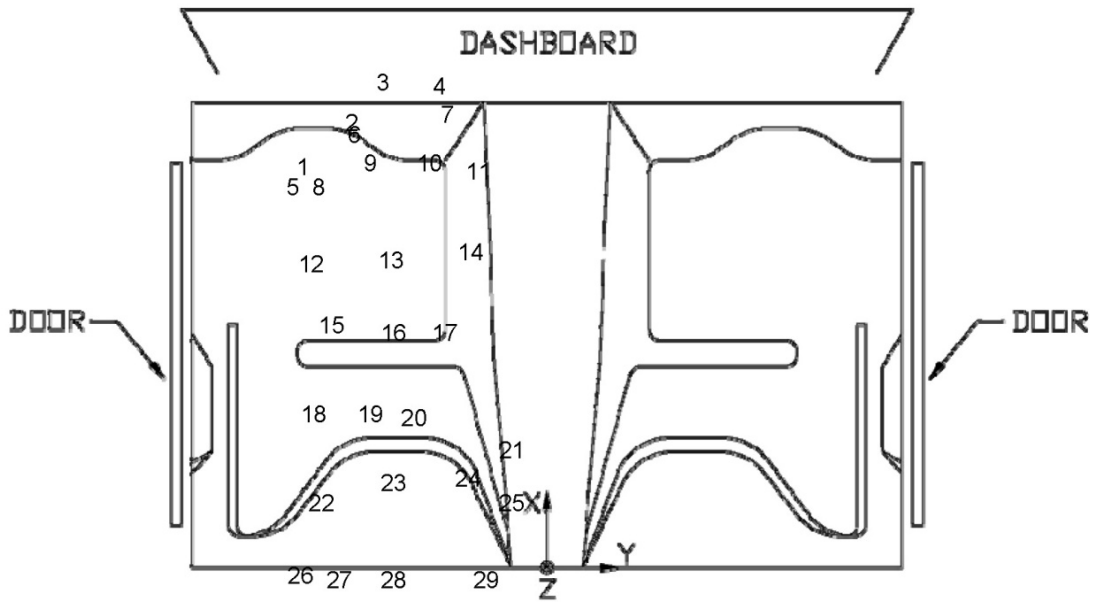


Figure D-21. Floorpan Deformation Data - Set 1, Test No. NYBBT-8



VEHICLE PRE/POST CRUSH  
FLOORPAN - SET 2

TEST: NYBBT-8  
VEHICLE: Rio Sedan (1100C)

POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
1	48.75	-25.75	-1.5	48	-25.5	-1.5	-0.75	0.25	0
2	51	-21.5	-1.5	50	-21	-1.75	-1	0.5	-0.25
3	53.75	-17.5	-1	52.25	-17.75	-0.75	-1.5	-0.25	0.25
4	53.75	-12.5	-1.75	53.5	-13	-1.75	-0.25	-0.5	0
5	47.75	-26.25	-3.75	47.5	-26.25	-4	-0.25	0	-0.25
6	50.5	-21	-4.25	50.25	-21	-4.25	-0.25	0	0
7	52.25	-12.5	-5	52.25	-13	-5.25	0	-0.5	-0.25
8	47.5	-24	-6.25	47.5	-23.25	-6.5	0	0.75	-0.25
9	49.25	-17.75	-7.5	49.25	-17.75	-7.5	0	0	0
10	49.25	-12.75	-7.75	49.25	-12.75	-7.75	0	0	0
11	48.5	-8.75	-8.25	48.5	-8.75	-8.5	0	0	-0.25
12	42.75	-25.75	-9	42.75	-25.75	-9	0	0	0
13	43.25	-17	-8.75	43.25	-17.25	-9	0	-0.25	-0.25
14	43.75	-9	-9	43.75	-9.75	-9.25	0	-0.75	-0.25
15	39	-22.5	-9	39	-23.25	-8.5	0	-0.75	0.5
16	38.75	-16.5	-8.5	38.75	-17	-8.75	0	-0.5	-0.25
17	38.75	-11.5	-8.75	38.75	-12.25	-9	0	-0.75	-0.25
18	33.25	-24	-8.75	33.5	-24.5	-8.5	0.25	-0.5	0.25
19	33.75	-19.25	-8.25	34	-19.75	-8.5	0.25	-0.5	-0.25
20	33.75	-14.5	-8.25	33.75	-14.75	-8.25	0	-0.25	0
21	31.5	-5.5	-4.25	31.25	-5.5	-4.25	-0.25	0	0
22	28.25	-23	-8.5	28.25	-23.5	-8.25	0	-0.5	0.25
23	29.5	-16.5	-8	29.5	-16.5	-8.25	0	0	-0.25
24	29.75	-9.25	-8.25	29.75	-9.25	-8.25	0	0	0
25	28	-5.5	-3.75	28	-5.5	-4	0	0	-0.25
26	23.5	-26	-4.75	23.5	-26	-4.75	0	0	0
27	23.5	-22.5	-5.5	23.5	-22.5	-5.5	0	0	0
28	23.75	-17.5	-5.5	23.75	-17.5	-5.5	0	0	0
29	23.25	-8.5	-4.25	23.5	-8.5	-4.25	0.25	0	0
30							0	0	0
31							0	0	0

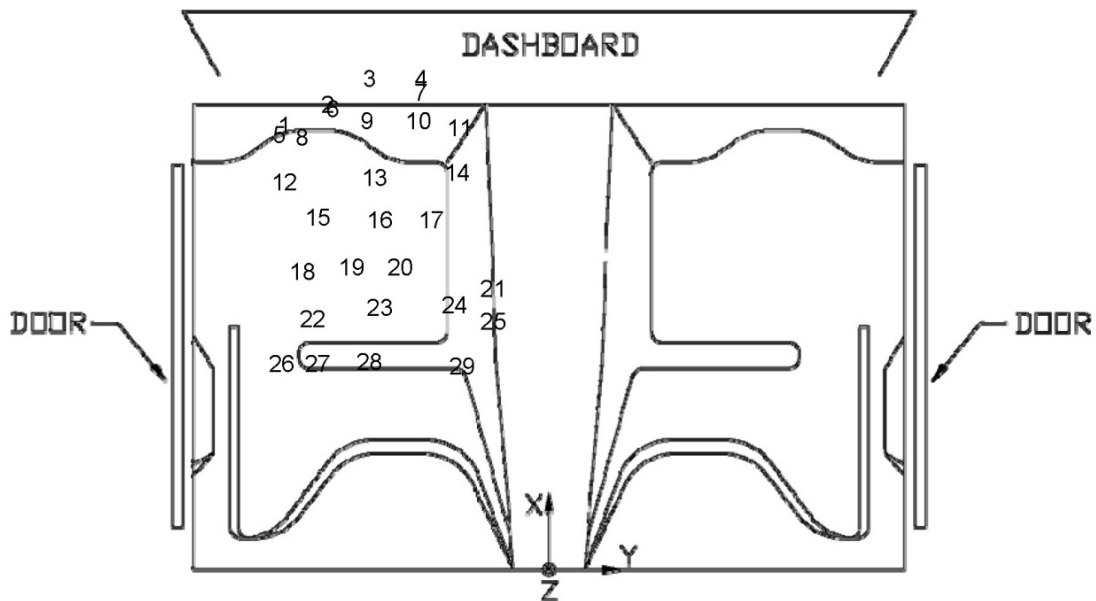


Figure D-22. Floorpan Deformation Data - Set 2, Test No. NYBBT-8

VEHICLE PRE/POST CRUSH  
INTERIOR CRUSH - SET 1

TEST: NYBBT-8  
VEHICLE: Rio Sedan (1100C)

	POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
DASH	A1	68.5	-19	21.5	68	-19	21.5	-0.5	0	0
	A2	71.5	2.25	22	71.25	2.25	22	-0.25	0	0
	A3	70.75	15	21.25	70.5	15	21	-0.25	0	-0.25
	A4	63	-14.5	22.75	63	-14.5	22.75	0	0	0
	A5	66	-1.5	21.75	66	-1.5	21.25	0	0	-0.5
	A6	64.25	15.25	20.25	64.25	15.25	20.5	0	0	0.25
SIDE PANEL	B1	20	-29	2.75	19.5	-29.25	3	-0.5	-0.25	0.25
	B2	23.5	-30.75	0	23.25	-30.75	0	-0.25	0	0
	B3	19.5	-29	-1.5	19.25	-29	-1.5	-0.25	0	0
IMPACT SIDE DOOR	C1	-11	-36.25	19.5	11.25	-36.75	19.25	22.25	-0.5	-0.25
	C2	7	-35.25	17.25	6.75	-35.5	17.5	-0.25	-0.25	0.25
	C3	-2.25	-33.75	13	-2.75	-34	13	-0.5	-0.25	0
	C4	8.75	-31.5	9.75	8.5	-32	9.5	-0.25	-0.5	-0.25
	C5	-11	-30	5.75	-11.25	-30	5.75	-0.25	0	0
	C6	15.5	-30	3.75	15.5	-29.5	4	0	0.5	0.25
ROOF	D1	44.5	-12.75	21.75	44.25	-12.75	22.25	-0.25	0	0.5
	D2	44.25	-6.75	21.75	44.25	-6.25	22.5	0	0.5	0.75
	D3	44.5	0	21.25	44.75	0	21.75	0.25	0	0.5
	D4	44.5	8	21	44.75	8	21	0.25	0	0
	D5	43.5	14.5	20.25	43.75	14.5	20.5	0.25	0	0.25
	D6	32.5	-10	25.5	32.5	-10	25.5	0	0	0
	D7	32	10.5	24.75	32	10.5	24.5	0	0	-0.25
	D8	23.75	-15	25.25	23.75	-15	25.25	0	0	0
	D9	23.25	-4.25	25.25	23.5	-4.25	25.75	0.25	0	0.5
	D10	23	2.75	25	23	2.75	25	0	0	0
	D11	23.5	14	23.75	23.5	14	23.75	0	0	0
	D12	13	-13.5	26.25	12.75	-13.5	26.75	-0.25	0	0.5
	D13	12.25	7	25.75	12.25	7.25	25.75	0	0.25	0
	D14	8.25	-7	26.25	8.25	-7	26.25	0	0	0
	D15	8	6.25	25.5	8	6.25	25.5	0	0	0

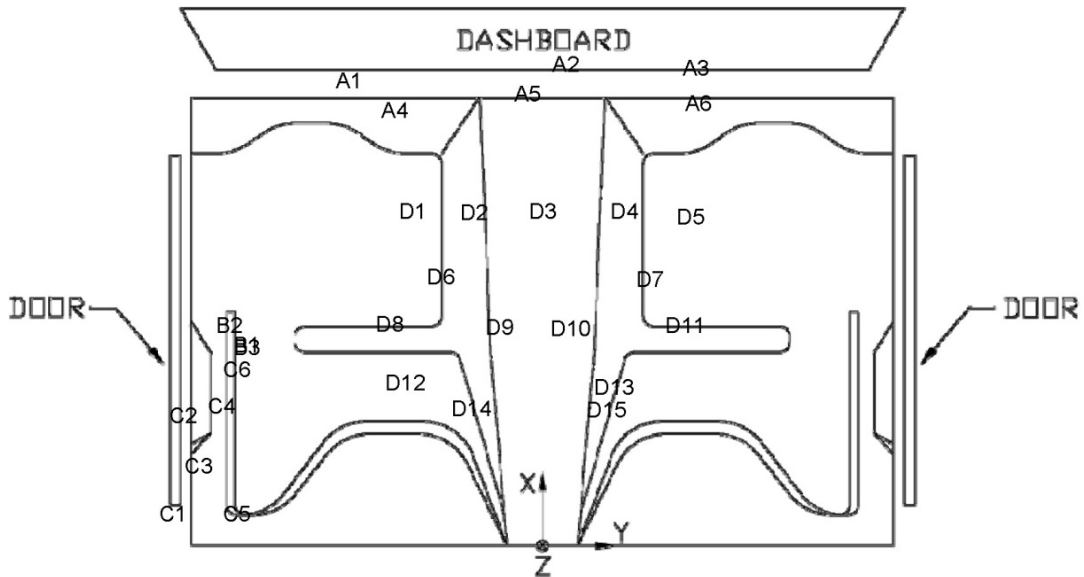


Figure D-23. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-8

VEHICLE PRE/POST CRUSH  
INTERIOR CRUSH - SET 2

TEST: NYBBT-8  
VEHICLE: Rio Sedan (1100C)

	POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
DASH	A1	38	-42	20.25	37.75	-42	20.5	-0.25	0	0.25
	A2	40.75	-21.25	21	40.5	-21.25	21	-0.25	0	0
	A3	40.25	-8.5	20.75	40	-8.5	21.25	-0.25	0	0.5
	A4	33	-37.75	21.75	32.75	-37.75	22	-0.25	0	0.25
	A5	35	-24.5	20.75	34.75	-24.5	21	-0.25	0	0.25
	A6	33.25	-8	20	33.25	-8.25	20	0	-0.25	0
SIDE PANEL	B1	33.5	-31.25	1.5	33.25	-31.25	1.5	-0.25	0	0
	B2	33.25	-33.5	2.5	37	-33	2.5	3.75	0.5	0
	B3	37.25	-31	-1.25	33.25	-31	-1.5	-4	0	-0.25
IMPACT SIDE DOOR	C1	2	-35.5	18	2	-36.25	18.25	0	-0.75	0.25
	C2	19.5	-35.75	16.25	19.5	-36.5	16.25	0	-0.75	0
	C3	11	-34.25	11.75	11	-34.75	12	0	-0.5	0.25
	C4	22	-33	8.5	22.25	-33.25	8.75	0.25	-0.25	0.25
	C5	2.5	-30.75	4.5	2.5	-31	4.75	0	-0.25	0.25
	C6	29.5	-31	2.75	29.25	-31	2.75	-0.25	0	0
ROOF	D1	48.5	-33.25	18.25	48.5	-33.25	18.5	0	0	0.25
	D2	48.75	-26.75	19	48.5	-27	19.25	-0.25	-0.25	0.25
	D3	49	-20.5	19.25	49	-20.75	19.5	0	-0.25	0.25
	D4	48.75	-12.75	19.5	49	-13	19.75	0.25	-0.25	0.25
	D5	48	-6.25	19.75	48	-6.25	19.75	0	0	0
	D6	37.25	-30.25	23	37.25	-30.75	23.25	0	-0.5	0.25
	D7	36.5	-10.75	24	36.75	-11.25	24.25	0.25	-0.5	0.25
	D8	28.5	-35.5	23.25	28.5	-35.75	23	0	-0.25	-0.25
	D9	28.25	-25	24.5	28.25	-25.25	24.5	0	-0.25	0
	D10	28	-18	25	28	-18.25	25	0	-0.25	0
	D11	28.5	-8	24.5	28.5	-7.75	24.75	0	0.25	0.25
	D12	17.75	-34.25	25.25	18	-34.25	25.5	0.25	0	0.25
	D13	17.5	-14	26.75	17.75	-14.25	26.75	0.25	-0.25	0
	D14	13.5	-27.75	26.25	13.75	-27.75	26.5	0.25	0	0.25
	D15	13.5	-14.5	27	13.5	-15	27	0	-0.5	0

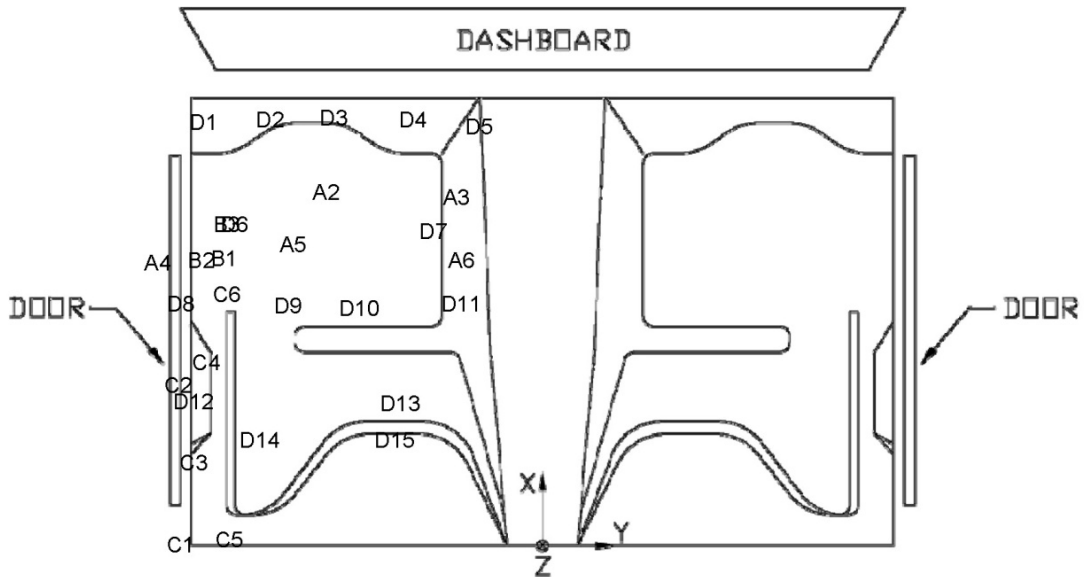


Figure D-24. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-8

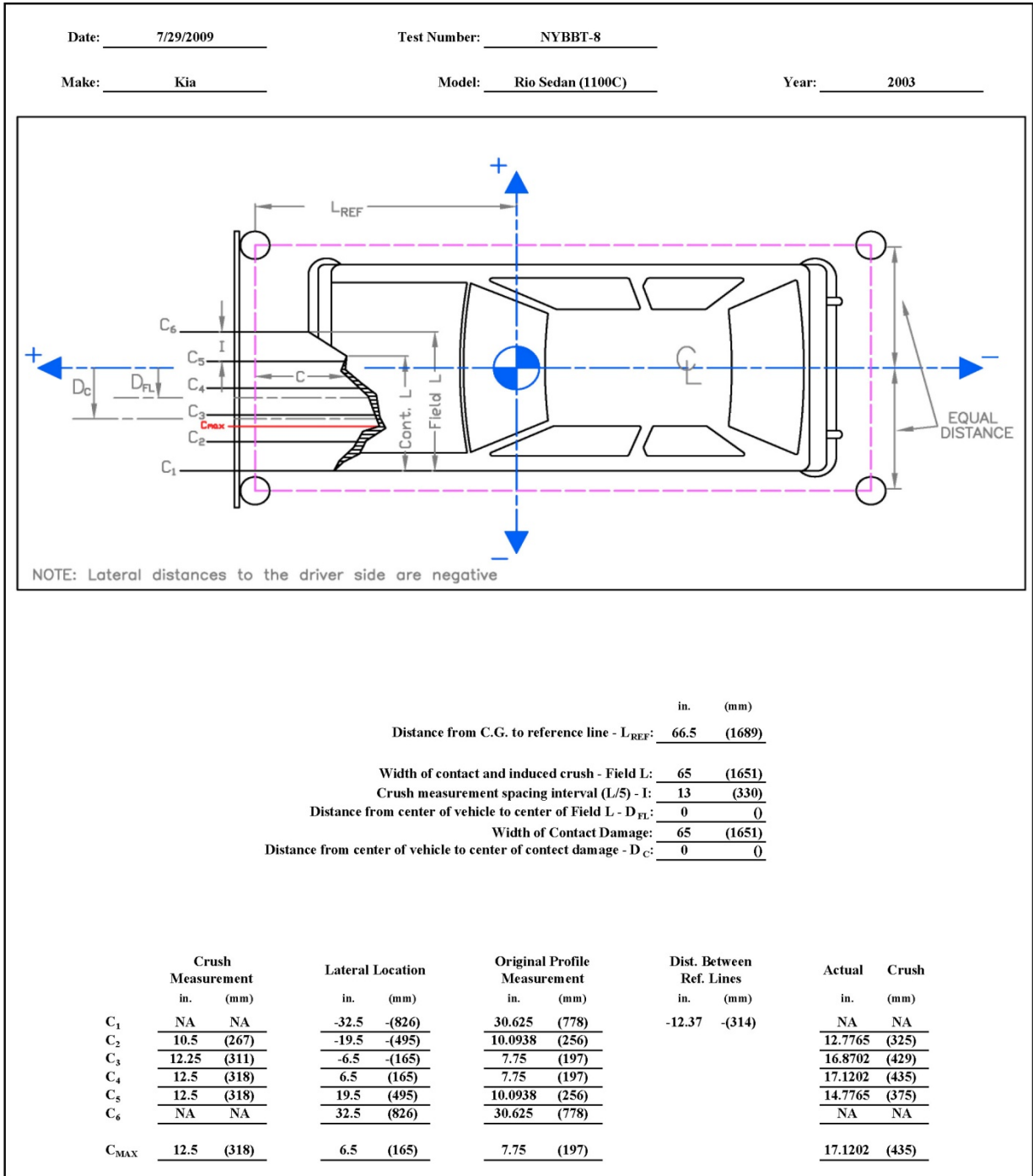


Figure D-25. Exterior Vehicle Crush (NASS) - Front, Test No. NYBBT-8

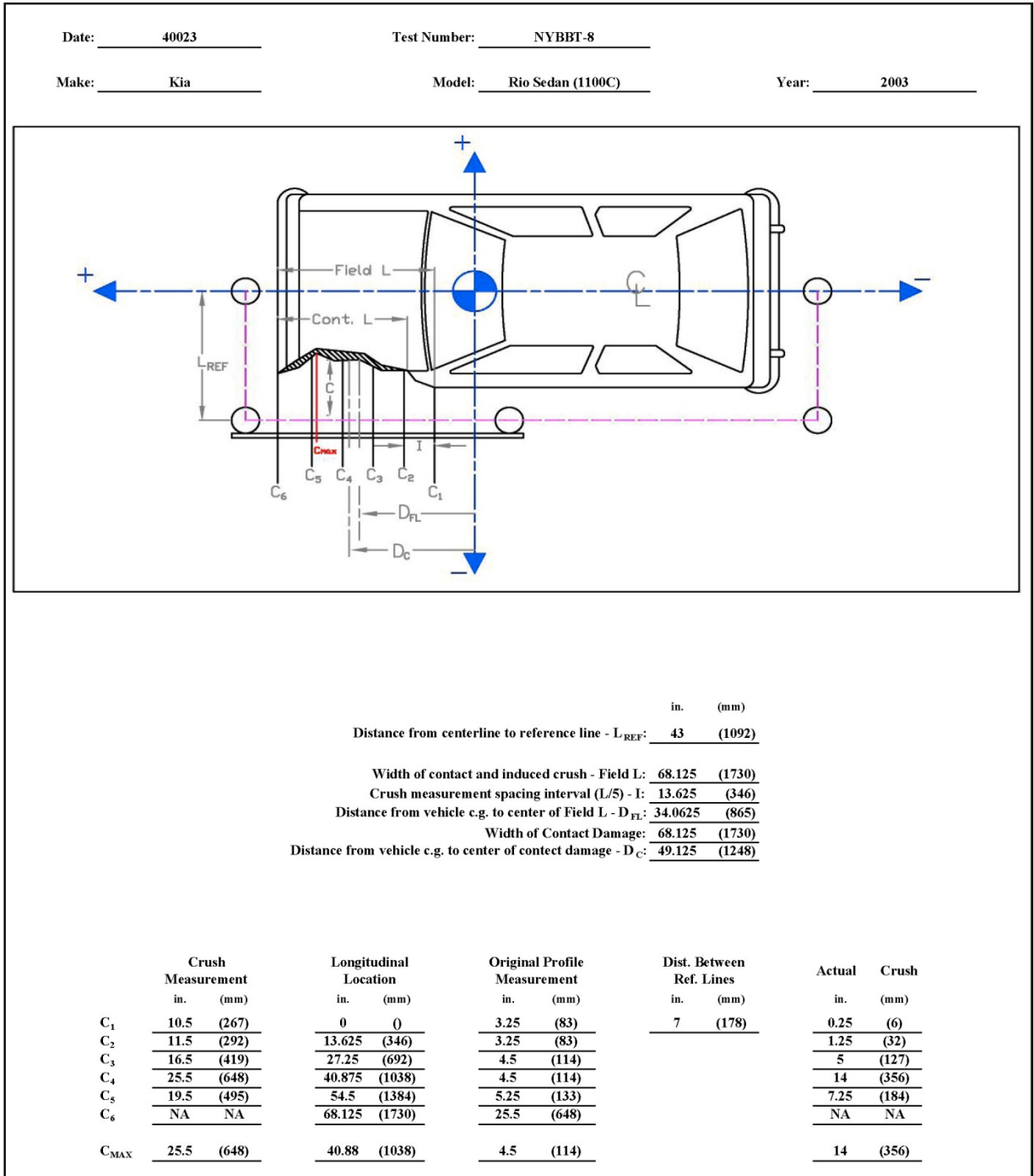


Figure D-26. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-8

VEHICLE PRE/POST CRUSH  
FLOORPAN - SET 1

TEST: NYBBT-9  
VEHICLE: Ram 1500 (2270P)

POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
1	29.25	-27.75	-2.75	29.25	-27.5	-2.75	0	0.25	0
2	33.75	-23.75	-0.25	33	-24.5	-0.25	-0.75	-0.75	0
3	33.5	-15.75	-1.75	33.5	-16.25	-2	0	-0.5	-0.25
4	28.75	-10.5	-2.25	29	-10	-2.25	0.25	0.5	0
5	26.25	-29	-7	26	-29	-7	-0.25	0	0
6	28.5	-23	-5.75	28.5	-22.5	-6	0	0.5	-0.25
7	29	-18.75	-5.25	29	-18	-5.5	0	0.75	-0.25
8	27.25	-10.25	-5	27.25	-10.5	-5	0	-0.25	0
9	21.75	-27.25	-9	21.75	-27	-9.25	0	0.25	-0.25
10	22.25	-22.25	-8.75	22.25	-21.5	-9	0	0.75	-0.25
11	22	-14	-8.75	22	-13.75	-9	0	0.25	-0.25
12	16.5	-28	-9.75	16.5	-28.5	-9.75	0	-0.5	0
13	16.5	-20.25	-9.5	16.5	-20	-9.5	0	0.25	0
14	16.5	-16	-9.5	16.5	-15.75	-9.5	0	0.25	0
15	14	-8	-2.5	14	-8	-2.75	0	0	-0.25
16	10.25	-26.25	-9.5	10.25	-25.5	-9.5	0	0.75	0
17	10.5	-17.5	-9.25	10.25	-17	-9.25	-0.25	0.5	0
18	10.5	-11.5	-9	10.5	-11.25	-9	0	0.25	0
19	8.5	-8	-3	8.5	-8	-3	0	0	0
20	5.75	-27.5	-9.5	5.75	-28	-9.5	0	-0.5	0
21	5.25	-21	-9.5	6.25	-21	-9.5	1	0	0
22	6.5	-15.5	-9.25	6.5	-15.5	-9.25	0	0	0
23	4.75	-8	-3.25	4.75	-8	-3.5	0	0	-0.25
24	0	-28.25	-5.5	0.25	-28.25	-5.5	0.25	0	0
25	0.25	-21.75	-5.25	0.25	-21.75	-5.25	0	0	0
26	0	-17	-5.25	0	-17.5	-5.25	0	-0.5	0
27	0.25	-12	-5	0.25	-12	-5	0	0	0
28	0.5	-4.5	-2.25	0.5	-4.5	-2.25	0	0	0
29							0	0	0
30							0	0	0
31							0	0	0

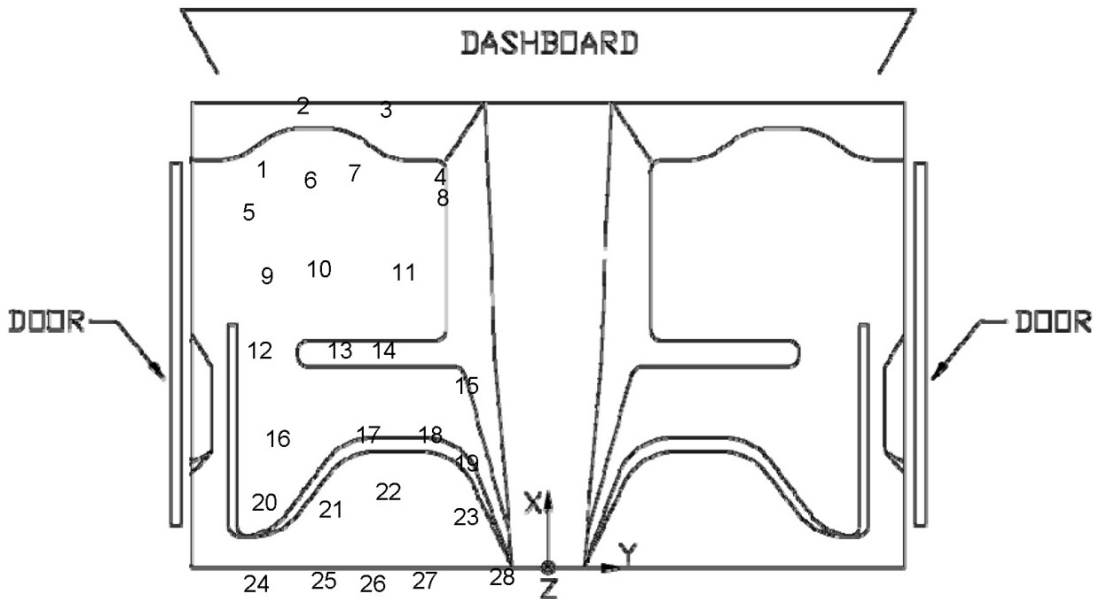


Figure D-27. Floorpan Deformation Data - Set 1, Test No. NYBBT-9

VEHICLE PRE/POST CRUSH  
FLOORPAN - SET 2

TEST: NYBBT-9  
VEHICLE: Ram 1500 (2270P)

POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
1	52.25	-32	-2.25	52	-32.75	-2.5	-0.25	-0.75	-0.25
2	56.25	-28.75	0	56.25	-29.5	0	0	-0.75	0
3	56.25	-21	-2	56.25	-21.5	-1.75	0	-0.5	0.25
4	51.75	-15	-2.25	51.5	-15.25	-2.25	-0.25	-0.25	0
5	49.25	-33	-6.5	49	-33.25	-6.5	-0.25	-0.25	0
6	51.5	-26.25	-5.5	51.5	-26.5	-5.75	0	-0.25	-0.25
7	51.75	-22.25	-5.25	52	-22.75	-5.25	0.25	-0.5	0
8	50	-14.25	-5	50	-14.5	-5.25	0	-0.25	-0.25
9	44.75	-32	-8.75	44.75	-32	-8.75	0	0	0
10	45.25	-27	-8.5	45.25	-26.75	-8.75	0	0.25	-0.25
11	45	-18.5	-8.5	45	-17.75	-8.75	0	0.75	-0.25
12	39.5	-33.75	-9.5	39.5	-33.5	-9.5	0	0.25	0
13	39.5	-25.25	-9.25	39.5	-24.5	-9.25	0	0.75	0
14	39.5	-21.25	-9.25	39.5	-20.5	-9.25	0	0.75	0
15	37	-13	-2.5	36.75	-12.75	-2.5	-0.25	0.25	0
16	33.5	-31.25	-9.25	33.5	-30.75	-9.25	0	0.5	0
17	33.5	-22.5	-9	33.5	-21.75	-9	0	0.75	0
18	33.5	-16.25	-9	33.5	-16	-9	0	0.25	0
19	31.25	-13	-3	31.25	-12.75	-3	0	0.25	0
20	29	-32.75	-9	29	-32.5	-9.25	0	0.25	-0.25
21	29.75	-26.25	-9.25	29.5	-25.5	-9.25	-0.25	0.75	0
22	29.5	-20.25	-9.25	29.5	-19.75	-9.25	0	0.5	0
23	27.5	-13	-3.5	27.5	-12.75	-3.5	0	0.25	0
24	23.25	-33	-5	23.25	-33	-5	0	0	0
25	23.25	-26.5	-5	23.25	-26.25	-5	0	0.25	0
26	23	-22	-5	23.25	-22	-5	0.25	0	0
27	23.25	-17	-5	23	-16.5	-5	-0.25	0.5	0
28	23.25	-9.75	-2.5	23.5	-9.25	-2.5	0.25	0.5	0
29							0	0	0
30							0	0	0
31							0	0	0

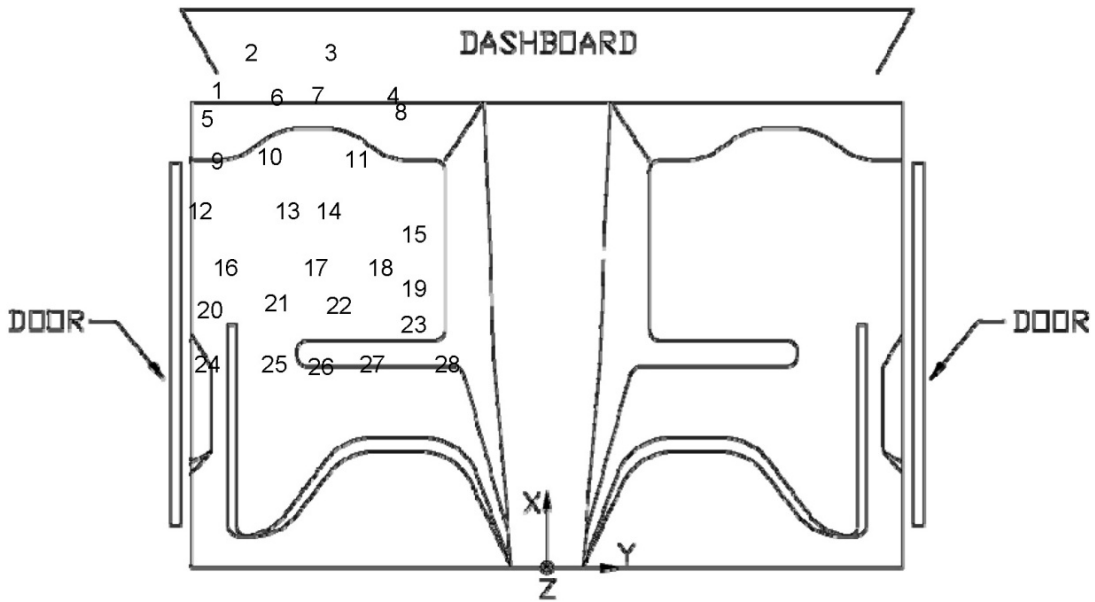


Figure D-28. Floorpan Deformation Data - Set 2, Test No. NYBBT-9



VEHICLE PRE/POST CRUSH  
INTERIOR CRUSH - SET 1

TEST: NYBBT-9  
VEHICLE: Ram 1500 (2270P)

	POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
DASH	A1	70.25	-26.75	24.25	69.5	-26.5	24	-0.75	0.25	-0.25
	A2	70	-8.75	25.75	70	-8.75	25.25	0	0	-0.5
	A3	70.75	0	25.25	70.75	0	24.75	0	0	-0.5
	A4	69.5	-28.25	13.25	69	-28.25	13.25	-0.5	0	0
	A5	70.5	-19.25	12	70	-19	12	-0.5	0.25	0
	A6	70.5	-11.25	13.25	69.75	-11	13.25	-0.75	0.25	0
SIDE PANEL	B1	20	-36	1.25	20.25	-36	1.5	0.25	0	0.25
	B2	24.5	-38	-3.5	24.5	-38	-3.25	0	0	0.25
	B3	20.25	-36.25	-4	20.25	-36.25	-4	0	0	0
IMPACT SIDE DOOR	C1	-10.25	-38	17.25	-10.25	-38	17.25	0	0	0
	C2	7.5	-35.25	16	7.75	-35	16.25	0.25	0.25	0.25
	C3	-13.5	-39.25	4.25	-13.25	-39	4.25	0.25	0.25	0
	C4	1	-34.75	4.75	1	-34.75	4.75	0	0	0
	C5	-0.75	-35.5	-6	-0.75	-35.25	-5.75	0	0.25	0.25
	C6	15.25	-36.5	-2.5	15.5	-36.25	-2.5	0.25	0.25	0
ROOF	D1							0	0	0
	D2							0	0	0
	D3							0	0	0
	D4							0	0	0
	D5							0	0	0
	D6							0	0	0
	D7							0	0	0
	D8							0	0	0
	D9							0	0	0
	D10							0	0	0
	D11							0	0	0
	D12							0	0	0
	D13							0	0	0
	D14							0	0	0
	D15							0	0	0

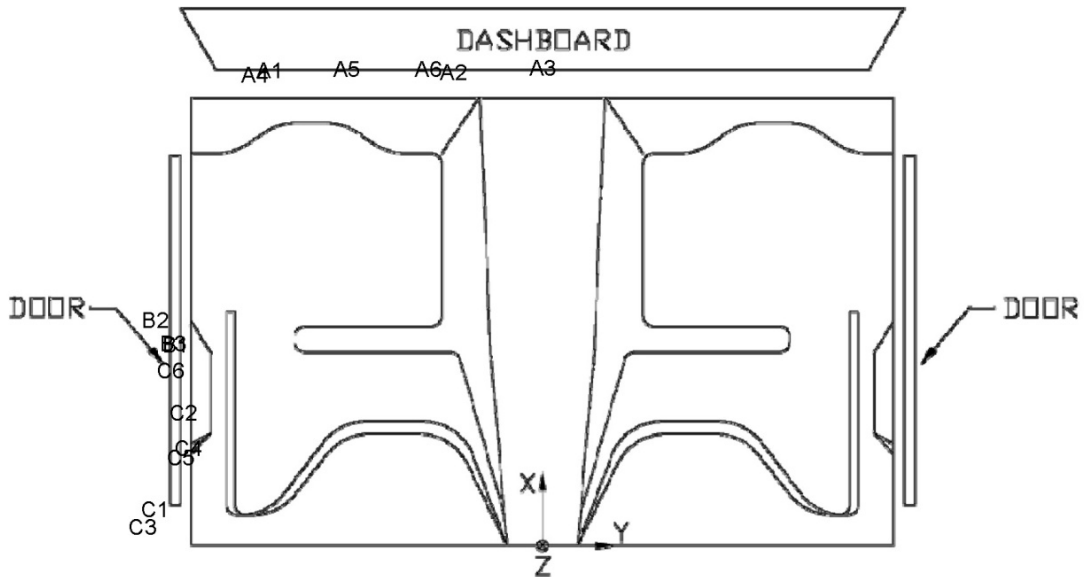


Figure D-29. Occupant Compartment Deformation Data - Set 1, Test No. NYBBT-9



VEHICLE PRE/POST CRUSH  
INTERIOR CRUSH - SET 2

TEST: NYBBT-9  
VEHICLE: Ram 1500 (2270P)

Cells marked "NA" indicate that the measurement was not taken due to procedural difficulties or reference compromise.

	POINT	X	Y	Z	X'	Y'	Z'	DEL X	DEL Y	DEL Z
DASH	A1	64.25	-55.75	24.5	64.25	-55.75	24.5	0	0	0
	A2	63.5	-38	25.75	63.5	-38.25	25.25	0	-0.25	-0.5
	A3	64.5	-29.25	25	64.25	-29.25	24.25	-0.25	0	-0.75
	A4	67.5	-58	13.75	67.25	-58	13.75	-0.25	0	0
	A5	68	-48.75	12	68.25	-48.5	12.25	0.25	0.25	0.25
	A6	67.25	-40.25	13.25	67	-40.25	13.5	-0.25	0	0.25
SIDE PANEL	B1	35.25	-53.5	-2	35.25	NA	-2	0	#VALUE!	0
	B2	39.75	-54.5	3	40	NA	2.75	0.25	#VALUE!	-0.25
	B3	35.5	-63.5	3.5	35.5	NA	3.25	0	#VALUE!	-0.25
IMPACT SIDE DOOR	C1	4.25	-67.75	18	4.25	-67.75	17.5	0	0	-0.5
	C2	22.75	-64.75	16.75	22.5	-64.75	16.75	-0.25	0	0
	C3	1.5	-68.5	4.75	1.5	-68.5	4.75	0	0	0
	C4	16.25	-65.25	5.25	16.25	-65	5.25	0	0.25	0
	C5	14.5	-65.75	-5.5	14.25	-65.5	-5.75	-0.25	0.25	-0.25
	C6	31	-65	-1.75	31	-65	-2	0	0	-0.25
ROOF	D1							0	0	0
	D2							0	0	0
	D3							0	0	0
	D4							0	0	0
	D5							0	0	0
	D6							0	0	0
	D7							0	0	0
	D8							0	0	0
	D9							0	0	0
	D10							0	0	0
	D11							0	0	0
	D12							0	0	0
	D13							0	0	0
	D14							0	0	0
	D15							0	0	0

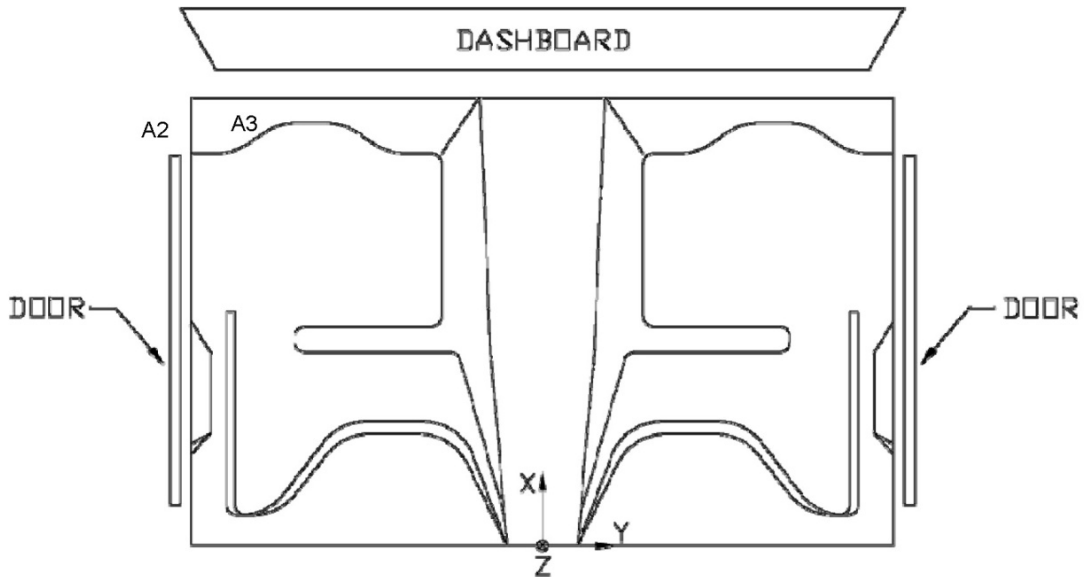


Figure D-30. Occupant Compartment Deformation Data - Set 2, Test No. NYBBT-9



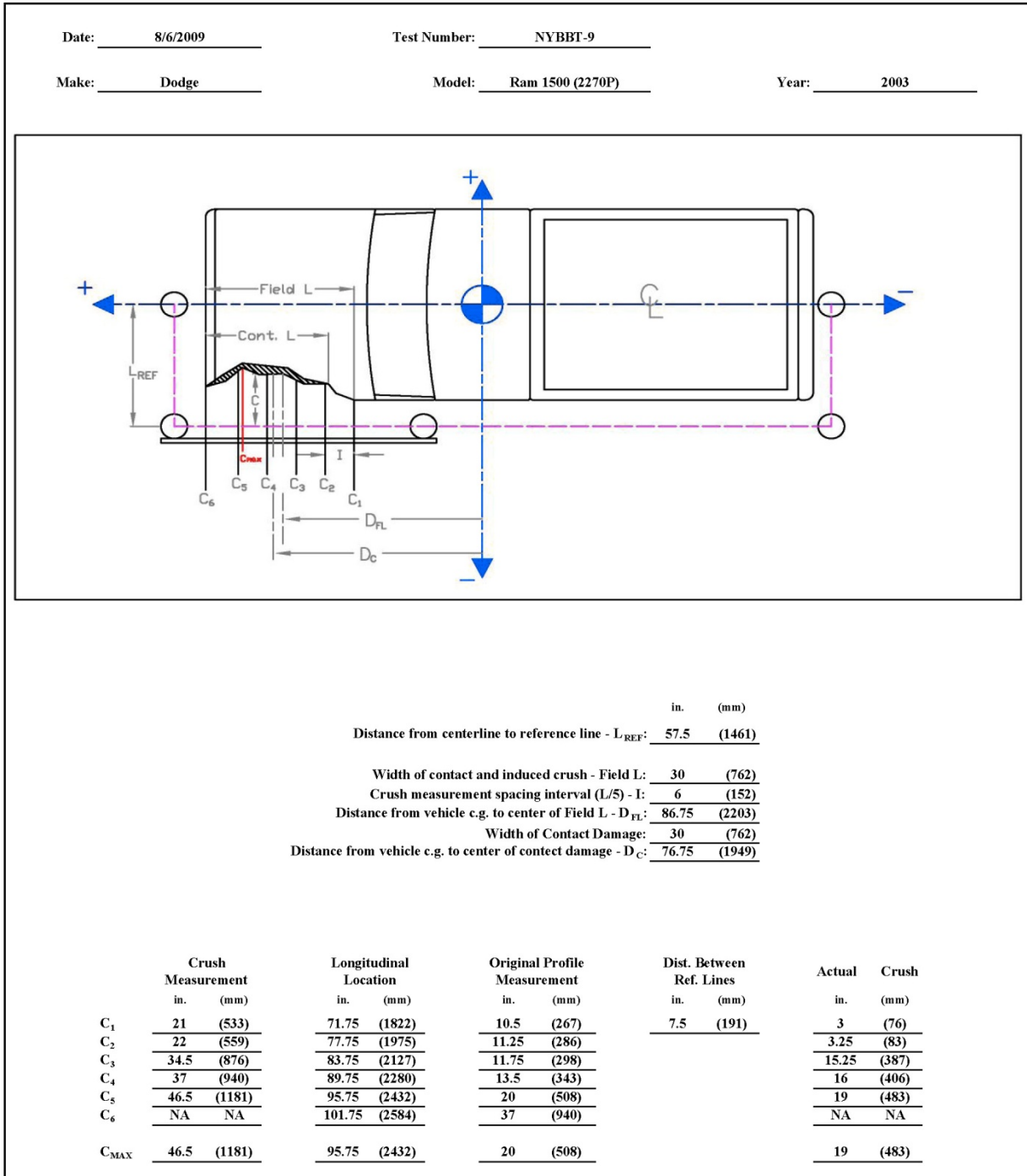


Figure D-32. Exterior Vehicle Crush (NASS) - Side, Test No. NYBBT-9

**APPENDIX E Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-1**

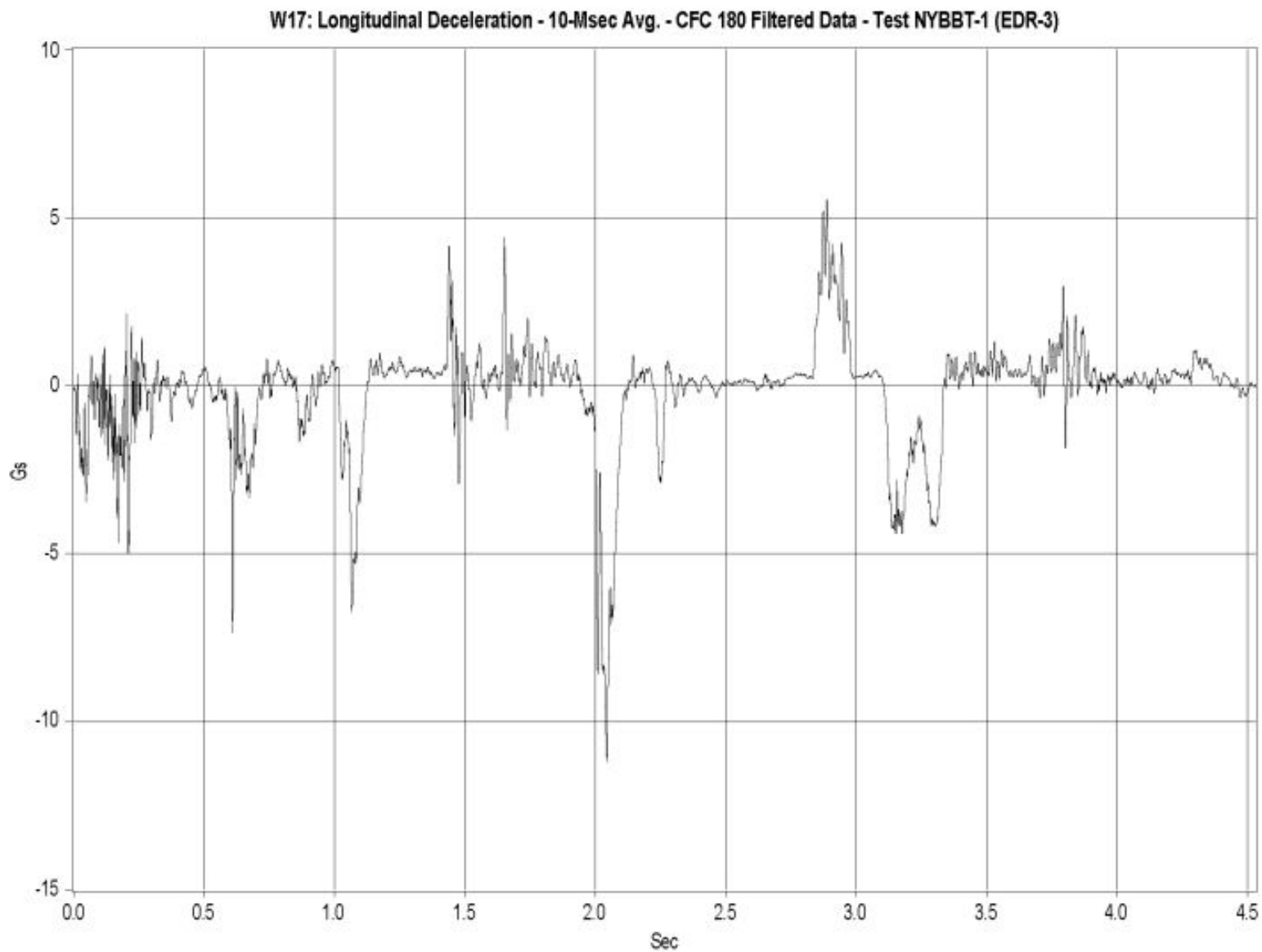


Figure E-1. Graph of Longitudinal Deceleration (EDR-3), Test No. NYBBT-1

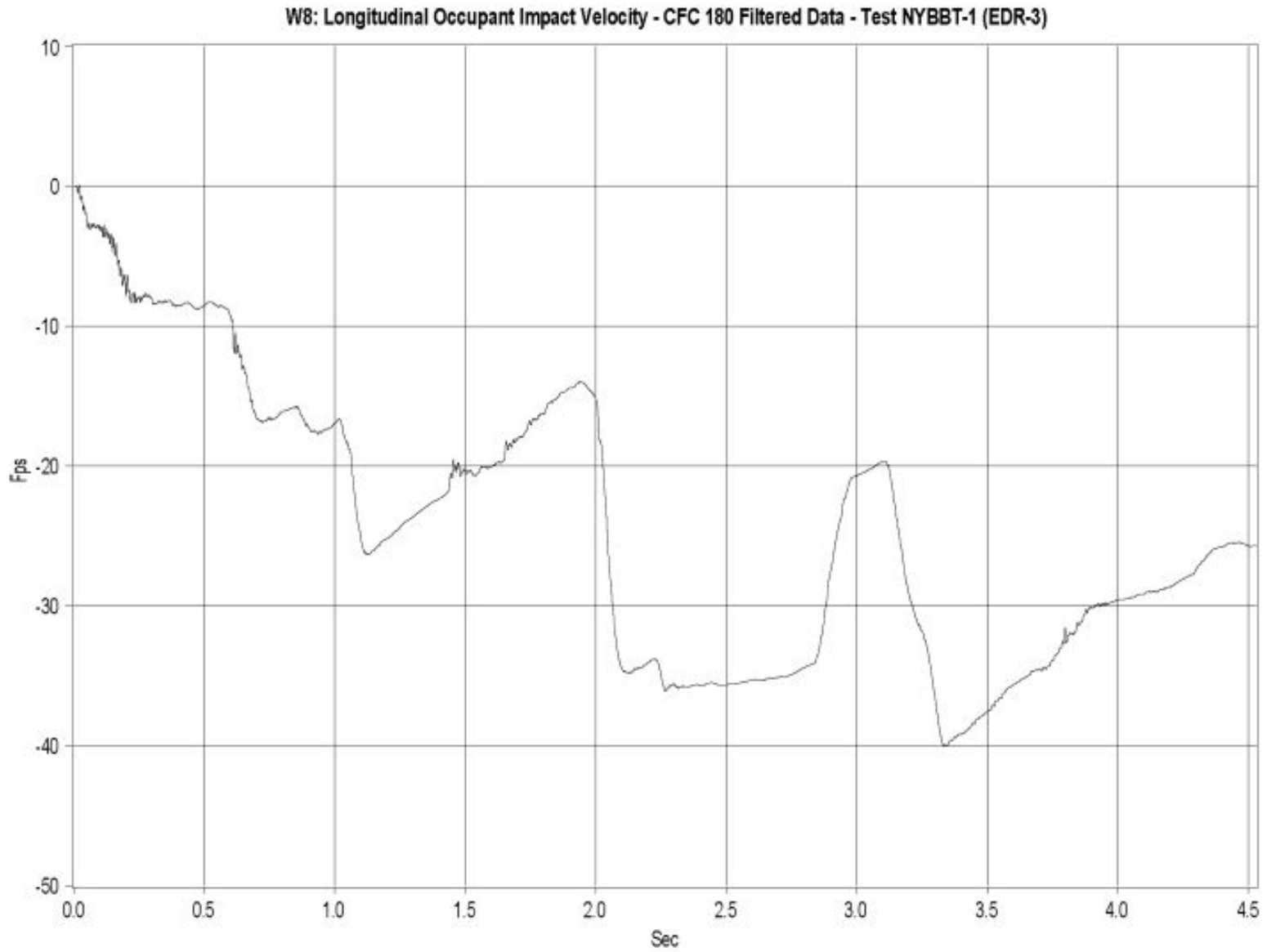


Figure E-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-1

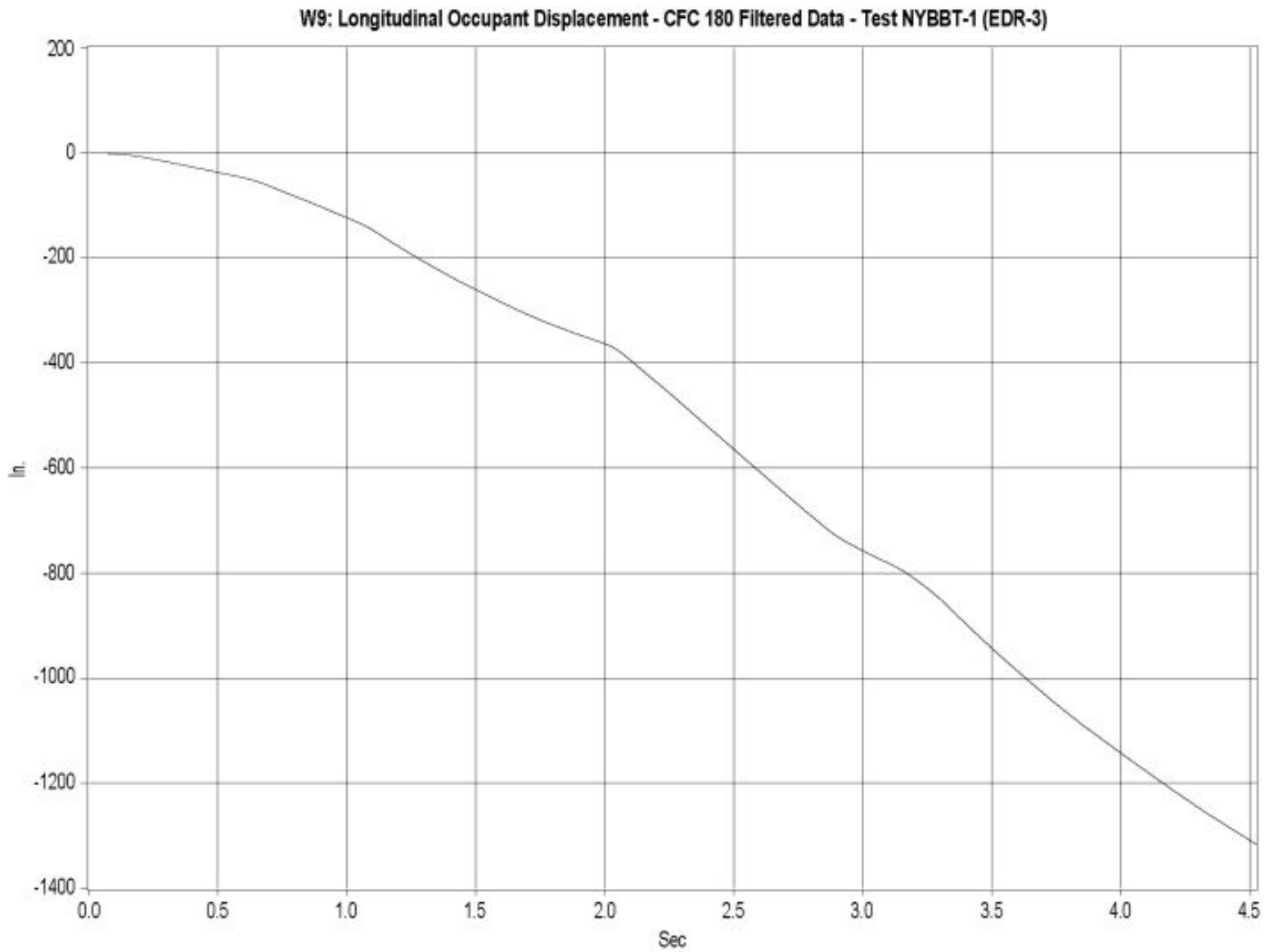


Figure E-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-1

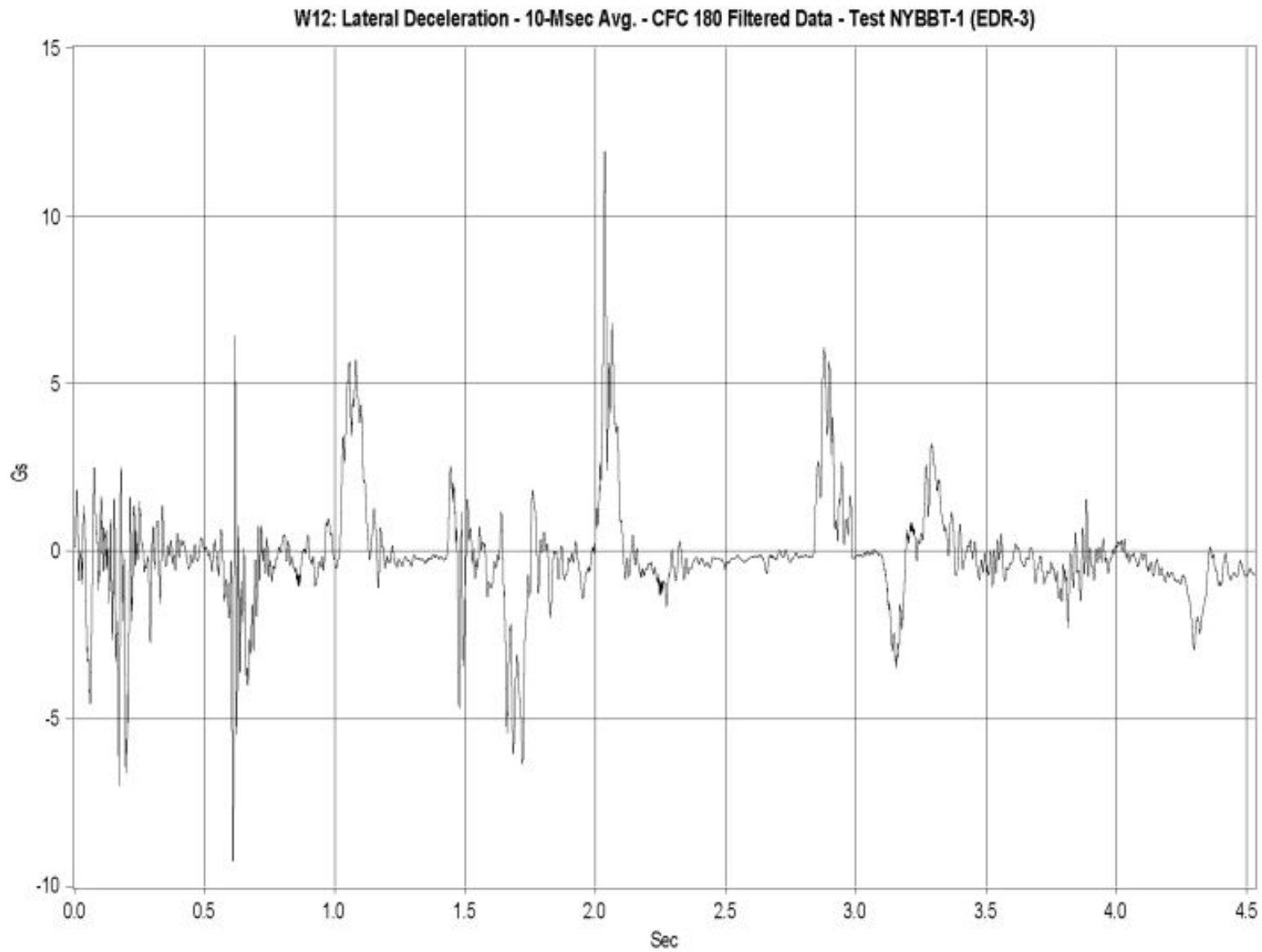


Figure E-4. Graph of Lateral Deceleration (EDR-3), Test No. NYBBT-1



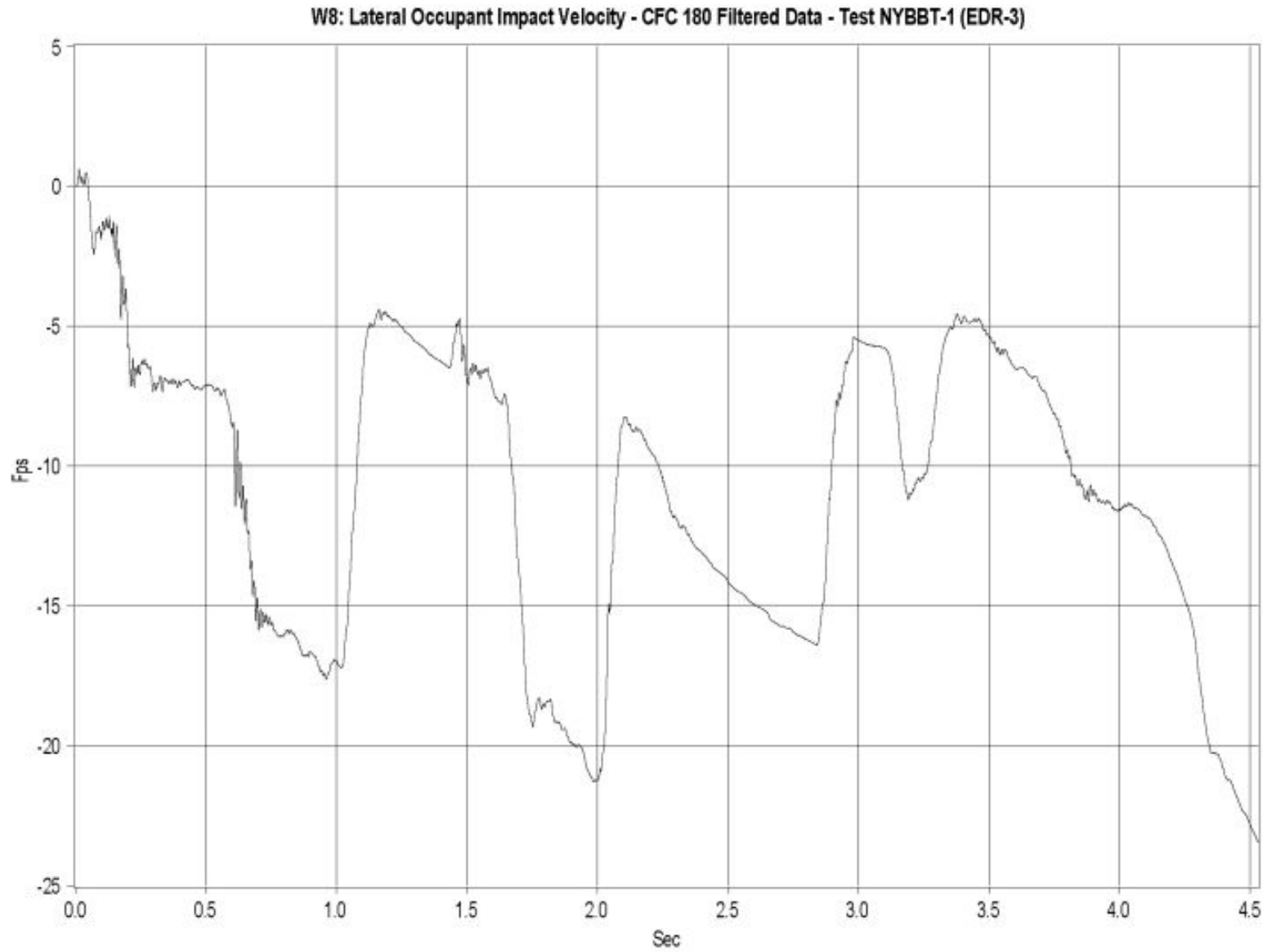


Figure E-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-1

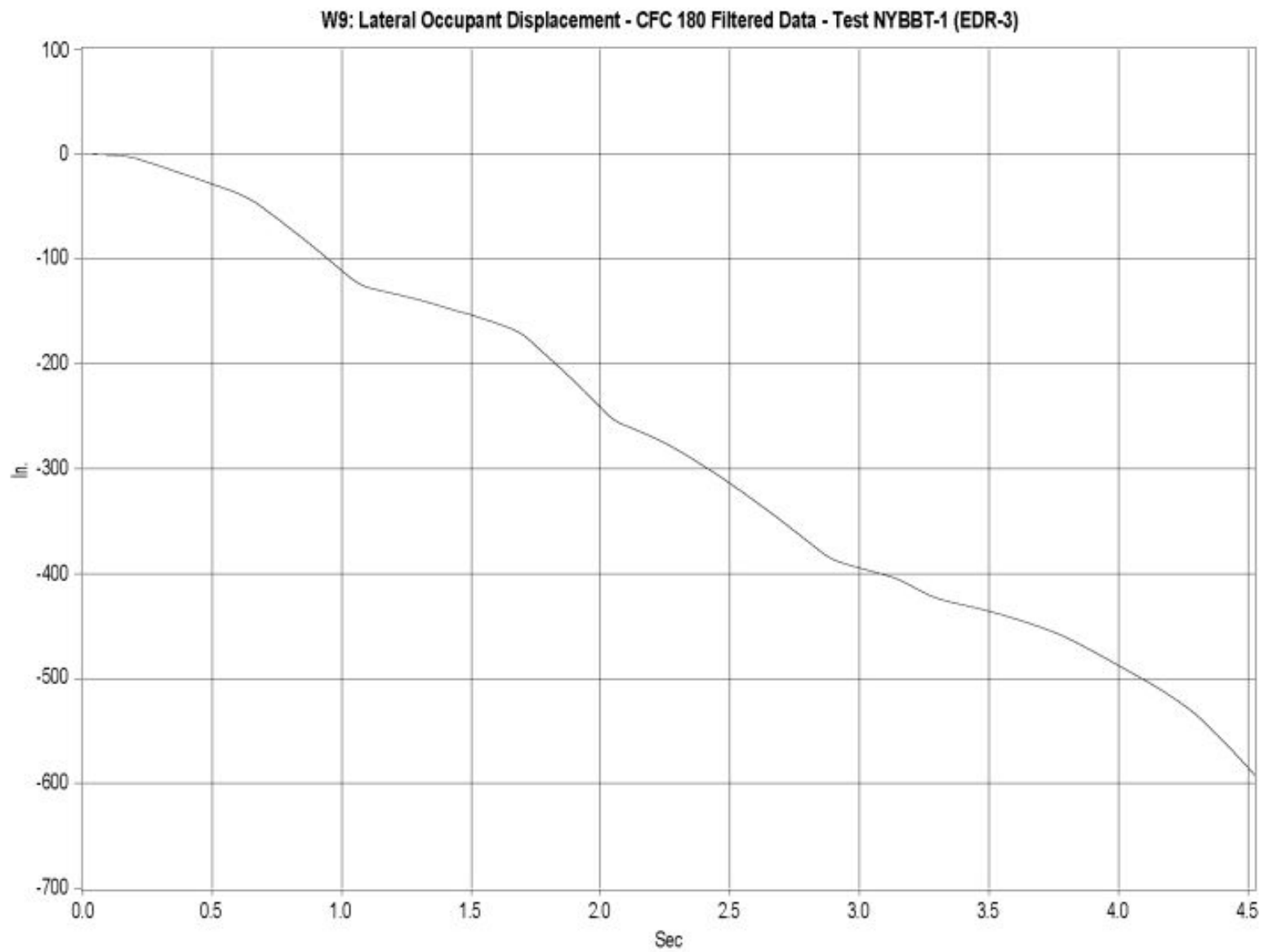


Figure E-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-1

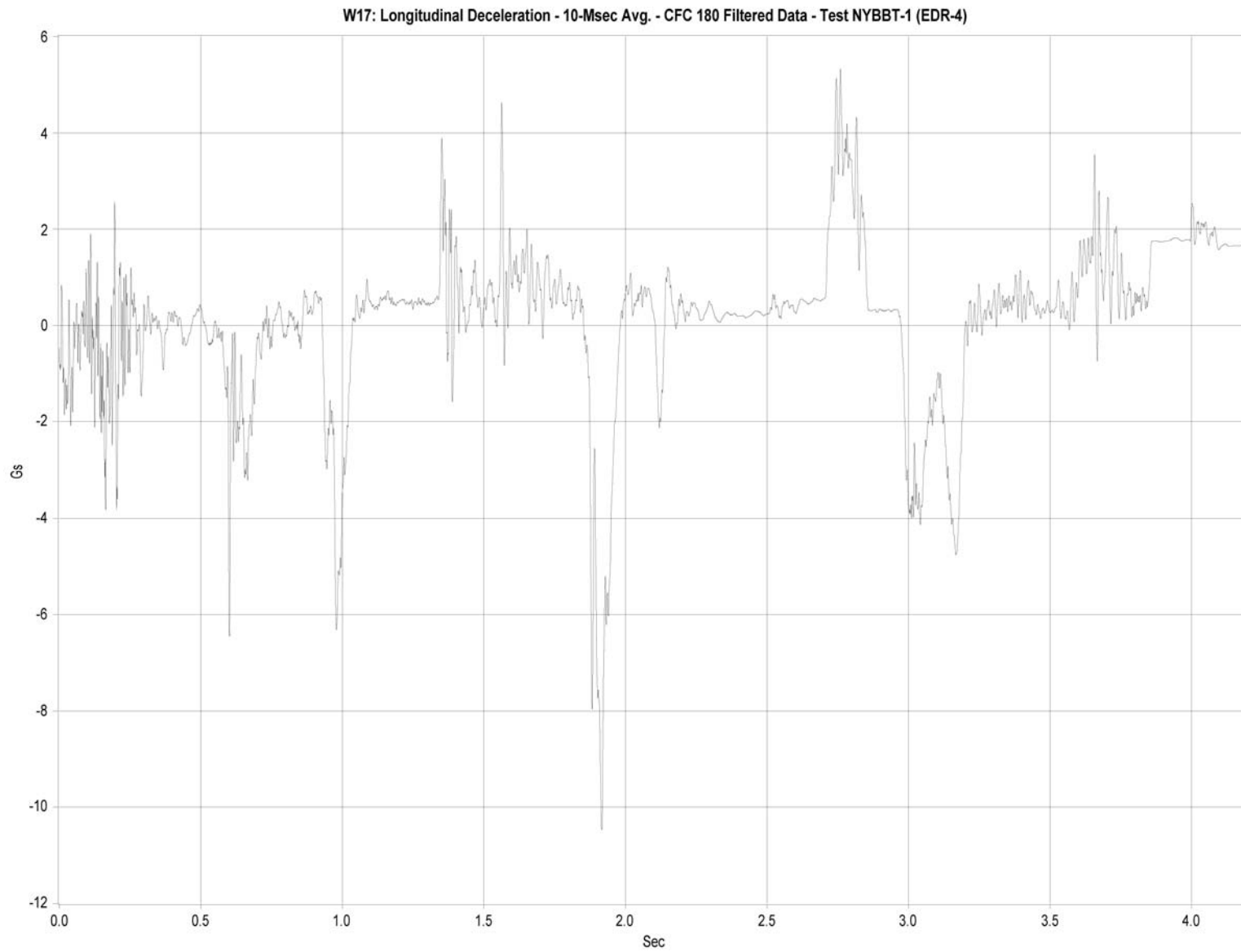


Figure E-7. Graph of Longitudinal Deceleration (EDR-4), Test No. NYBBT-1

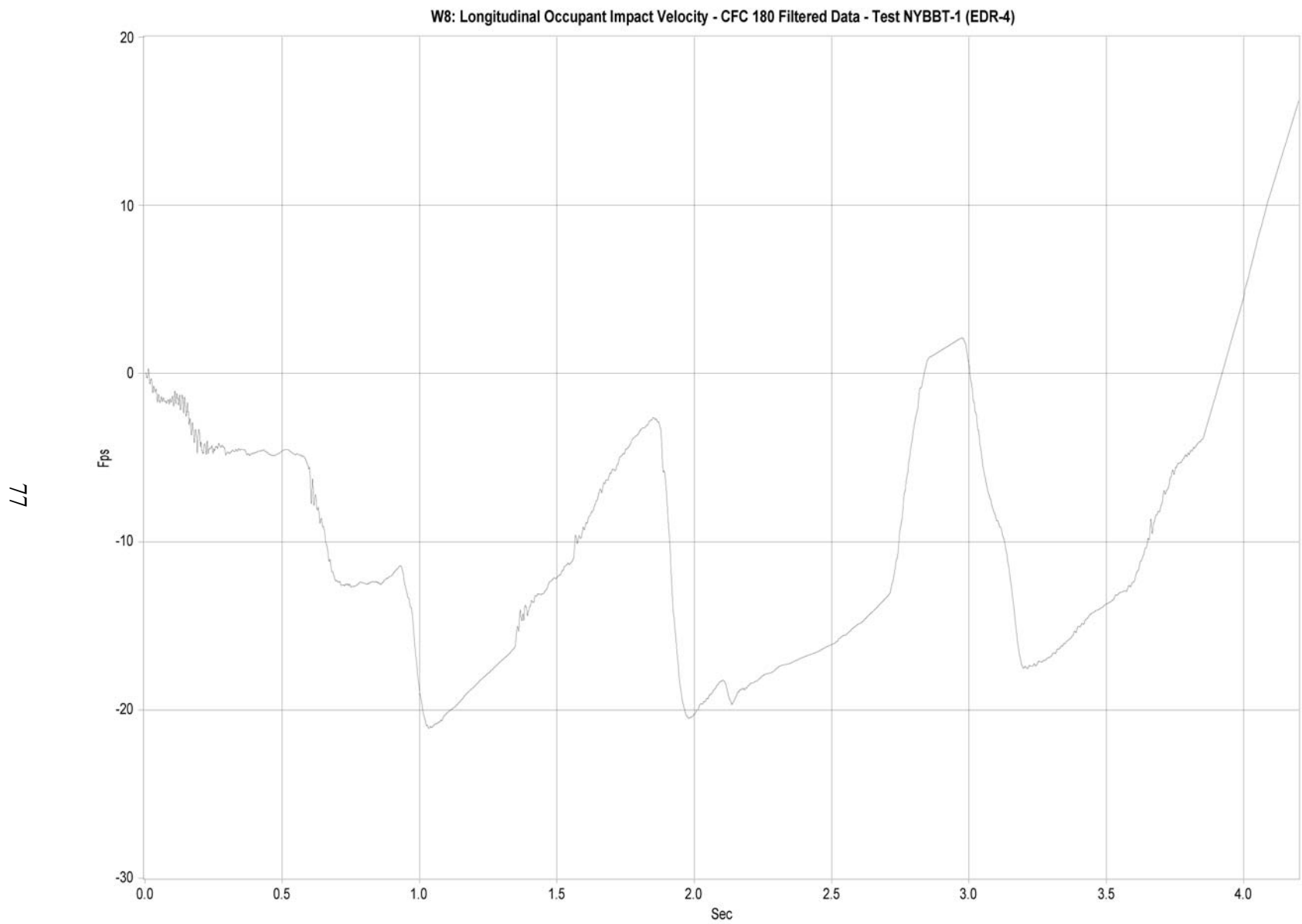


Figure E-8. Graph of Longitudinal Occupant Impact Velocity (EDR-4), Test No. NYBBT-1

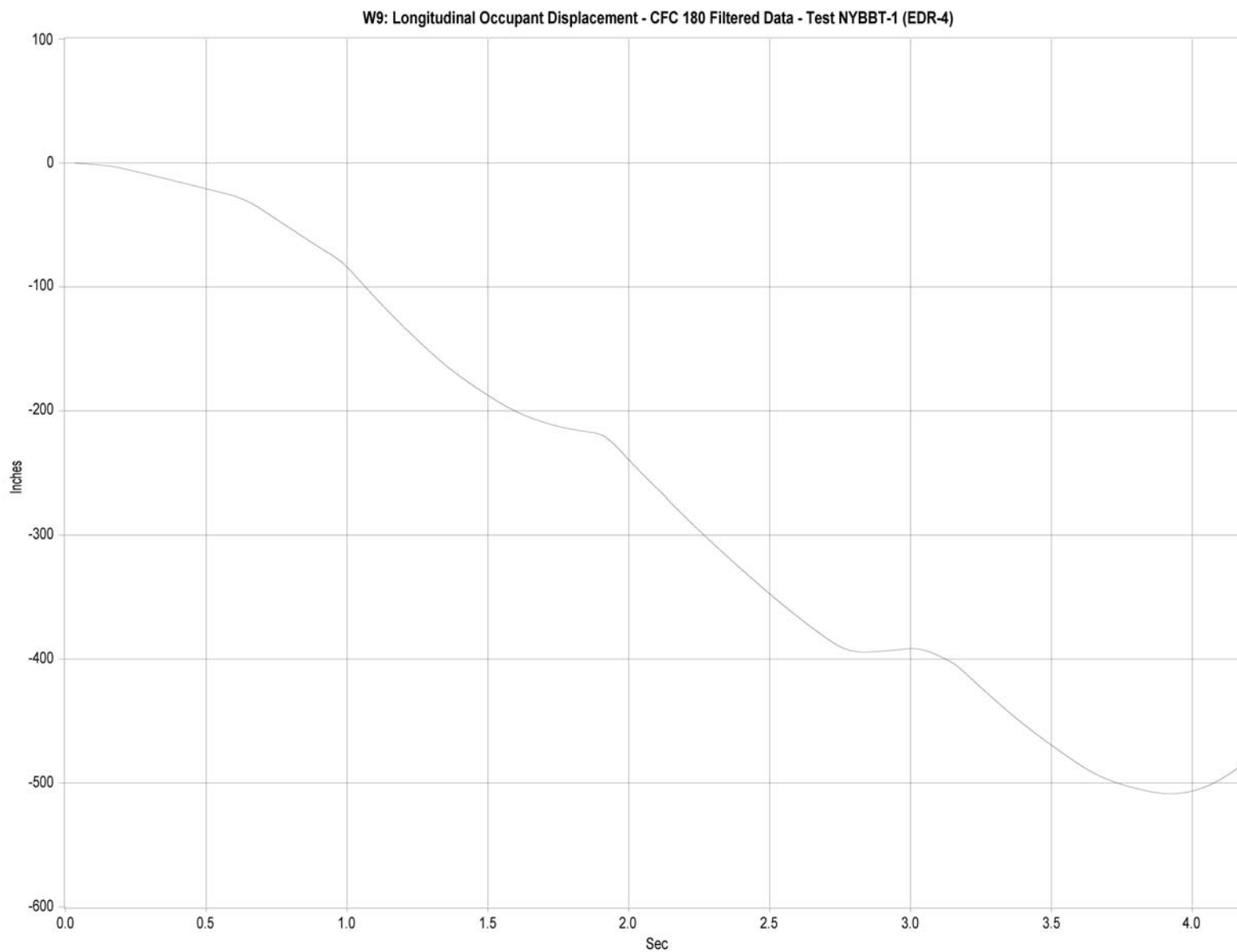


Figure E-9. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-1

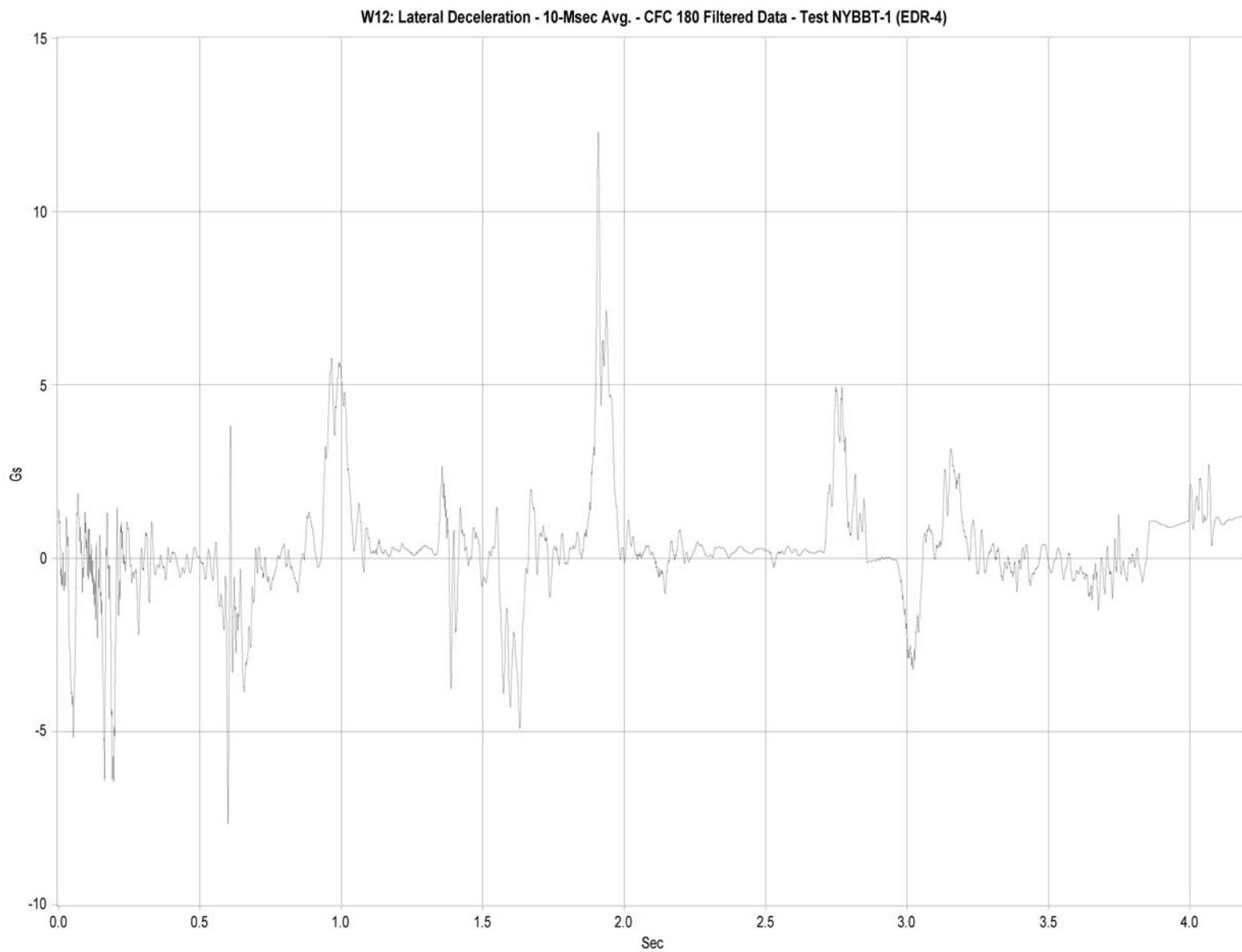


Figure E-10. Graph of Lateral Deceleration (EDR-4), Test No. NYBBT-1

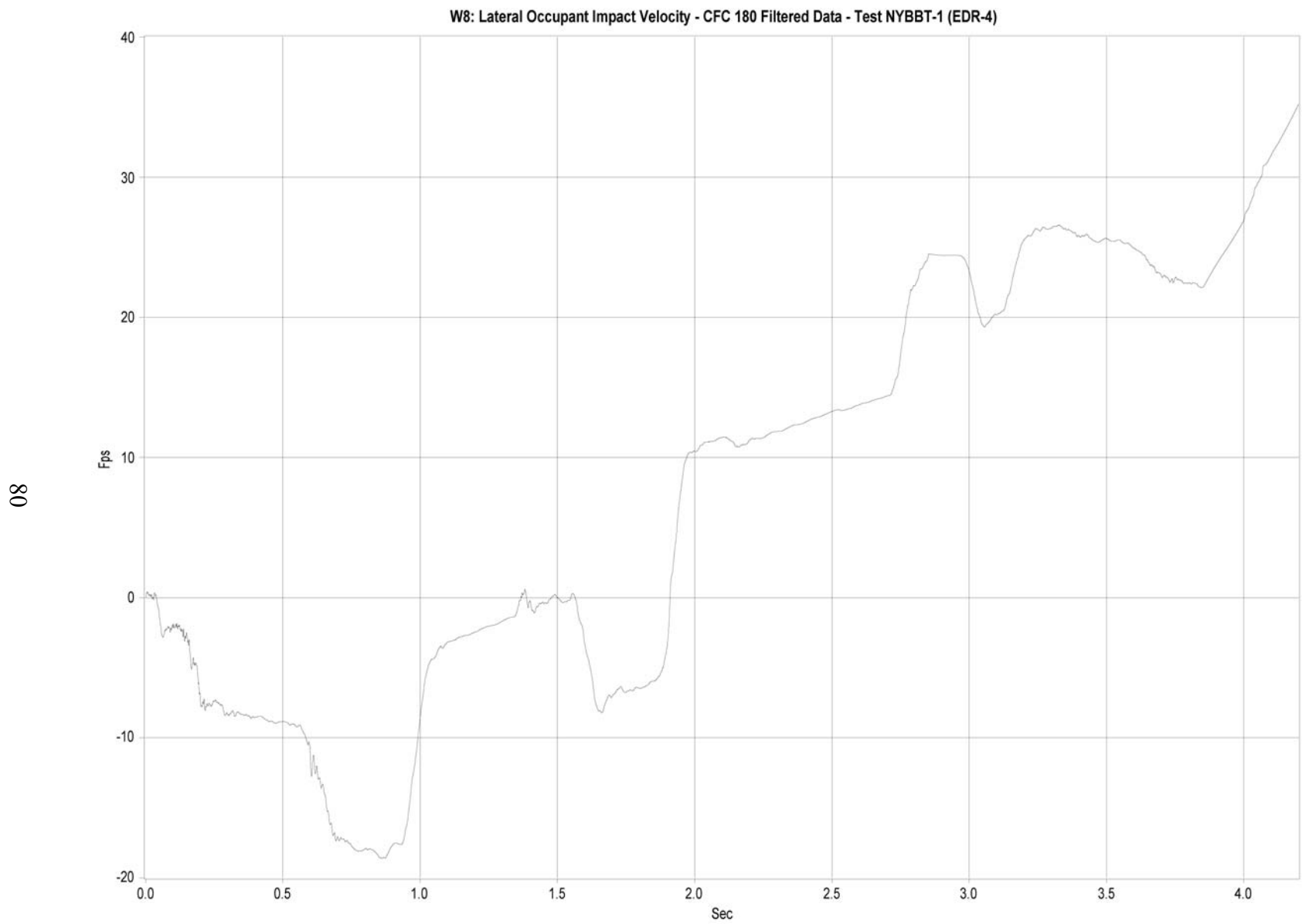


Figure E-11. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-1

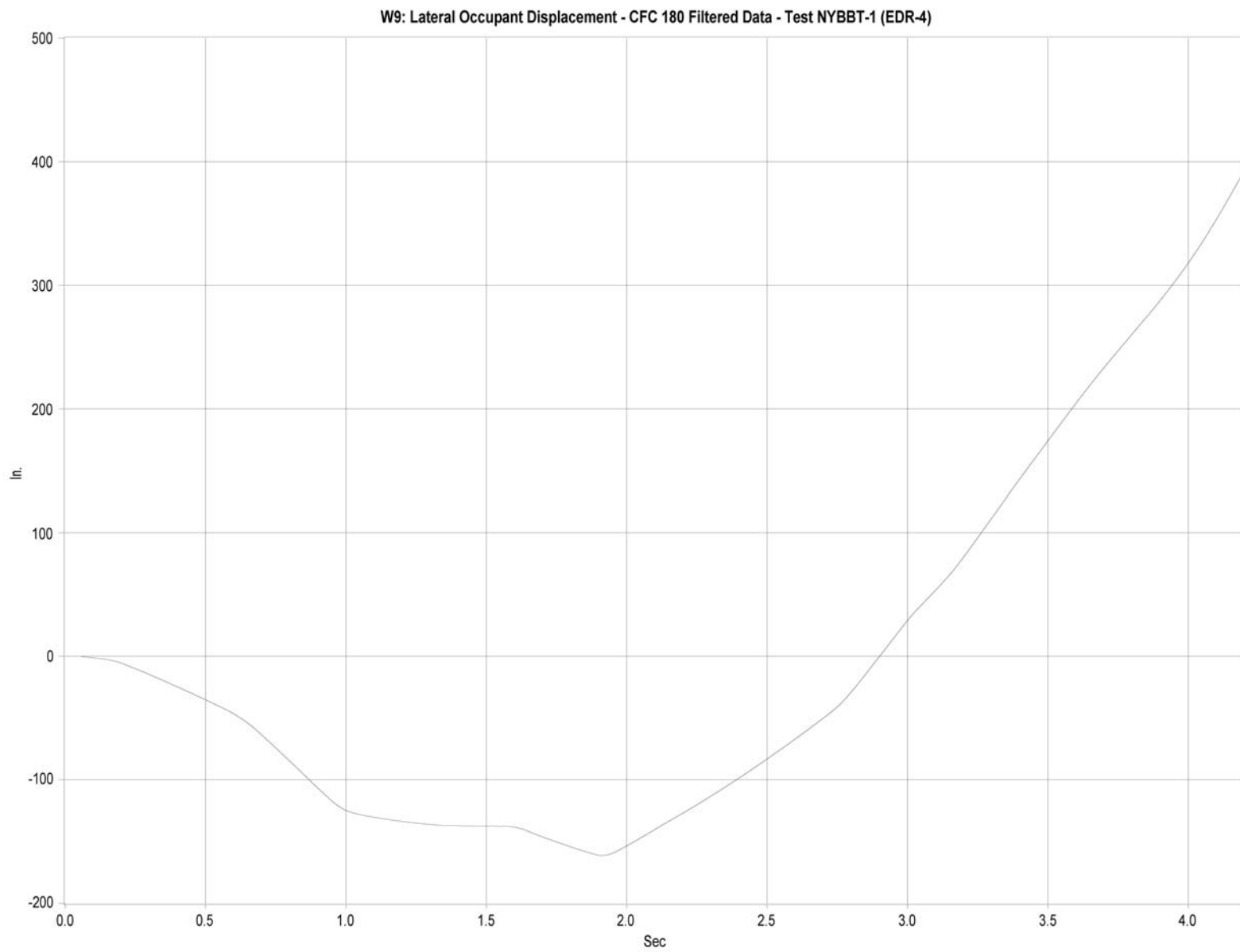


Figure E-12. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-1



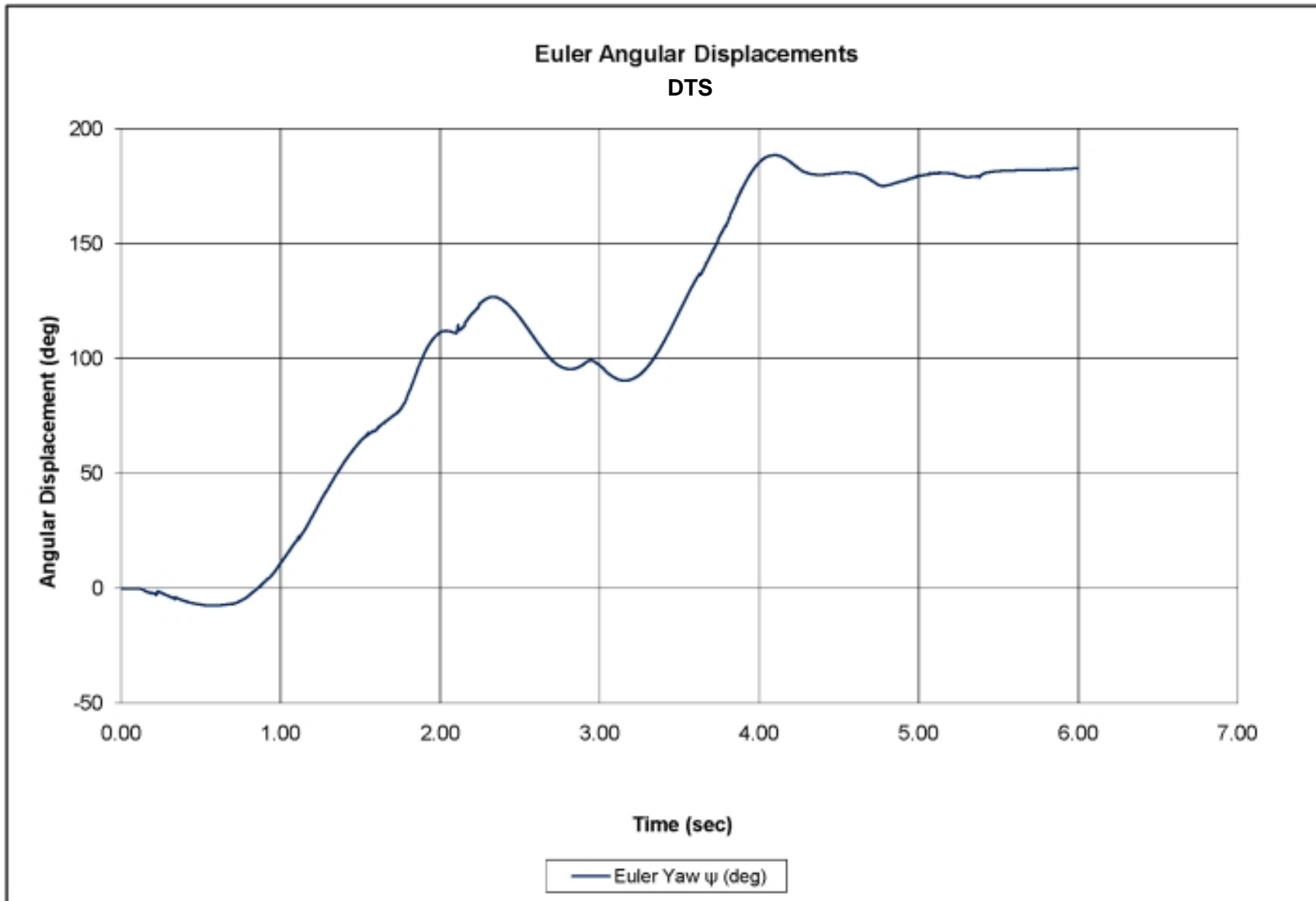


Figure E-13. Graph of Yaw Angular Displacement (DTS), Test No. NYBBT-1

# Roll Angular Displacement-NYBBT-1

Video Analysis

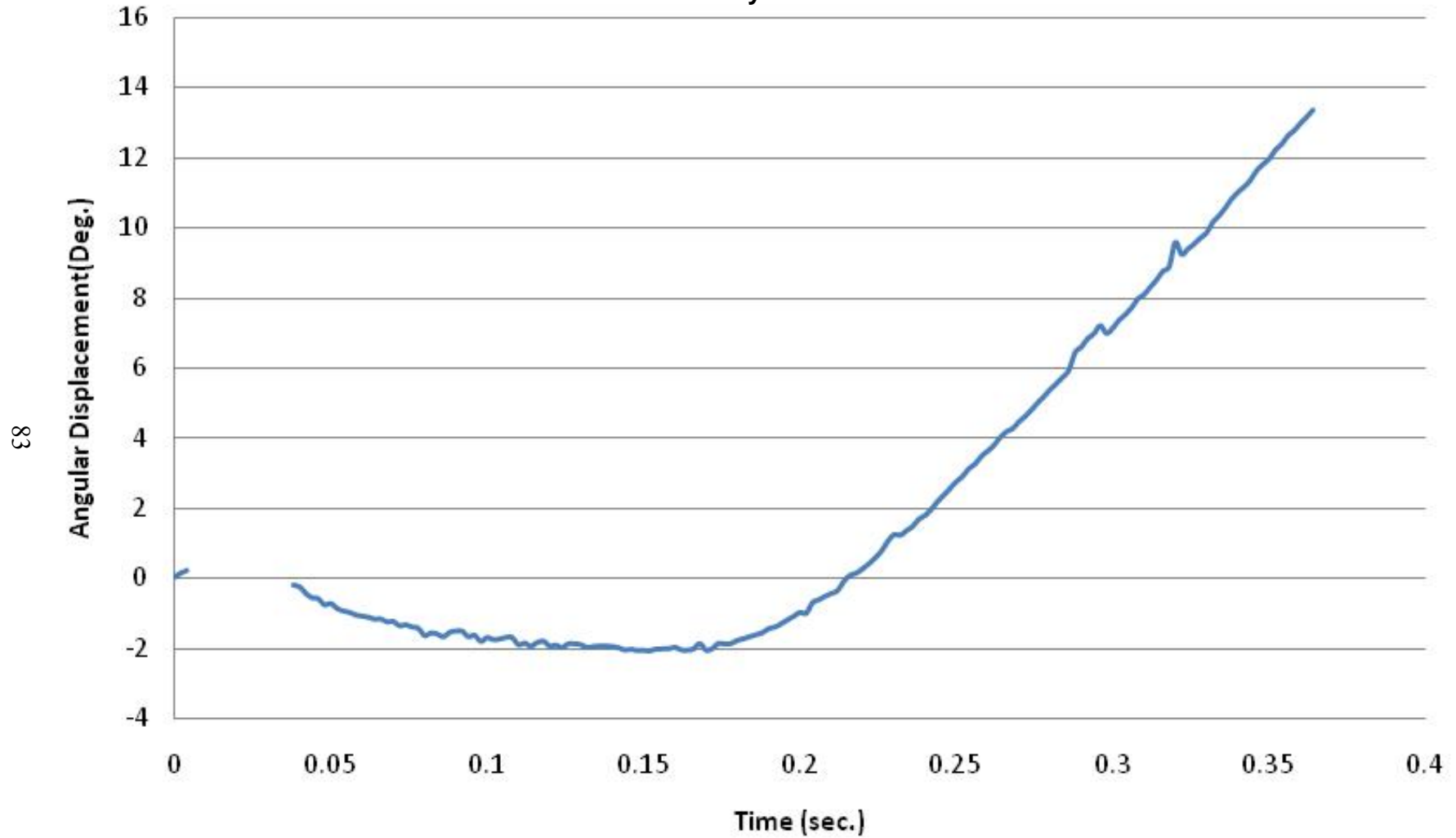


Figure E-14. Graph of Roll Angular Displacement (Video Analysis), Test No. NYBBT-1

**APPENDIX F Type IIA Box Beam Terminal System Details - English Units, Test No.  
NYBBT-2**

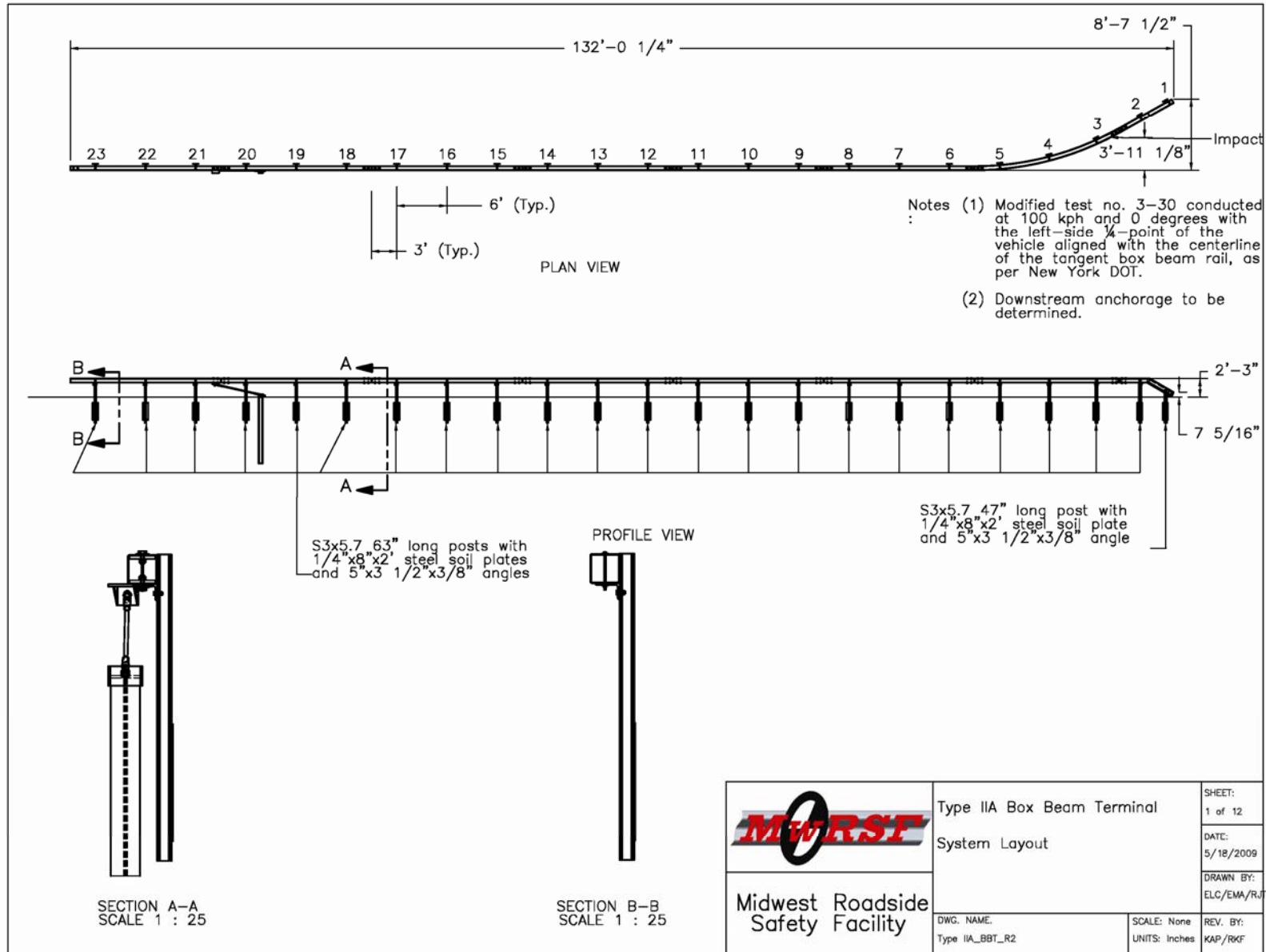


Figure F-1. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

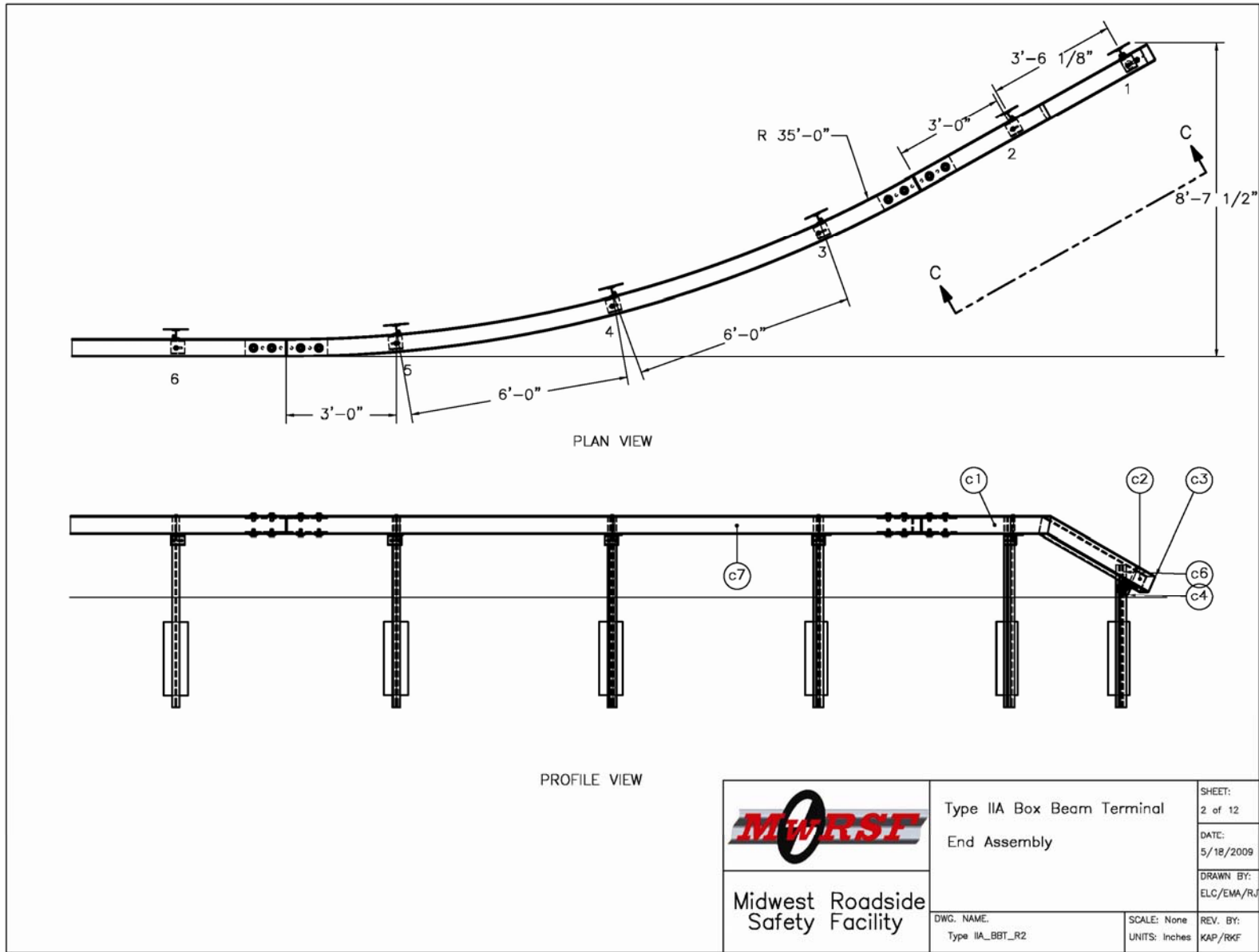


Figure F-2. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

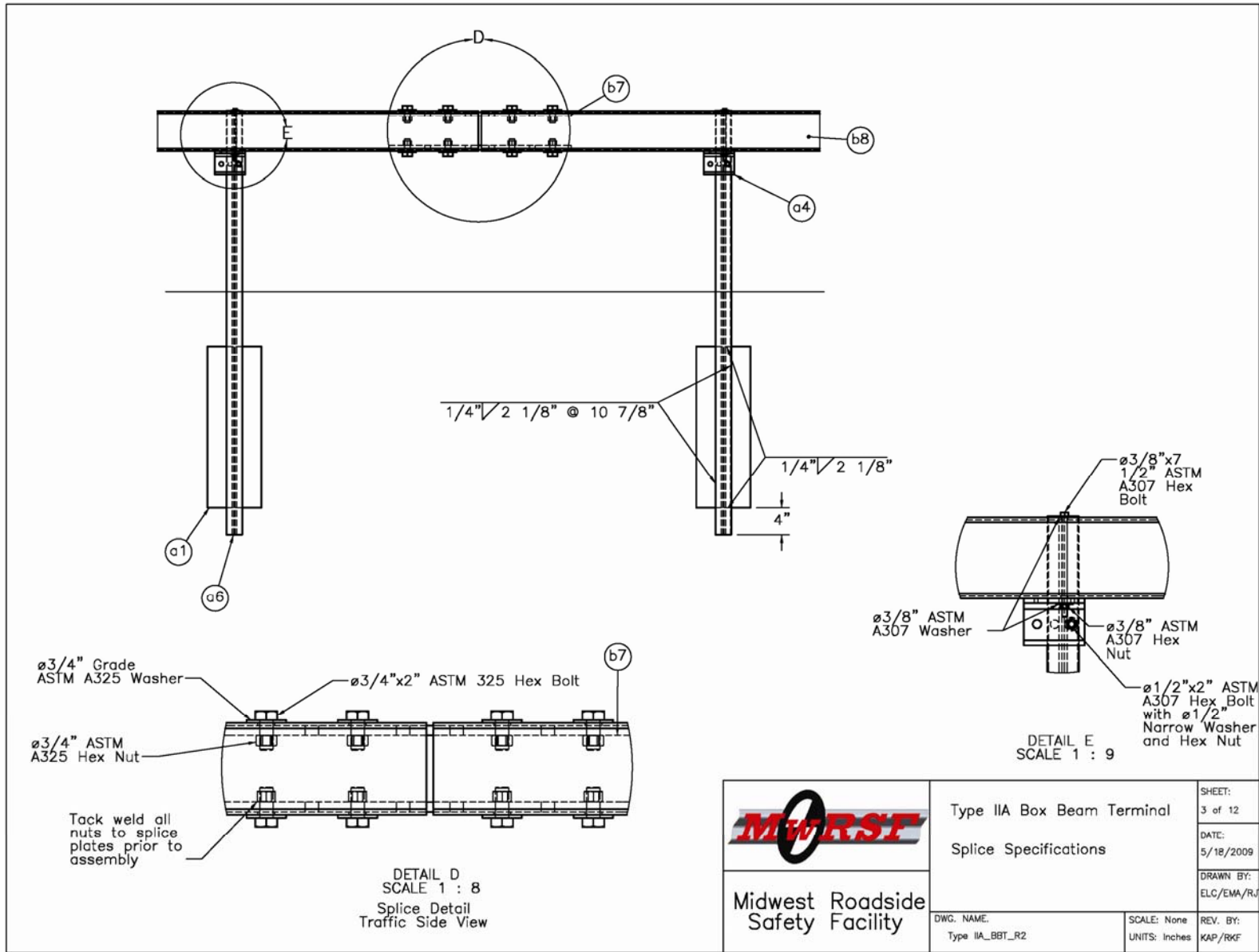


Figure F-3. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

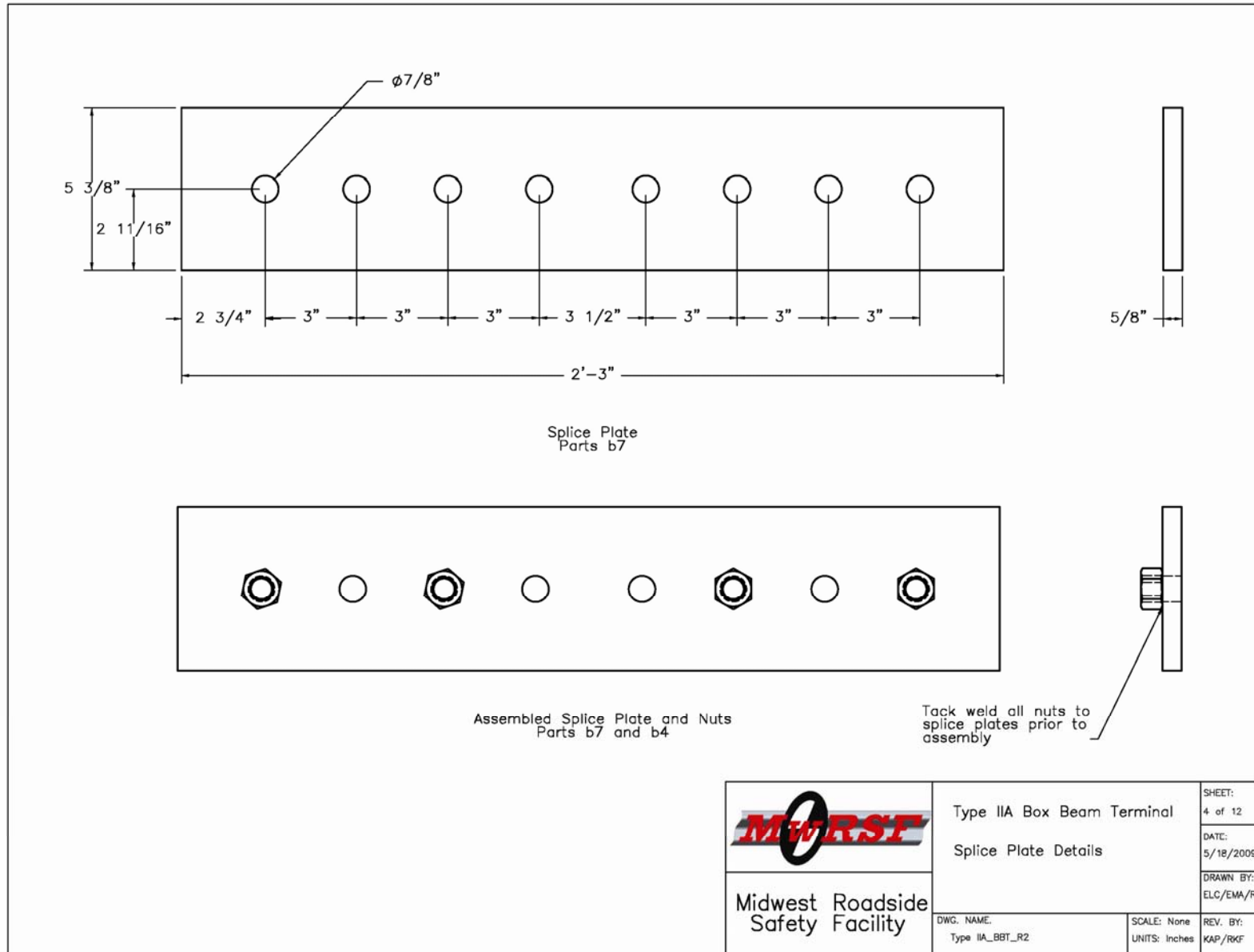


Figure F-4. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

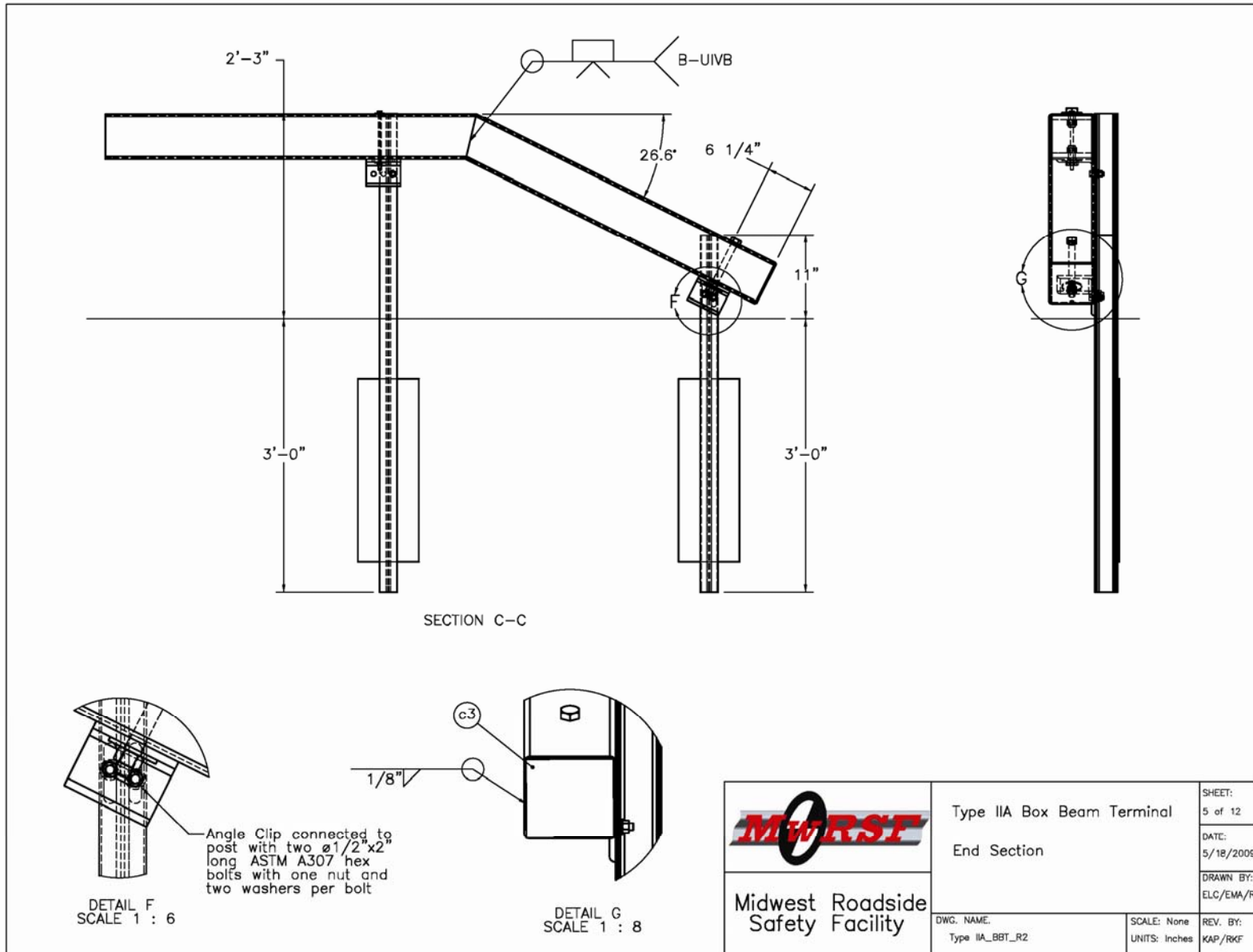


Figure F-5. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2



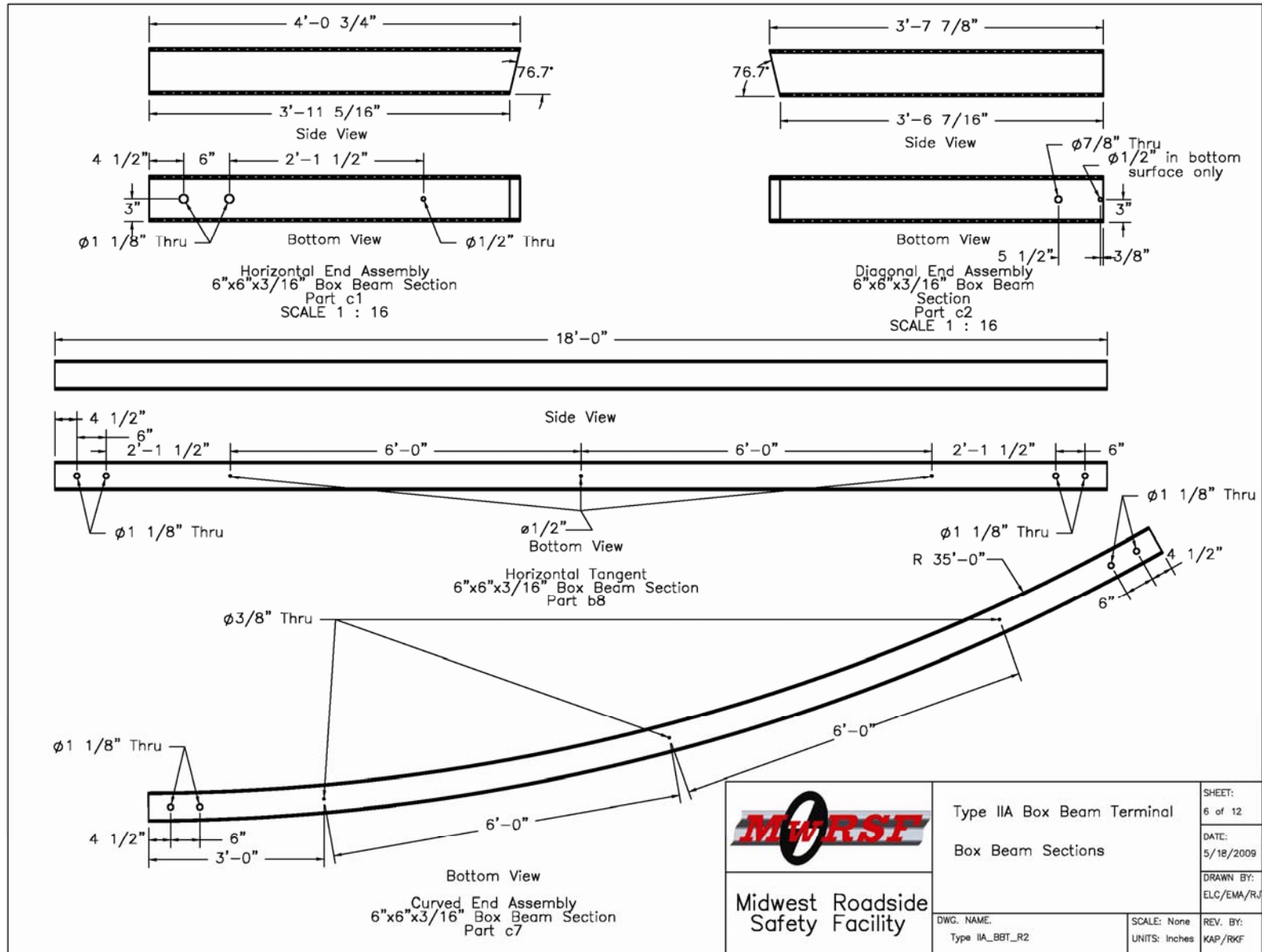
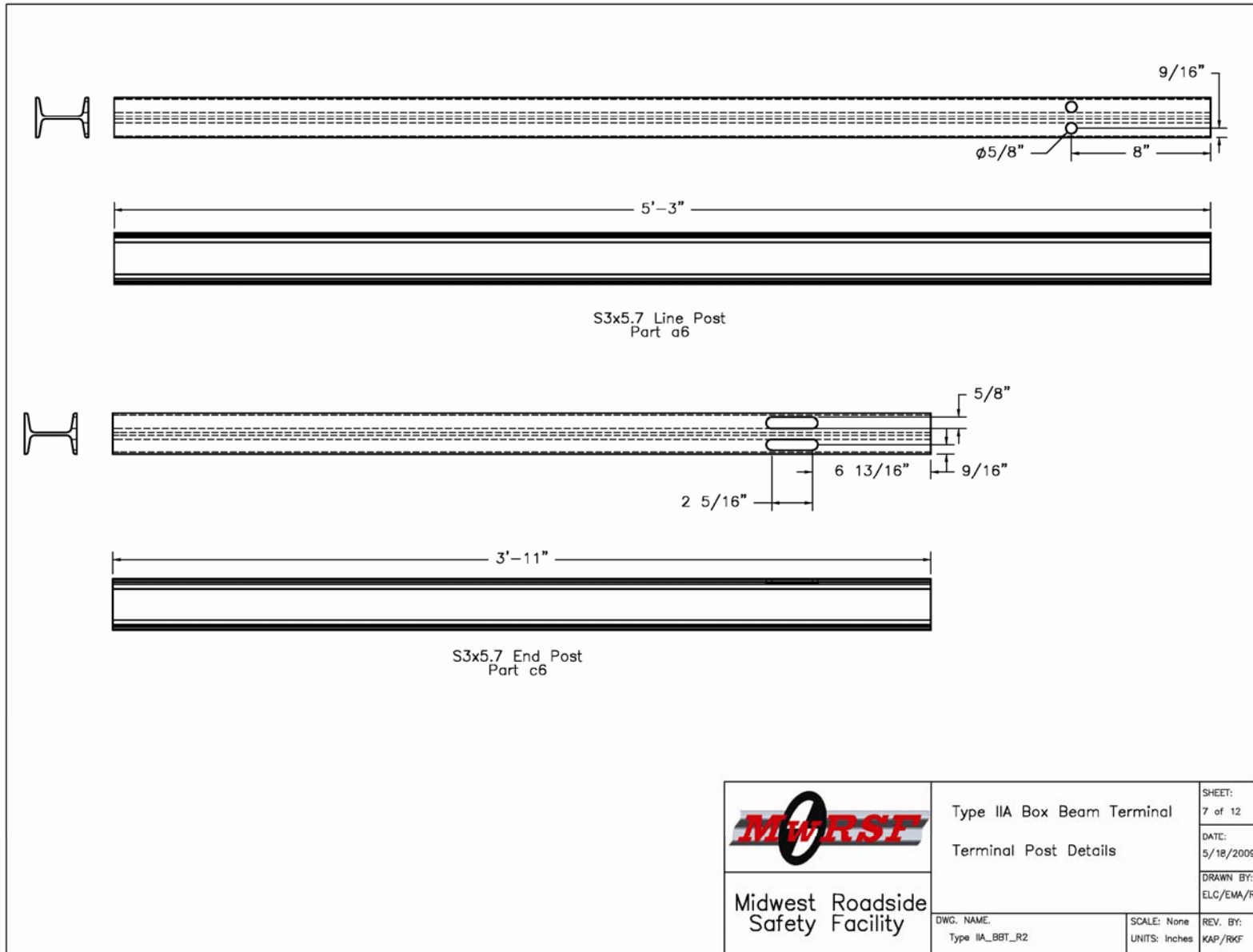


Figure F-6. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2




 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal	SHEET: 7 of 12
	Terminal Post Details	DATE: 5/18/2009
DWG. NAME: Type IIA_BBT_R2	SCALE: None UNITS: Inches	DRAWN BY: ELC/EMA/RJF
		REV. BY: KAP/RKF

Figure F-7. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

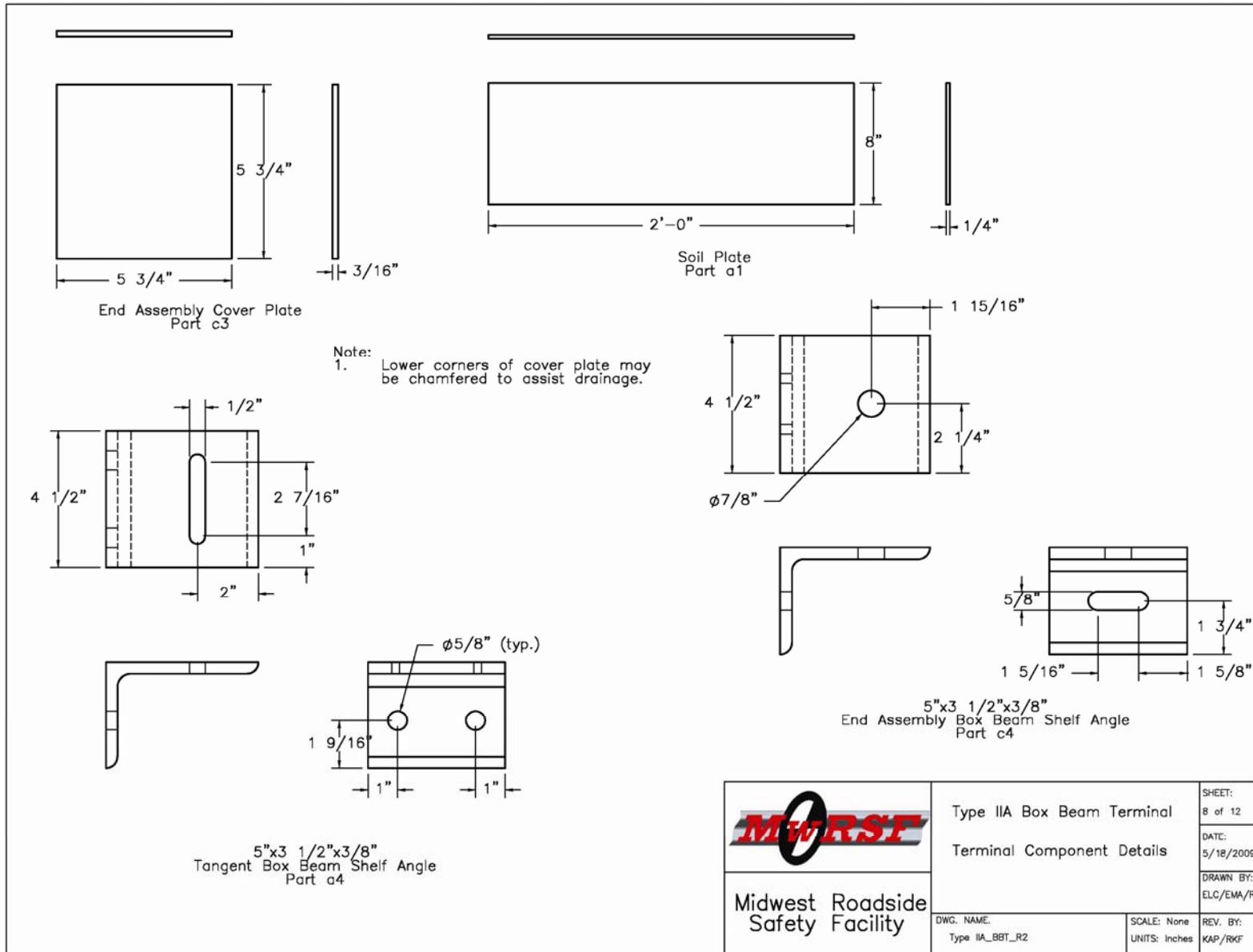
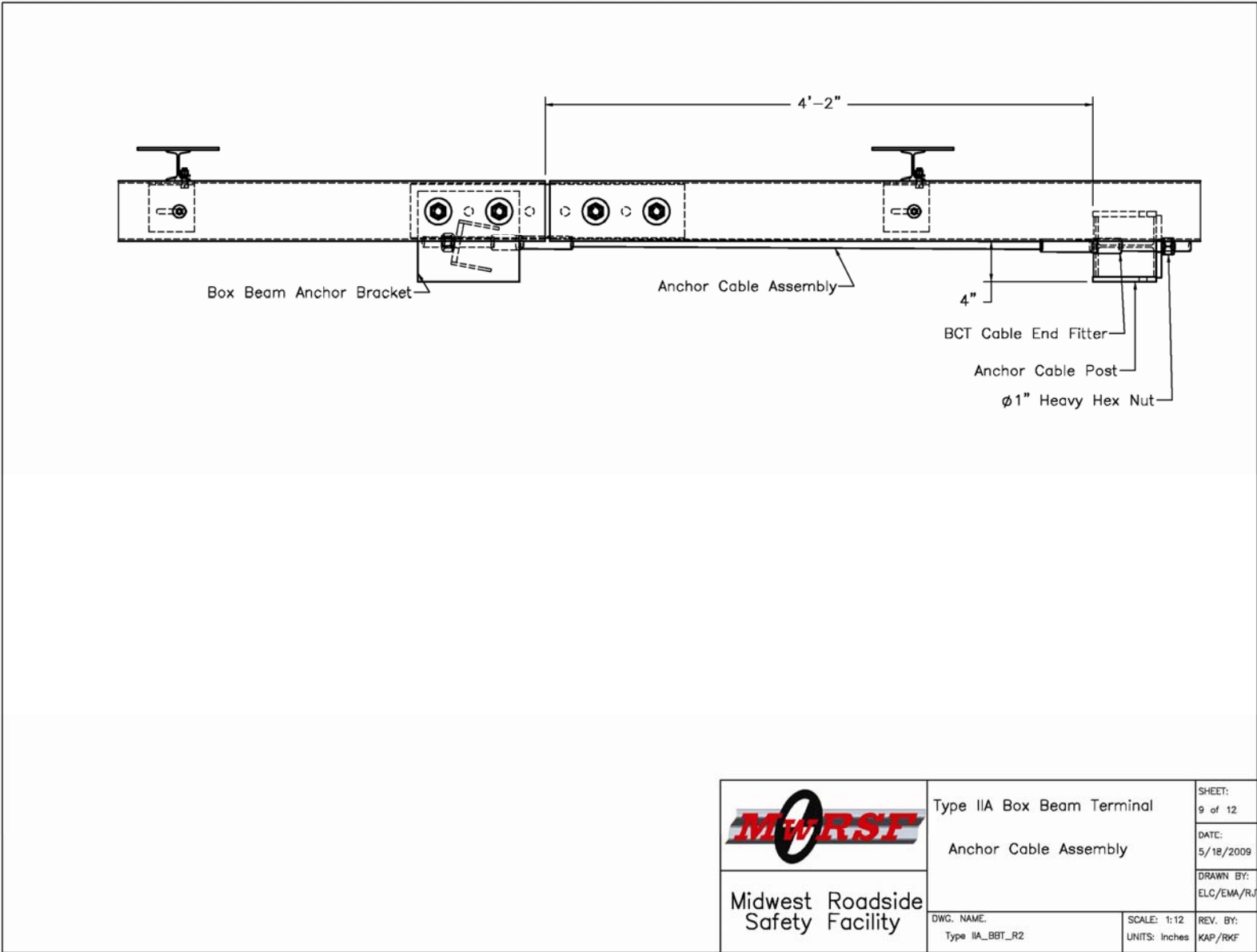


Figure F-8. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2




 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal	SHEET: 9 of 12
	Anchor Cable Assembly	DATE: 5/18/2009
DWG. NAME: Type IIA_BBT_R2	SCALE: 1:12	DRAWN BY: ELC/EMA/RJF
	UNITS: Inches	REV. BY: KAP/RKF

Figure F-9. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

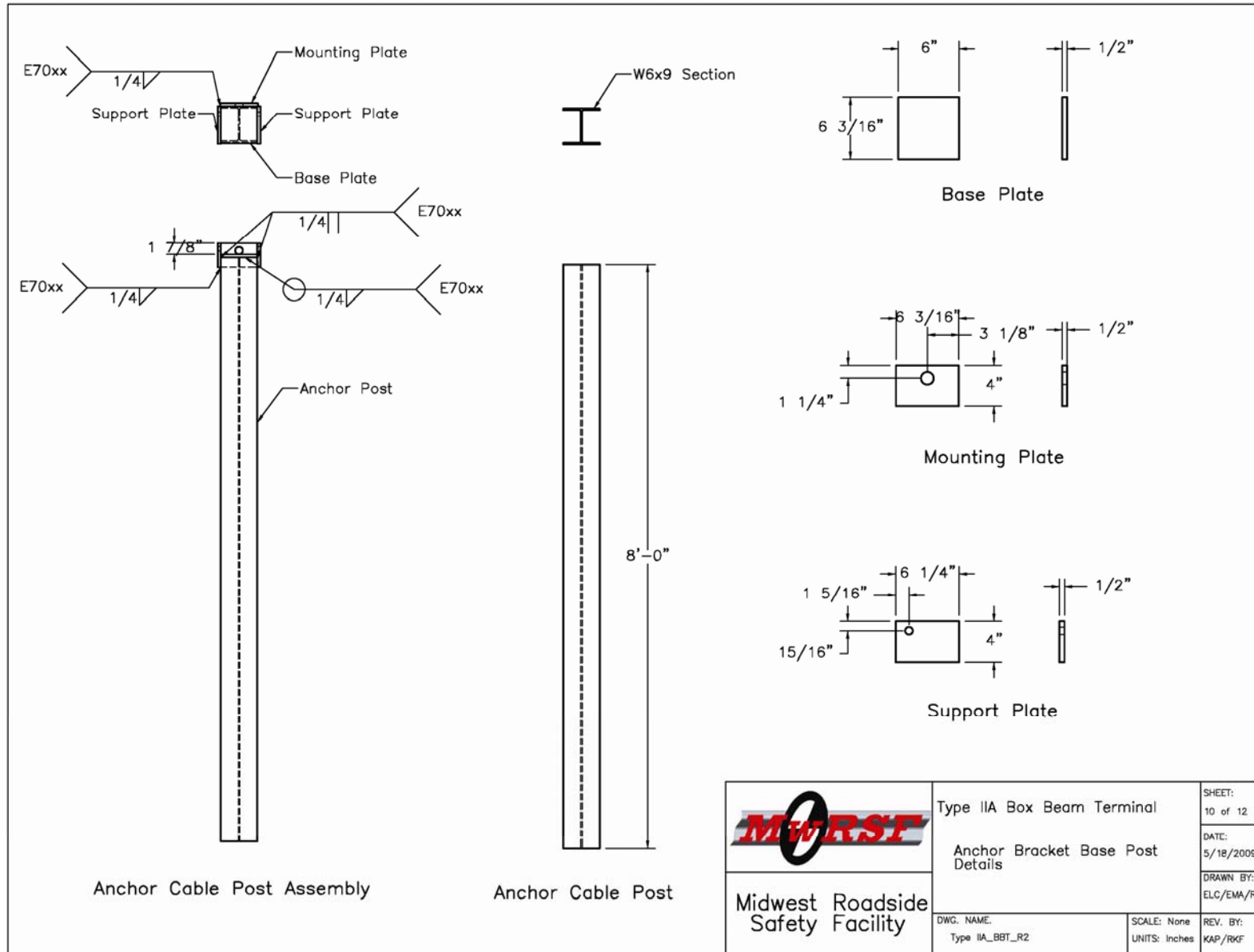



Figure F-10. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

	Type IIA Box Beam Terminal	SHEET: 10 of 12
	Anchor Bracket Base Post Details	DATE: 5/18/2009
Midwest Roadside Safety Facility	DWG. NAME: Type IIA_BBT_R2	DRAWN BY: ELC/EMA/RJF
	SCALE: None UNITS: Inches	REV. BY: KAP/RKF

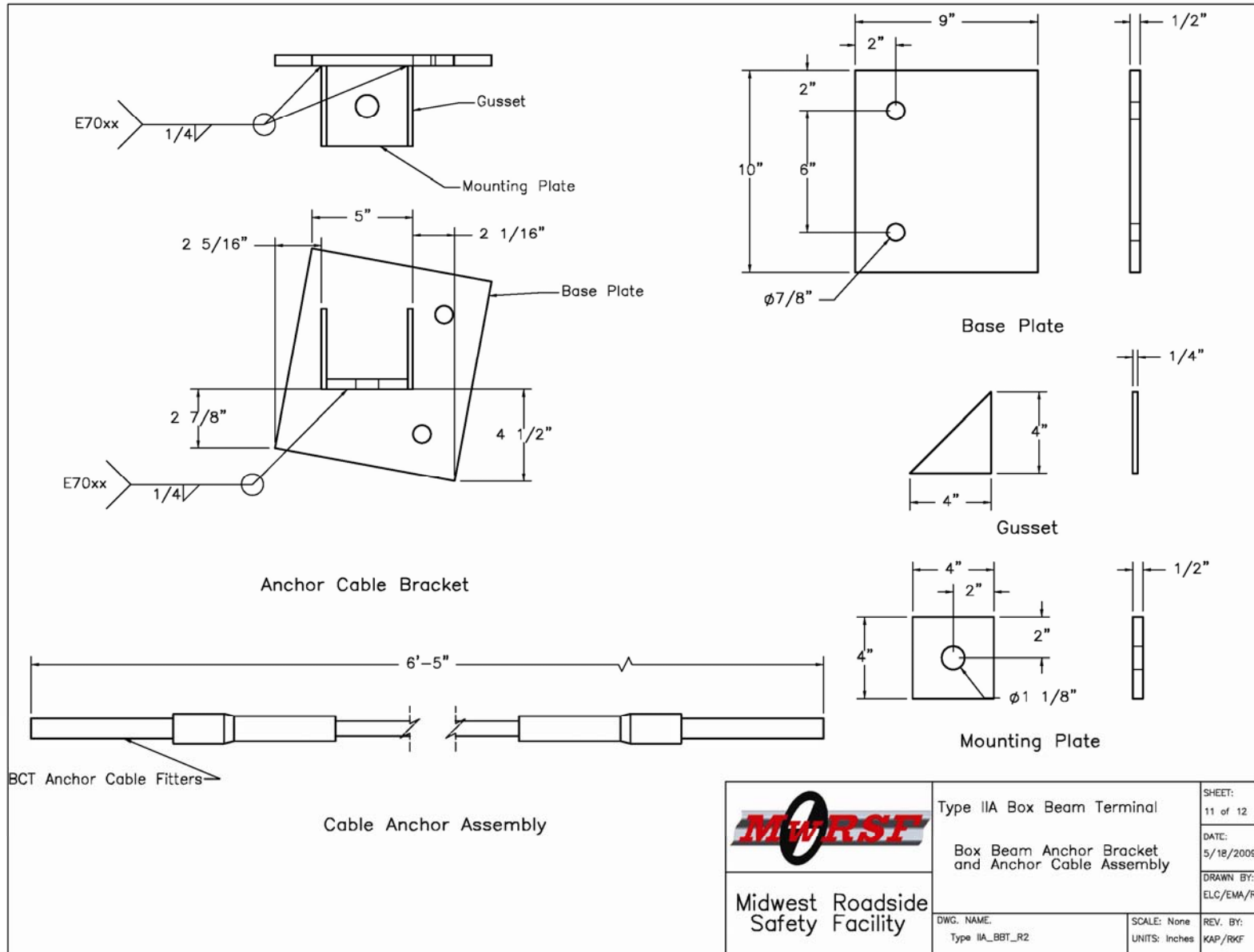


Figure F-11. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

Type IIA Box Beam Terminal			
Item No.	QTY.	Description	Material Specification
a1	23	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	24	ø 1/2" coarse thread 2" long hex bolt	ASTM A307
a3	24	ø 1/2" hex nut	ASTM A307
a4	22	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	24	ø 1/2" narrow washer	ASTM A307
a6	22	S3 x 5.7 63" long post	A36 Steel
b1	22	ø 3/8" coarse thread 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	56	ø 3/4" hex nut	ASTM A325
b5	56	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread 2" long hex bolt	ASTM A307
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" 18' long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread 7 1/2" long hex bolt	ASTM A307
c6	1	S3 x 5.7 47" long post	A36 Steel
c7	1	6" x 6" x 3/16" R35' Curved Box Beam	ASTM A500 Grade B
-	1	Box Beam Cable Anchor Mounting Plate	A36 steel, galvanized
-	2	Box Beam Cable Anchor Gusset	A36 steel, galvanized
-	1	Box Beam Cable Anchor Base Plate	A36 steel, galvanized
-	1	Lower End Post	A36 Steel
-	1	Lower End Post Base Plate	A36, galvanized
-	1	Lower End Post Front Collar Plate	A36 steel, galvanized
-	2	Lower End Post Side Plate	A36 steel, galvanized
-	2	BCT Anchor Cable End	-


 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal		SHEET: 12 of 12
	Bill of Materials		DATE: 5/18/2009
DWG. NAME: Type IIA_BBT_R2	SCALE: None UNITS: Inches	DRAWN BY: ELC/EMA/RJF	
		REV. BY: KAP/RKF	

Figure F-12. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-2

**APPENDIX G Type IIA Box Beam Terminal System Details - Metric and English Units,  
Test No. NYBBT-3**



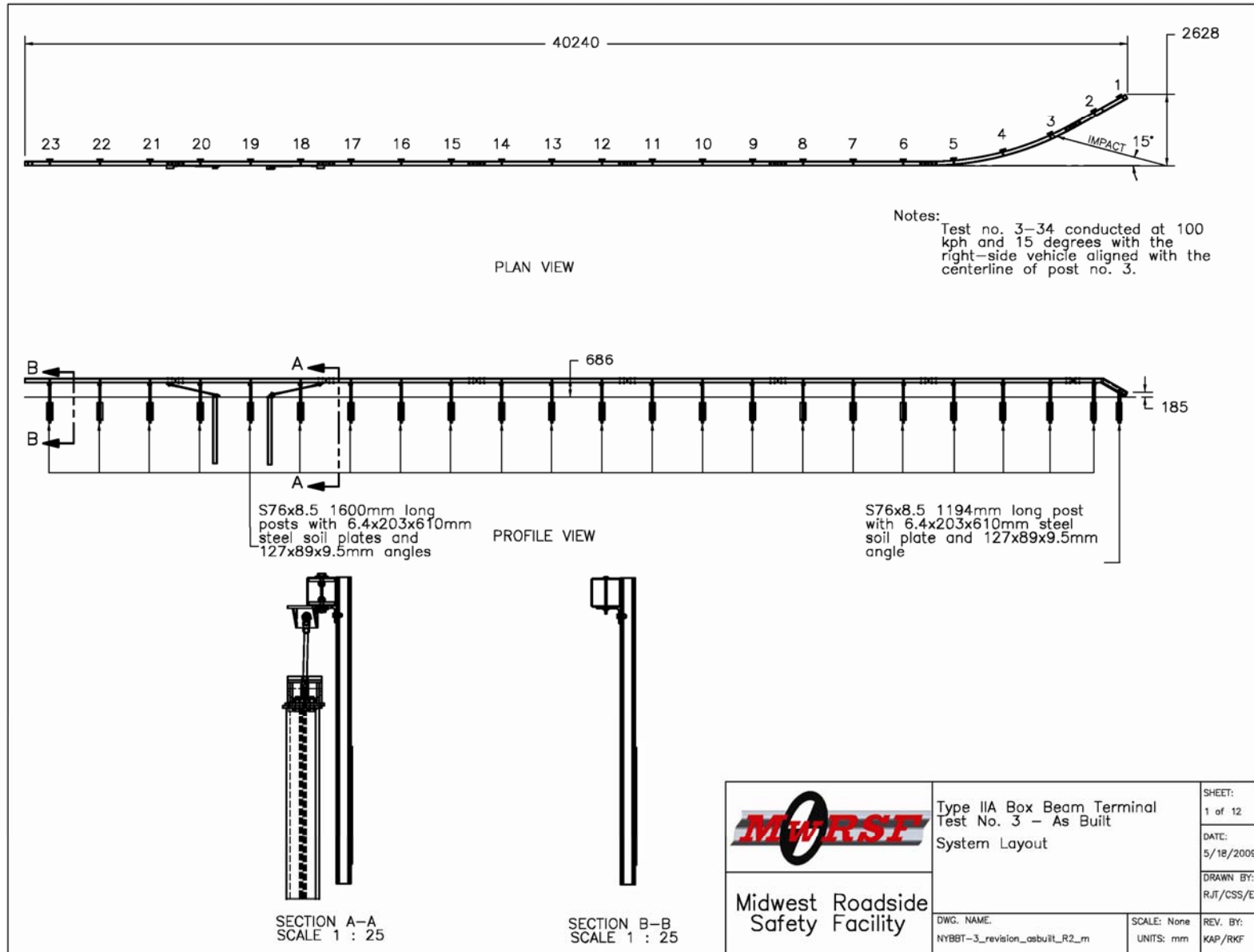


Figure G-1. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

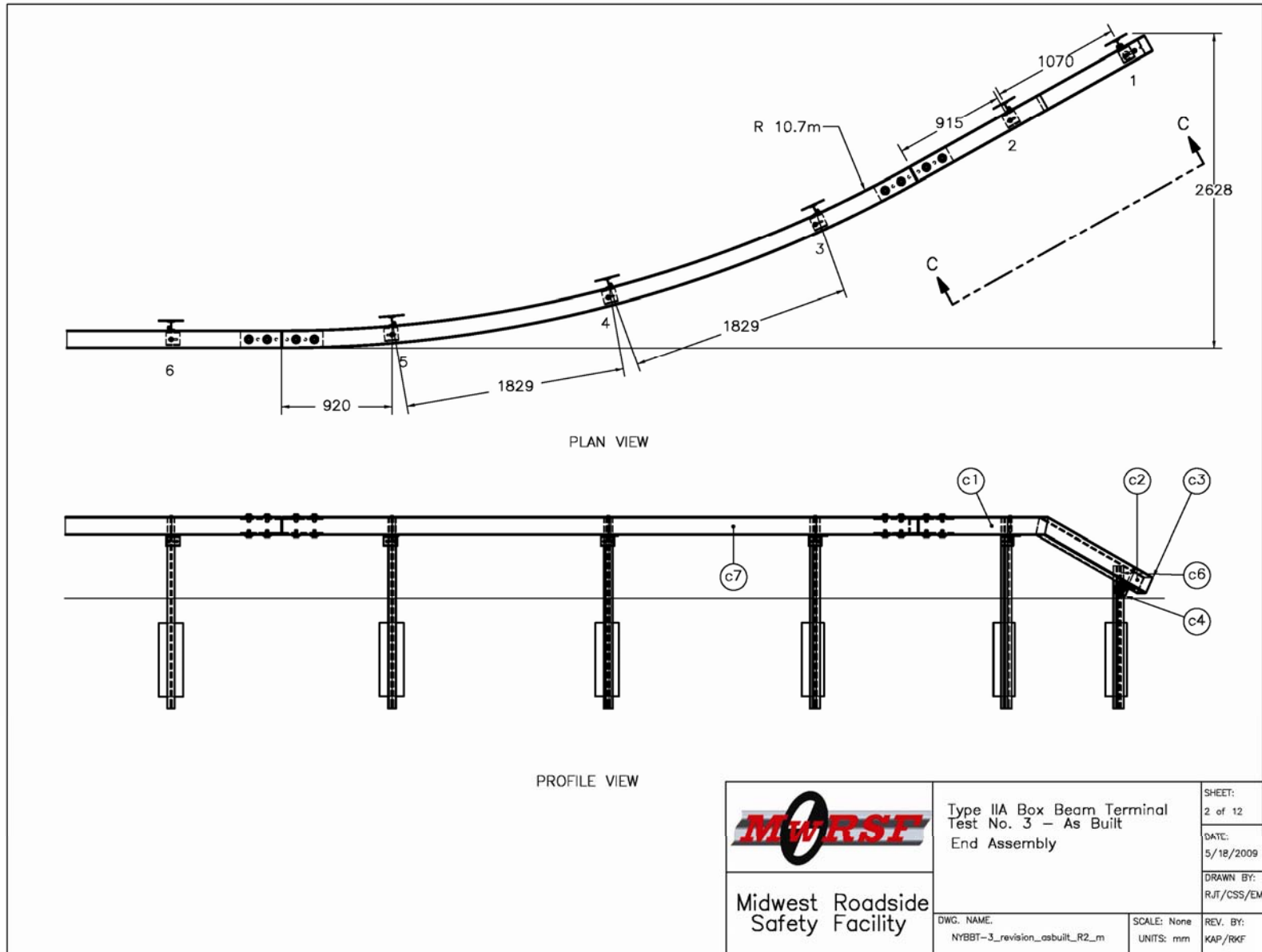


Figure G-2. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

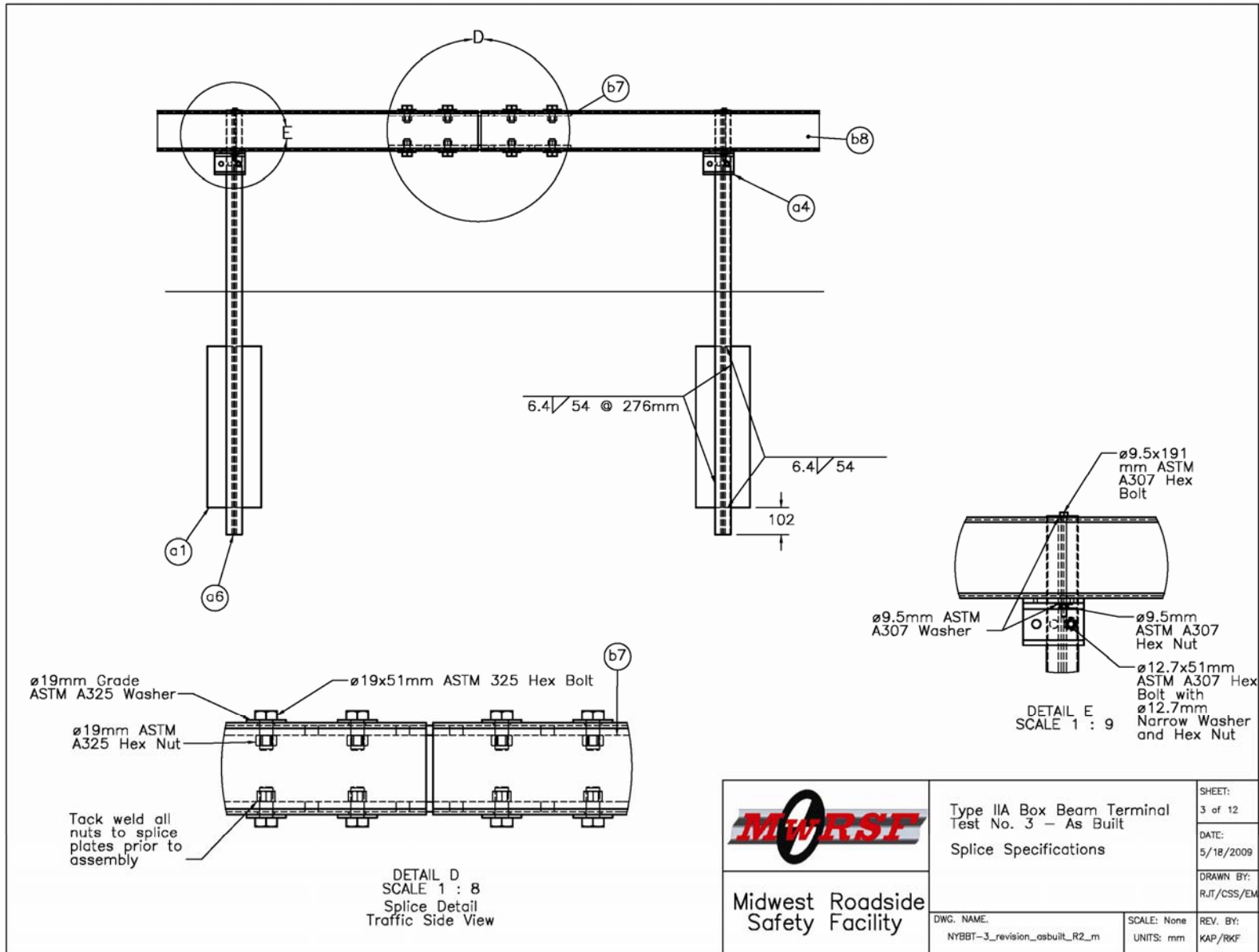


Figure G-3. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

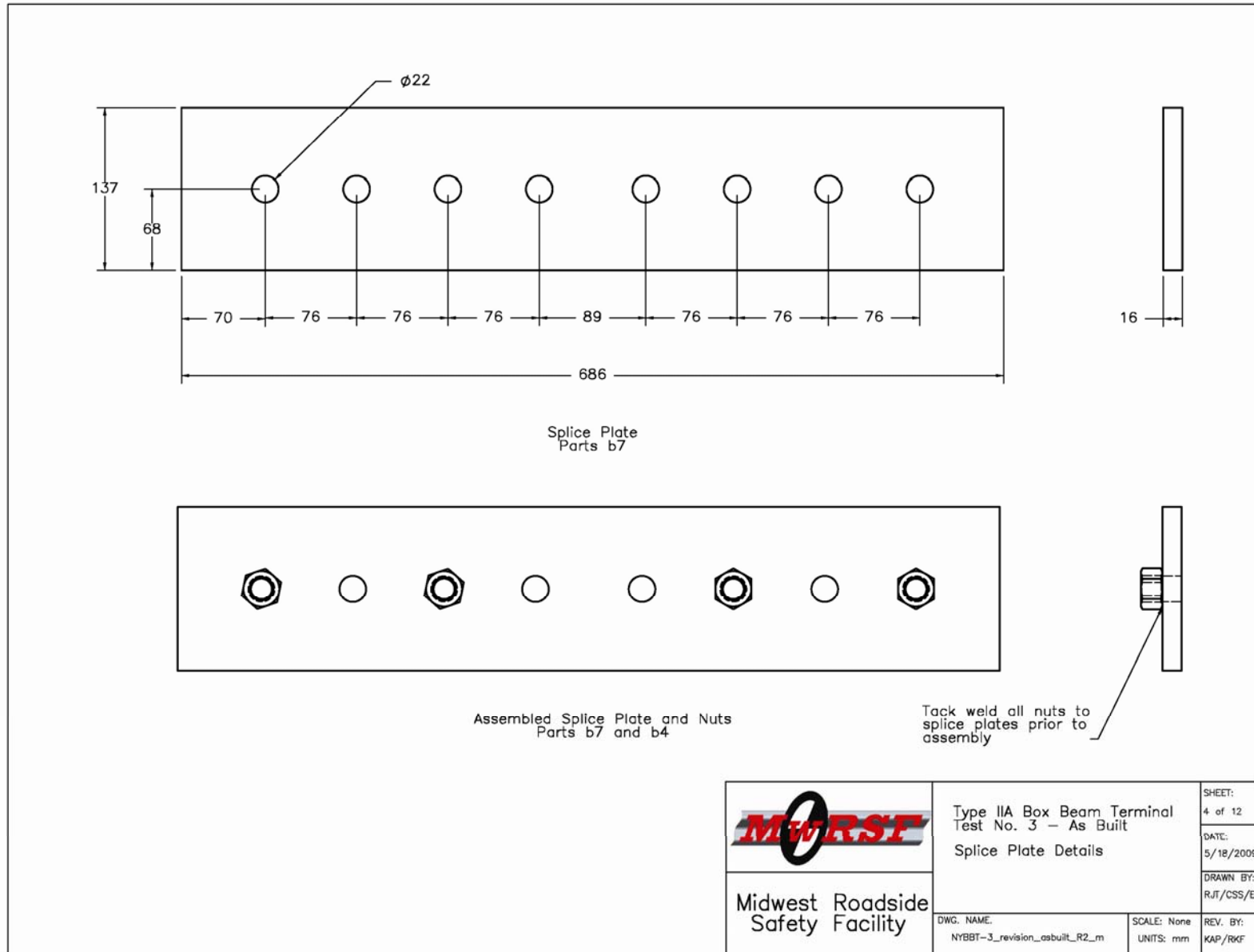


Figure G-4. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

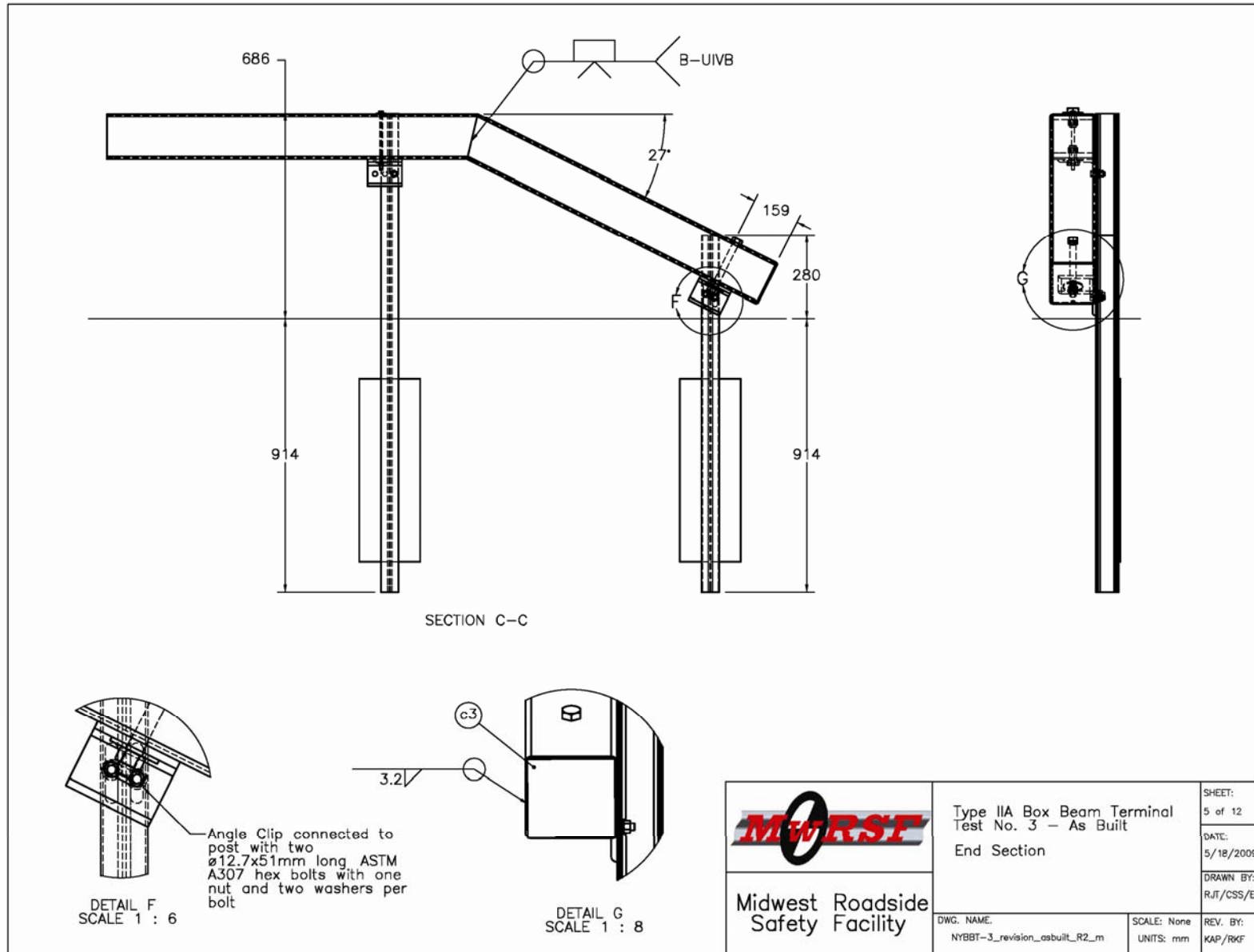


Figure G-5. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

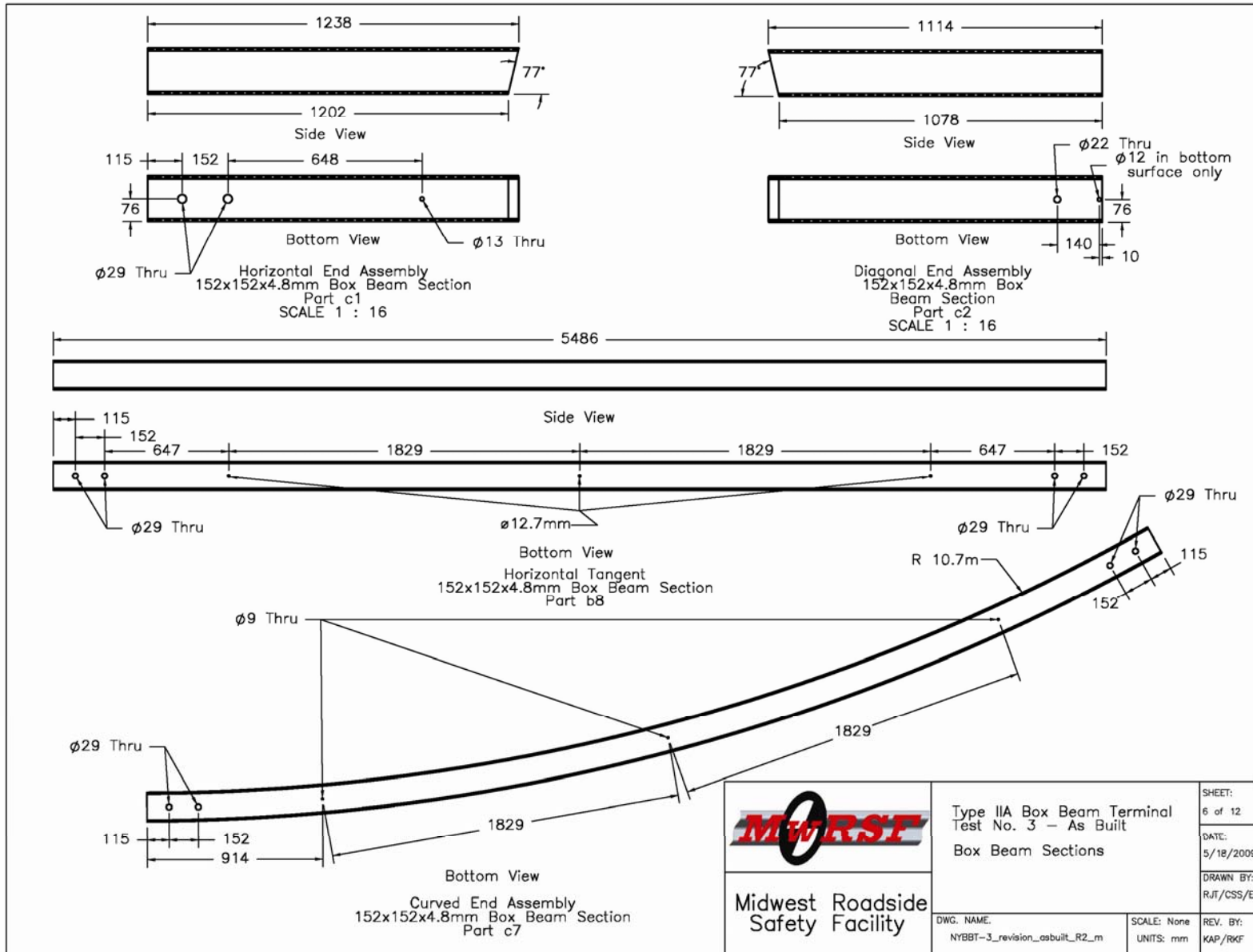
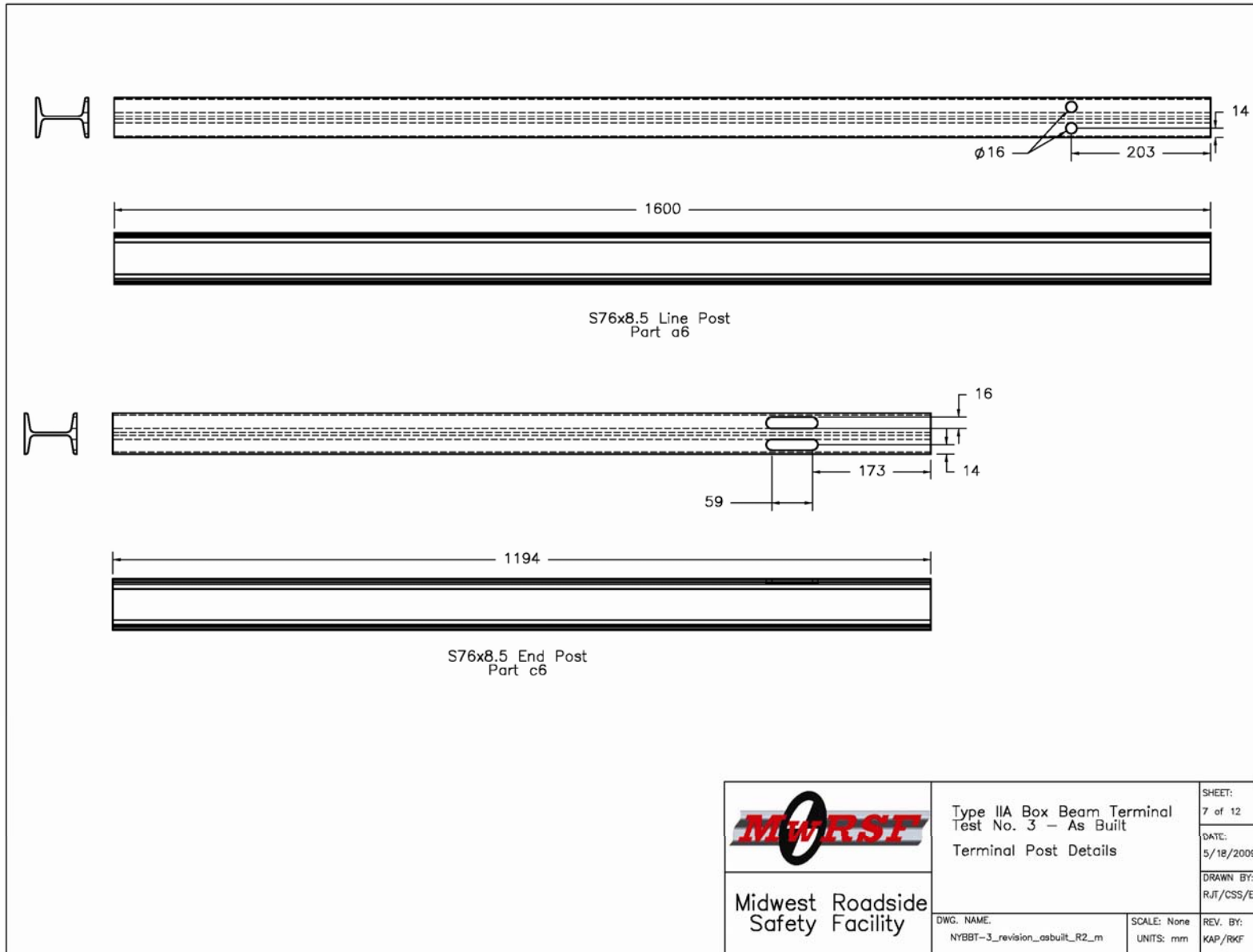


Figure G-6. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3




	Type IIA Box Beam Terminal Test No. 3 – As Built		SHEET: 7 of 12
	Terminal Post Details		DATE: 5/18/2009
Midwest Roadside Safety Facility	DWG. NAME: NYBBT-3_revision_asbuilt_R2_m	SCALE: None UNITS: mm	DRAWN BY: R/JT/CSS/EM
			REV. BY: KAP/RKF

Figure G-7. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

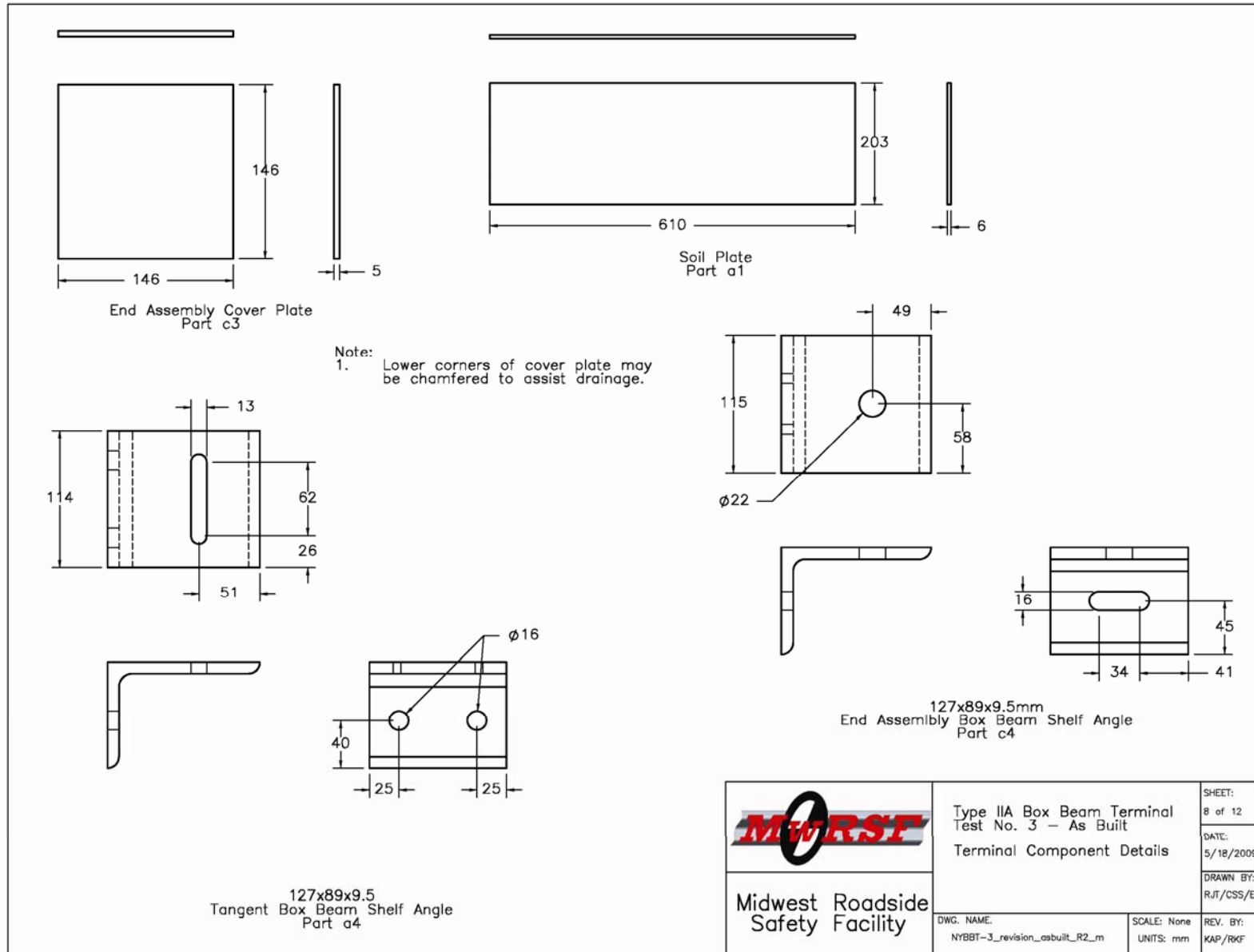
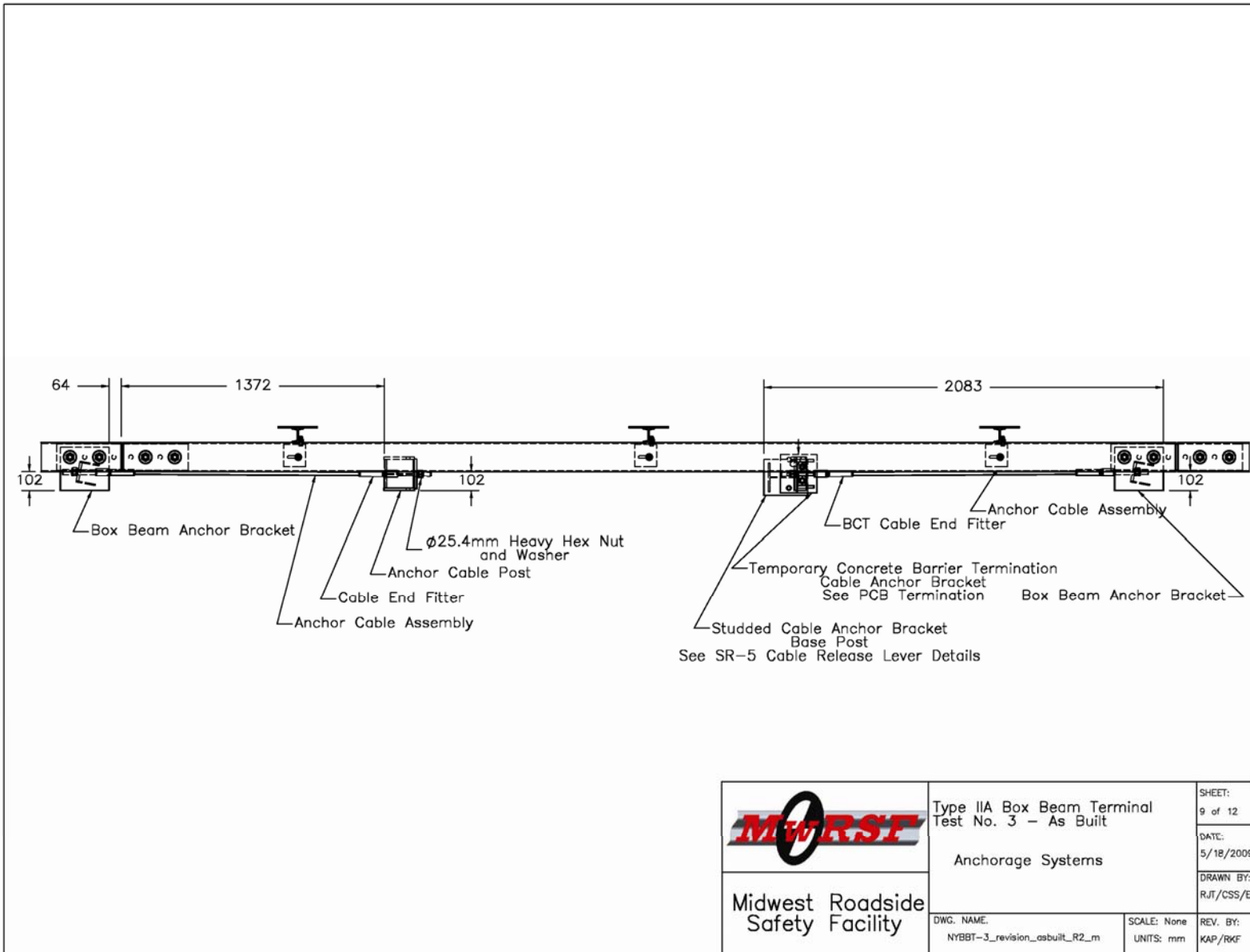


Figure G-8. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3






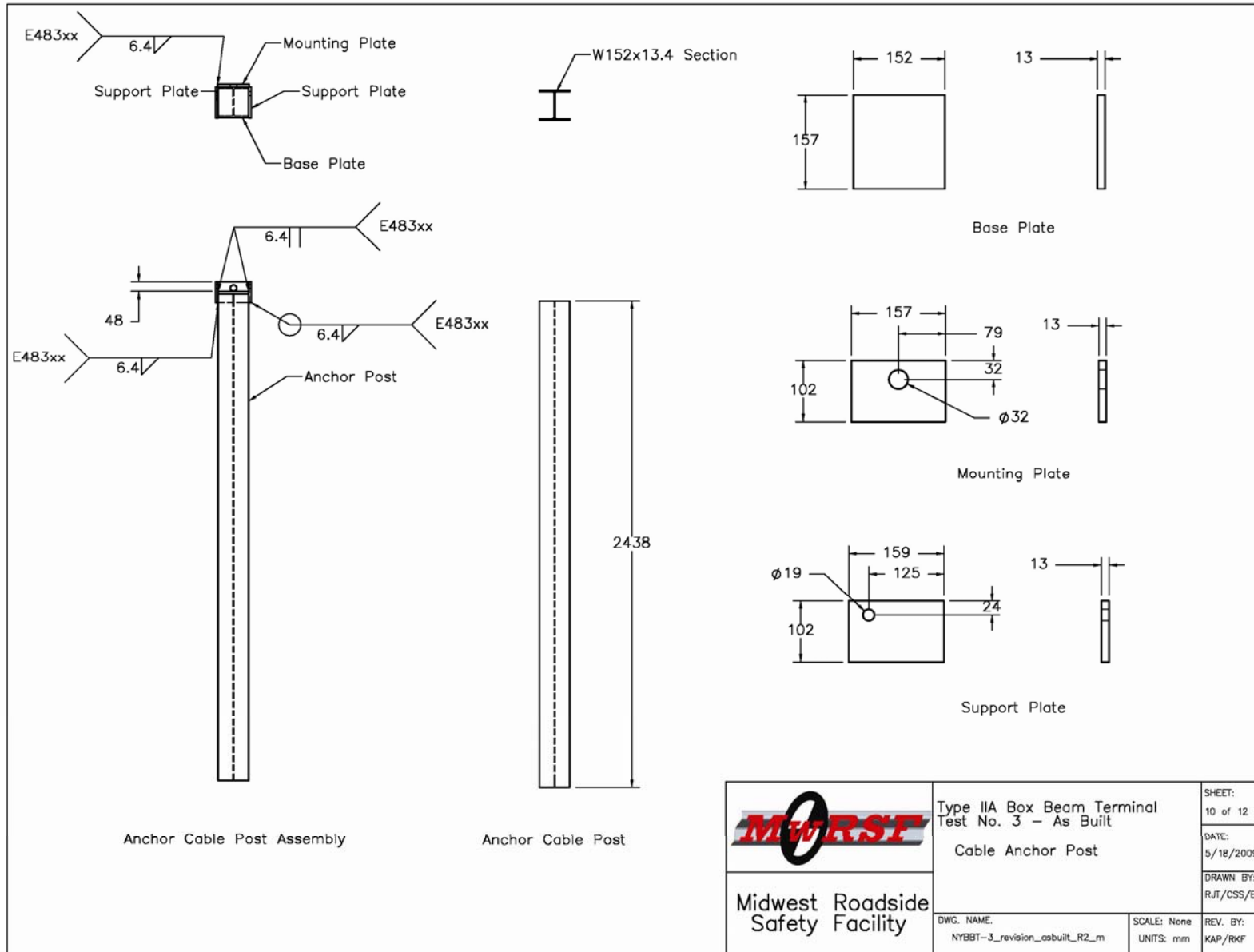
	Type IIA Box Beam Terminal Test No. 3 - As Built	SHEET: 9 of 12
	Anchorage Systems	DATE: 5/18/2009
Midwest Roadside Safety Facility	DWG. NAME: NYBBT-3_revision_asbuilt_R2_m	DRAWN BY: RJT/CSS/EM
	SCALE: None UNITS: mm	REV. BY: KAP/RKF

Figure G-9. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3




	Type IIA Box Beam Terminal Test No. 3 - As Built		SHEET: 10 of 12
	Cable Anchor Post		DATE: 5/18/2009
Midwest Roadside Safety Facility		DWG. NAME: NYBBT-3_revision_asbuilt_R2_m	DRAWN BY: RJT/CSS/EMK
		SCALE: None UNITS: mm	REV. BY: KAP/RKF

Figure G-10. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

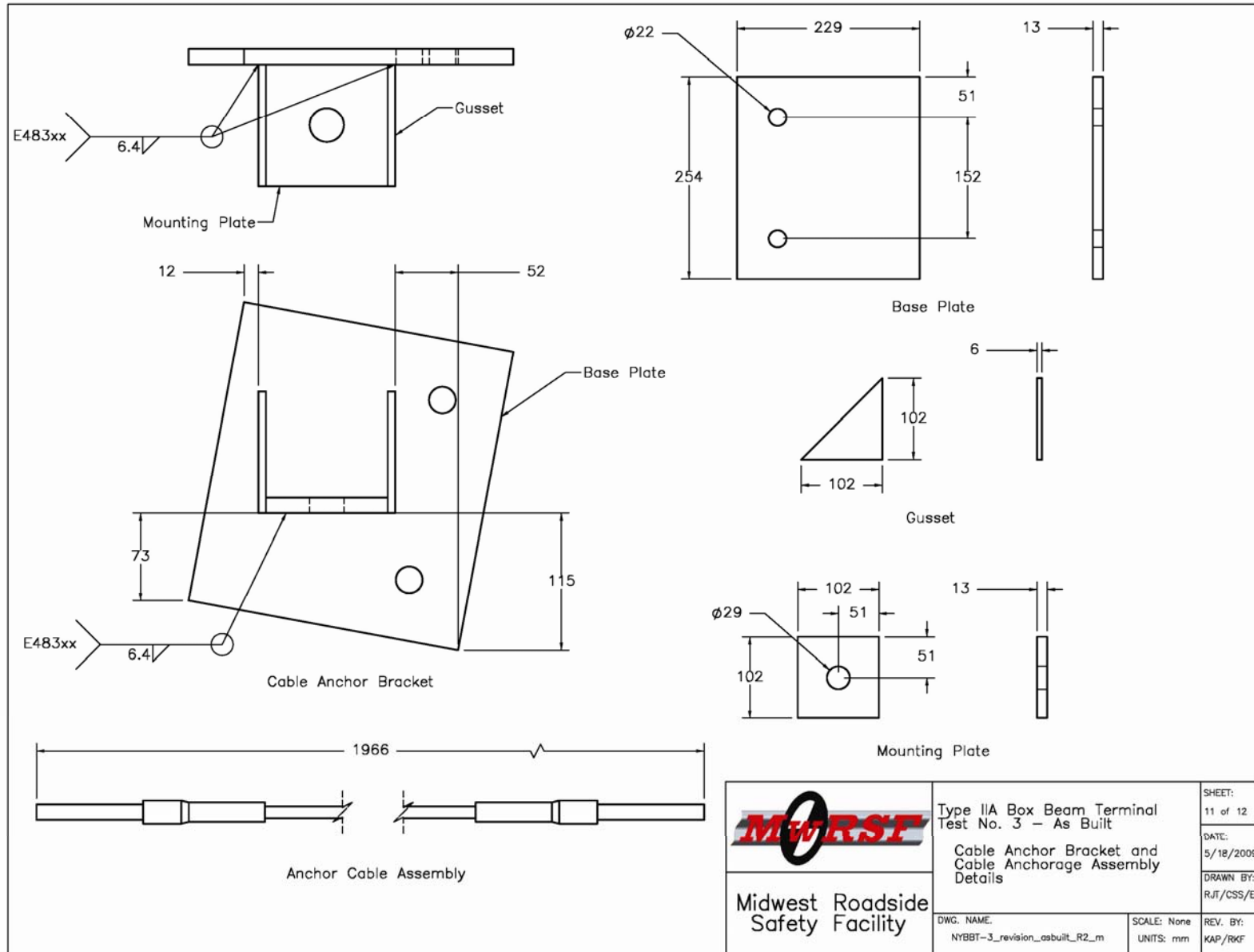


Figure G-11. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

New York Type IIA Box Beam Terminal			
Item No.	QTY.	Description	Material Spec
a1	23	6.4 x 203 x 610mm steel soil plate	A36 Steel
a2	24	∅ 12.7mm coarse thread 51mm long hex bolt	ASTM A307
a3	24	∅ 12.7mm hex nut	ASTM A307
a4	22	127 x 89 x 9.5mm box beam shelf angle	A36 Steel
a5	24	∅ 12.7mm narrow washer	ASTM A307
a6	22	S76 x 8.5 1600mm long post	A36 Steel
b1	22	∅ 9.5mm coarse thread 191mm long hex bolt	ASTM A307
b2	22	∅ 9.5mm hex nut	ASTM A307
b3	44	∅ 9.5mm wide washer	ASTM A307
b4	56	∅ 19mm hex nut	ASTM A325
b5	56	∅ 19mm wide washer	ASTM A325
b6	56	∅ 19mm coarse thread 51mm long hex bolt	ASTM A307
b7	14	686 x 137 x 16mm splice plate	A36 Steel
b8	6	152 x 152 x 4.8mm 5486mm long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 152 x 152 x 4.8mm box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 152 x 152 x 4.8mm box beam	ASTM A500 Grade B
c3	1	End assembly 4.8mm thick cover plate	A36 Steel
c4	1	127 x 89 x 9.5mm box beam shelf angle	A36 Steel
c5	1	∅ 19 coarse thread 191mm long hex bolt	ASTM A307
c6	1	S76 x 8.5 1194mm long post	A36 Steel
c7	1	152 x 152 x 4.8mm R10.7m Curved Box Beam	ASTM A500 Grade B


	Type IIA Box Beam Terminal Test No. 3 – As Built Bill of Materials		SHEET: 12 of 12
	Midwest Roadside Safety Facility		DATE: 5/18/2009
DWG. NAME: NYBBT-3_revision_asbuilt_R2_m		SCALE: None UNITS: mm	DRAWN BY: R/JT/CSS/EM
			REV. BY: KAP/RKF

Figure G-12. Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-3

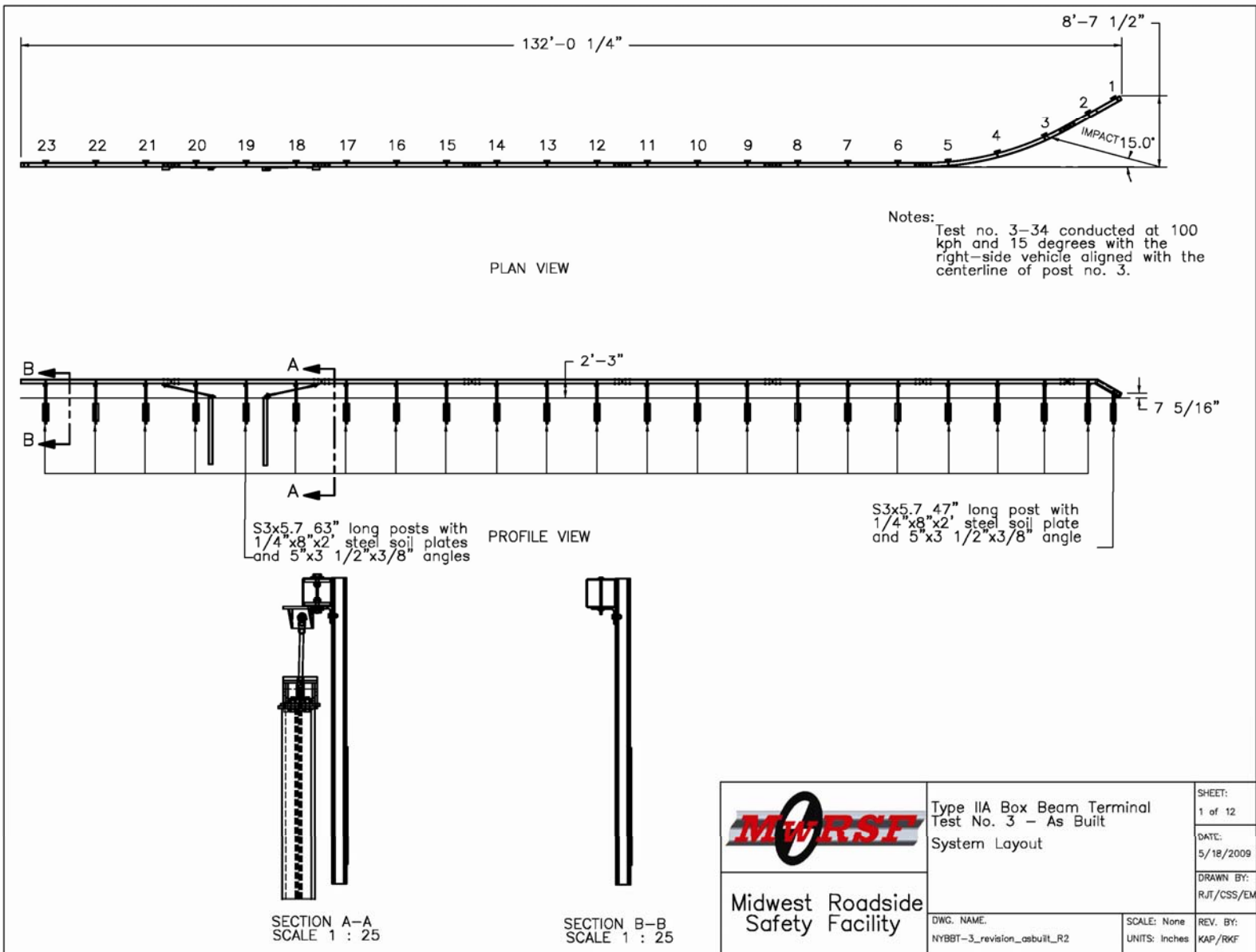


Figure G-13. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

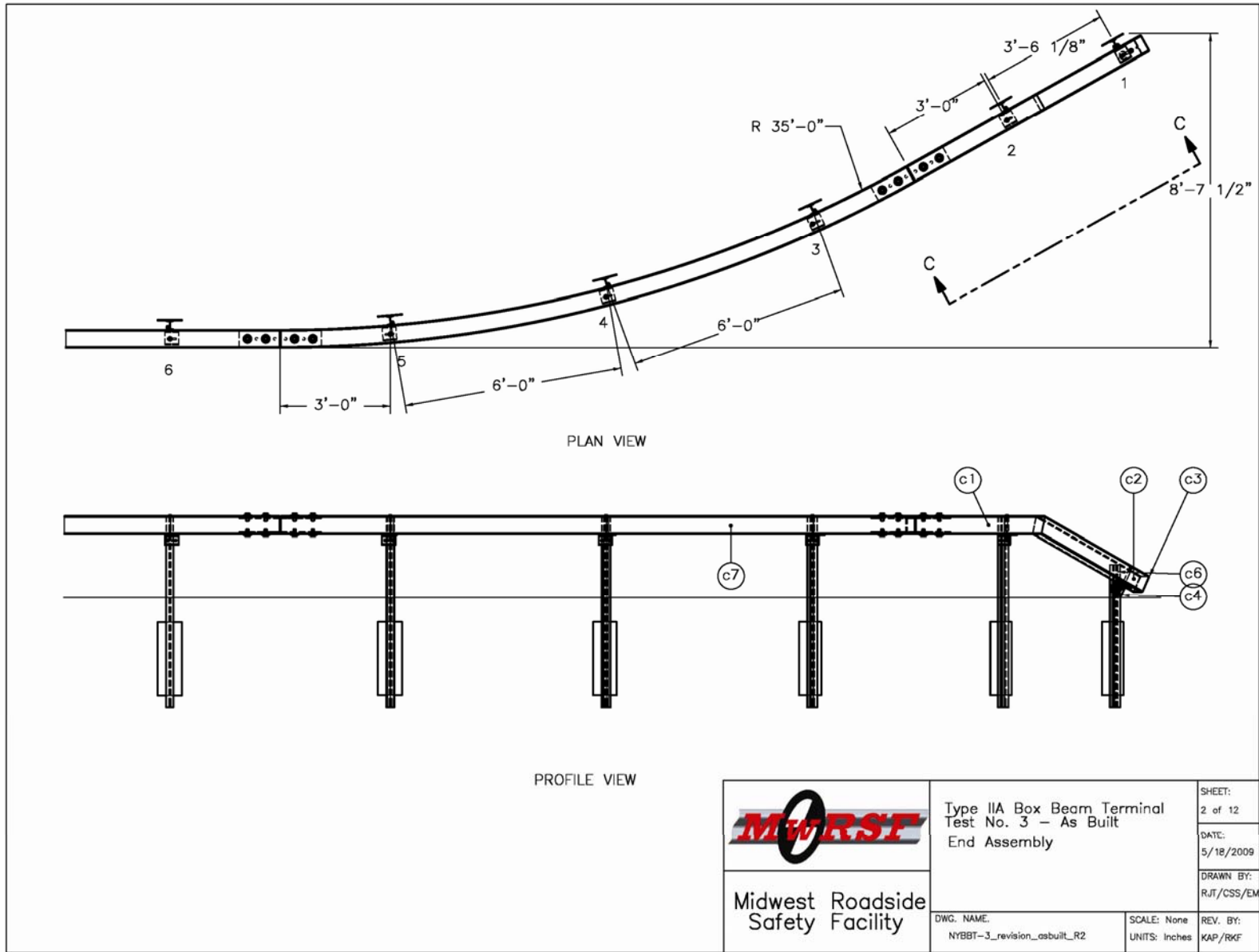


Figure G-14. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

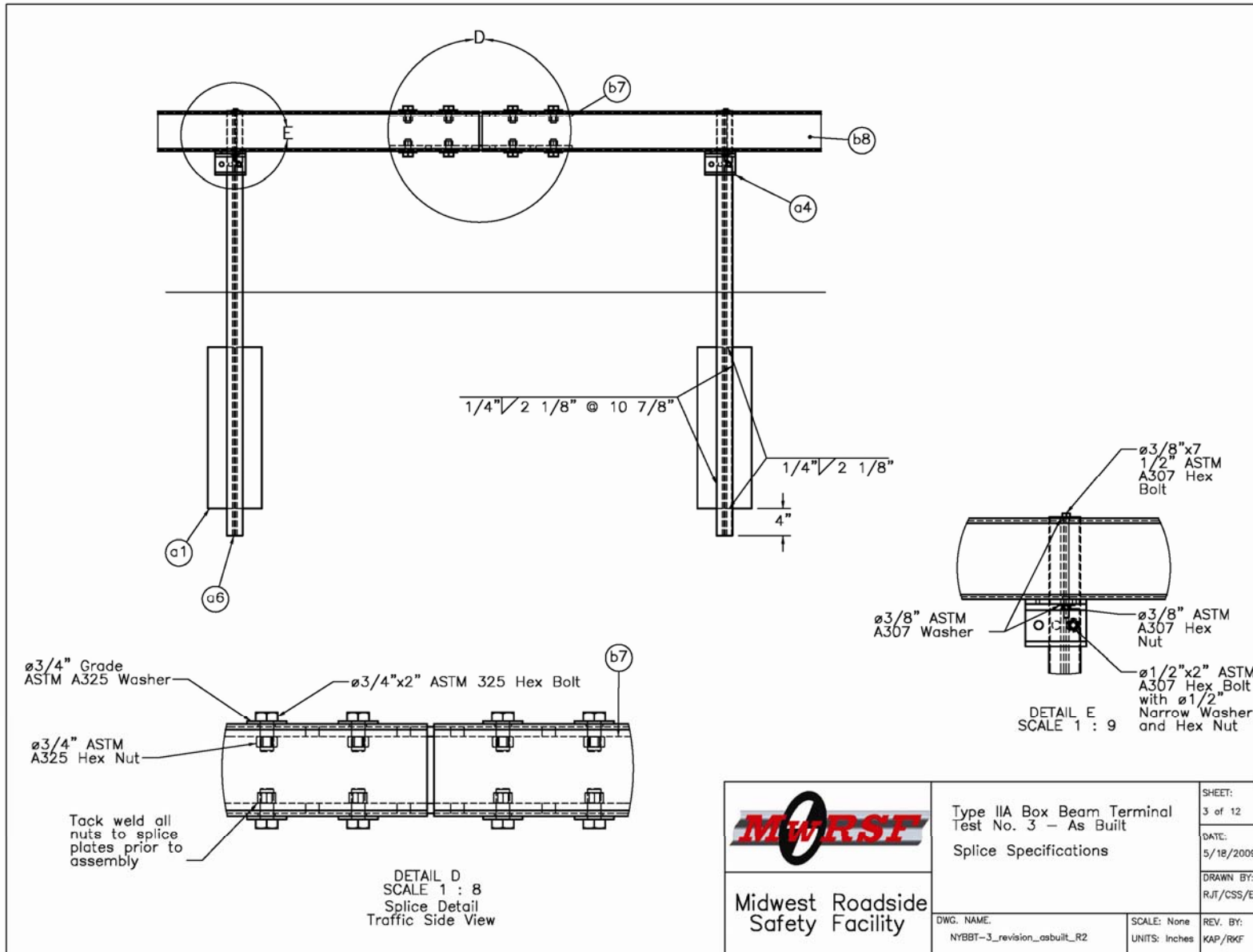


Figure G-15. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

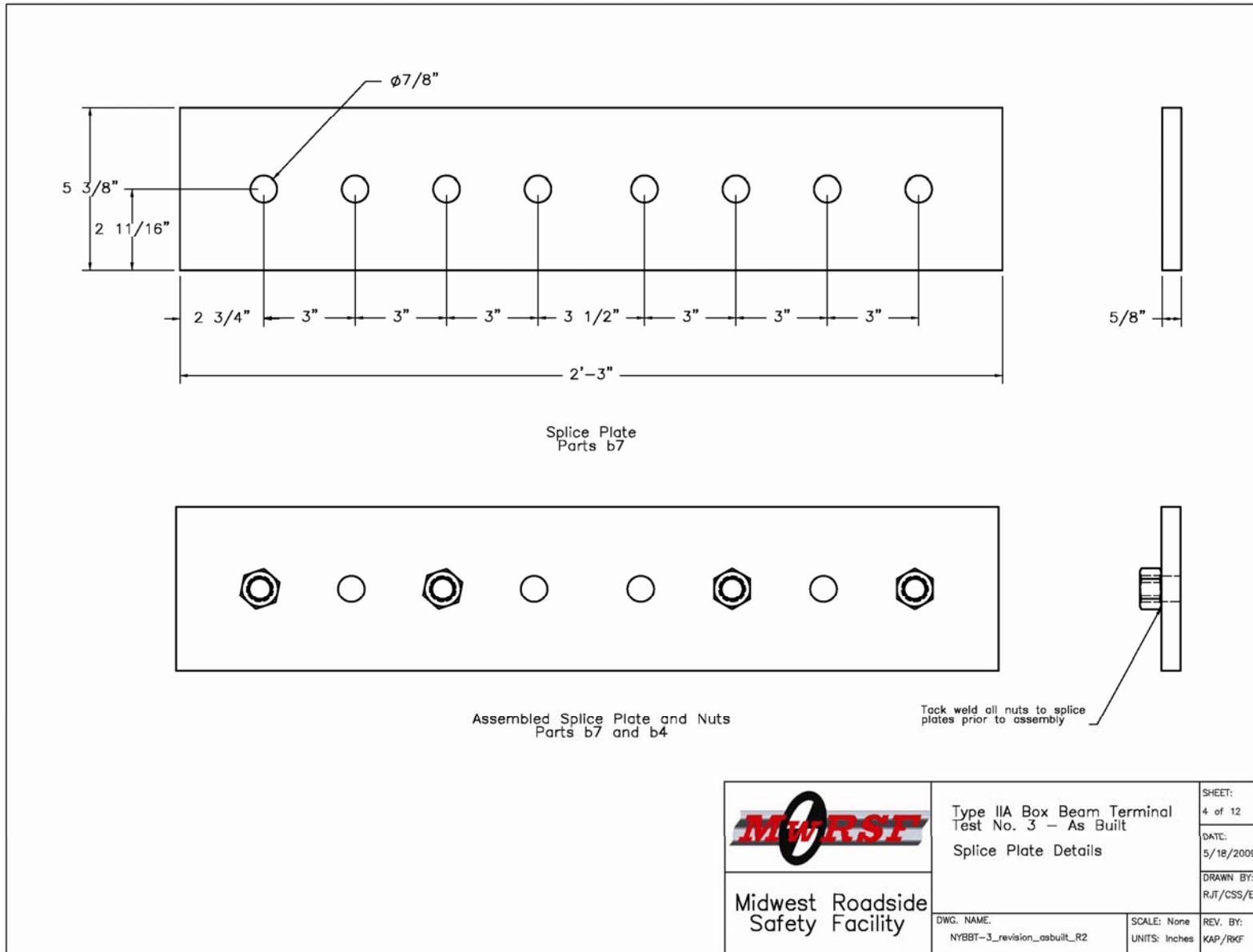


Figure G-16. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3



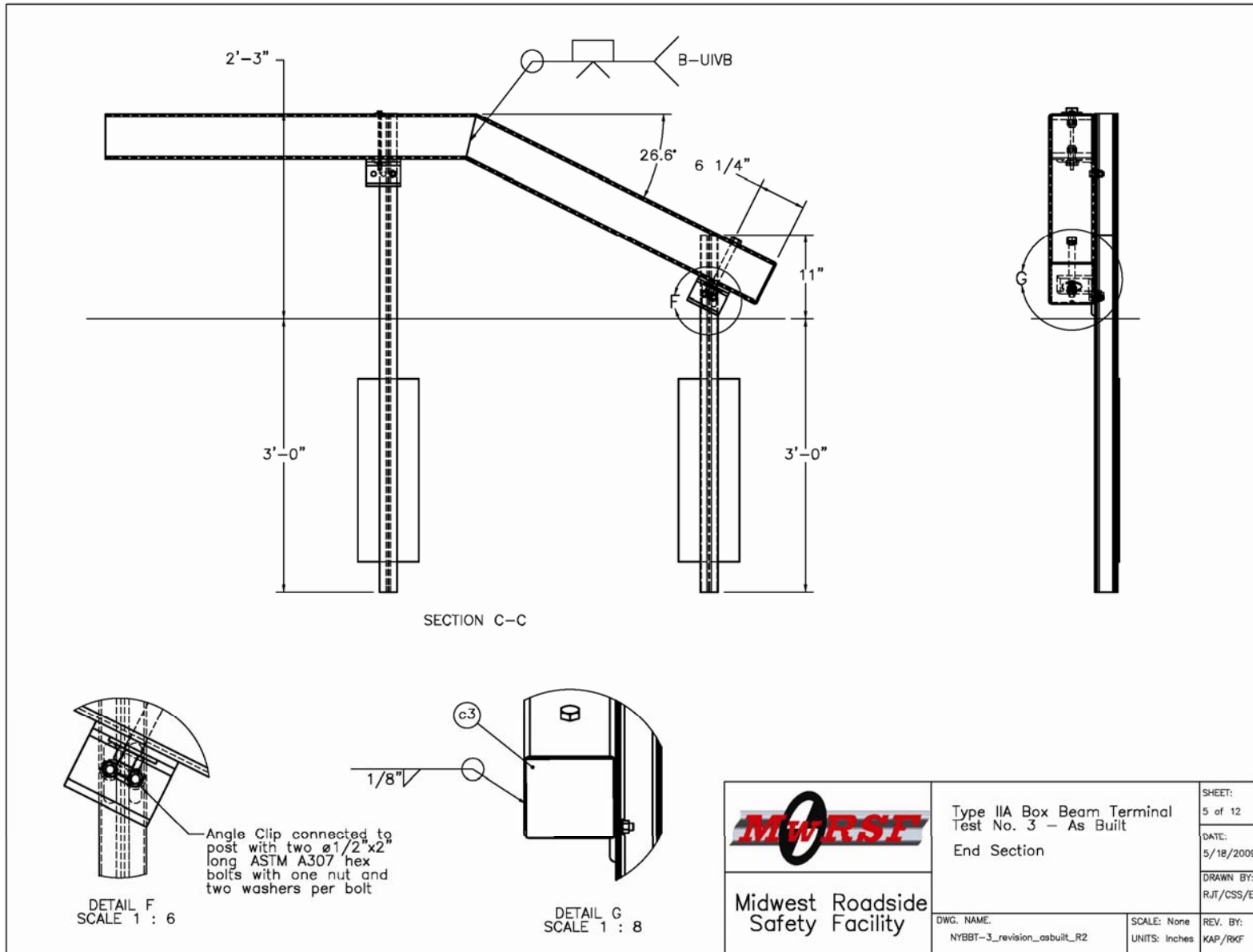


Figure G-17. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

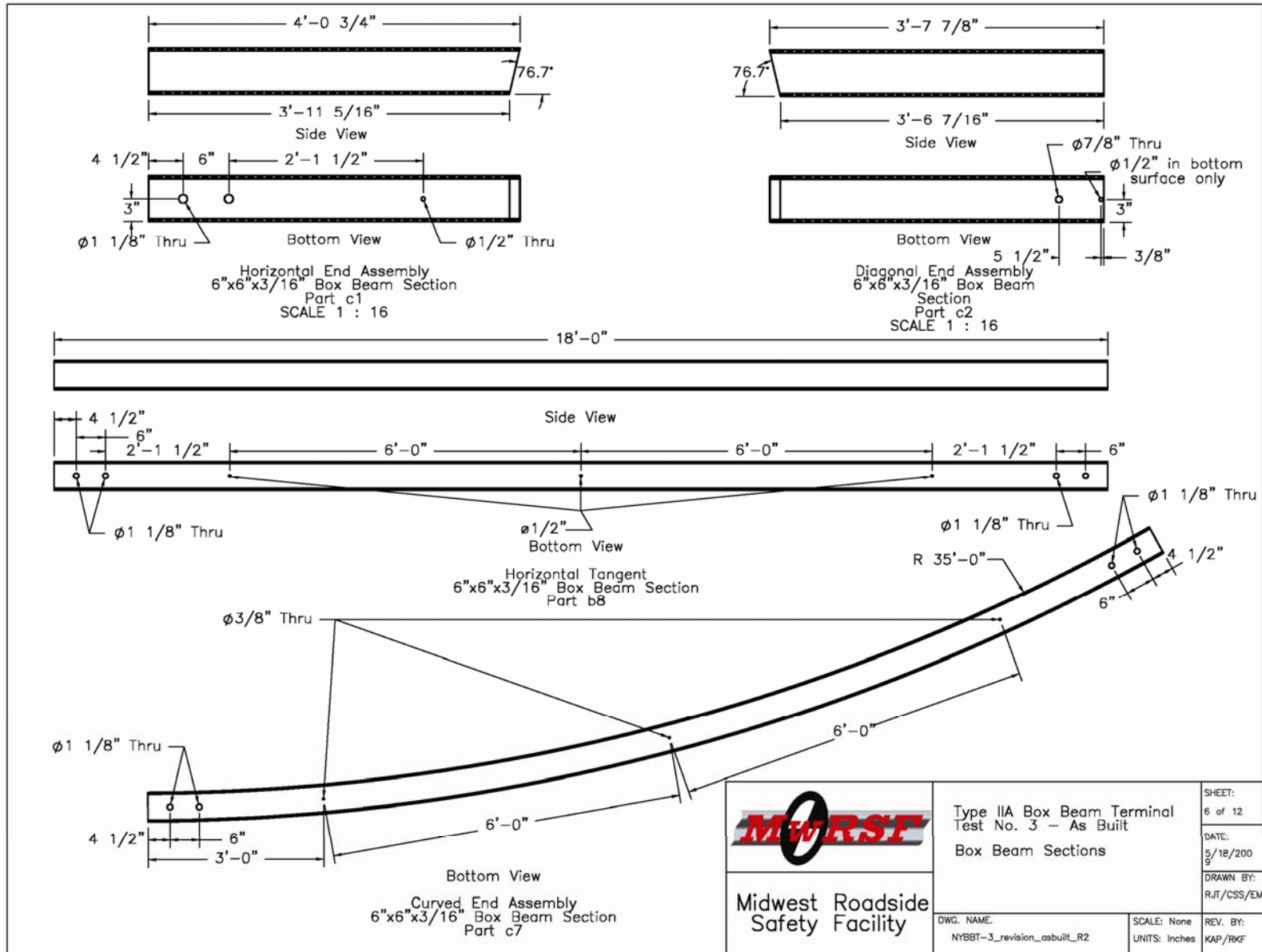



Figure G-18. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

 <b>Midwest Roadside Safety Facility</b>	Type IIA Box Beam Terminal Test No. 3 - As Built Box Beam Sections	SHEET: 6 of 12 DATE: 5/18/2009 DRAWN BY: RJT/CSS/EMK
	DWG. NAME: NYBBT-3_revision_asbuilt_R2	SCALE: None UNITS: Inches

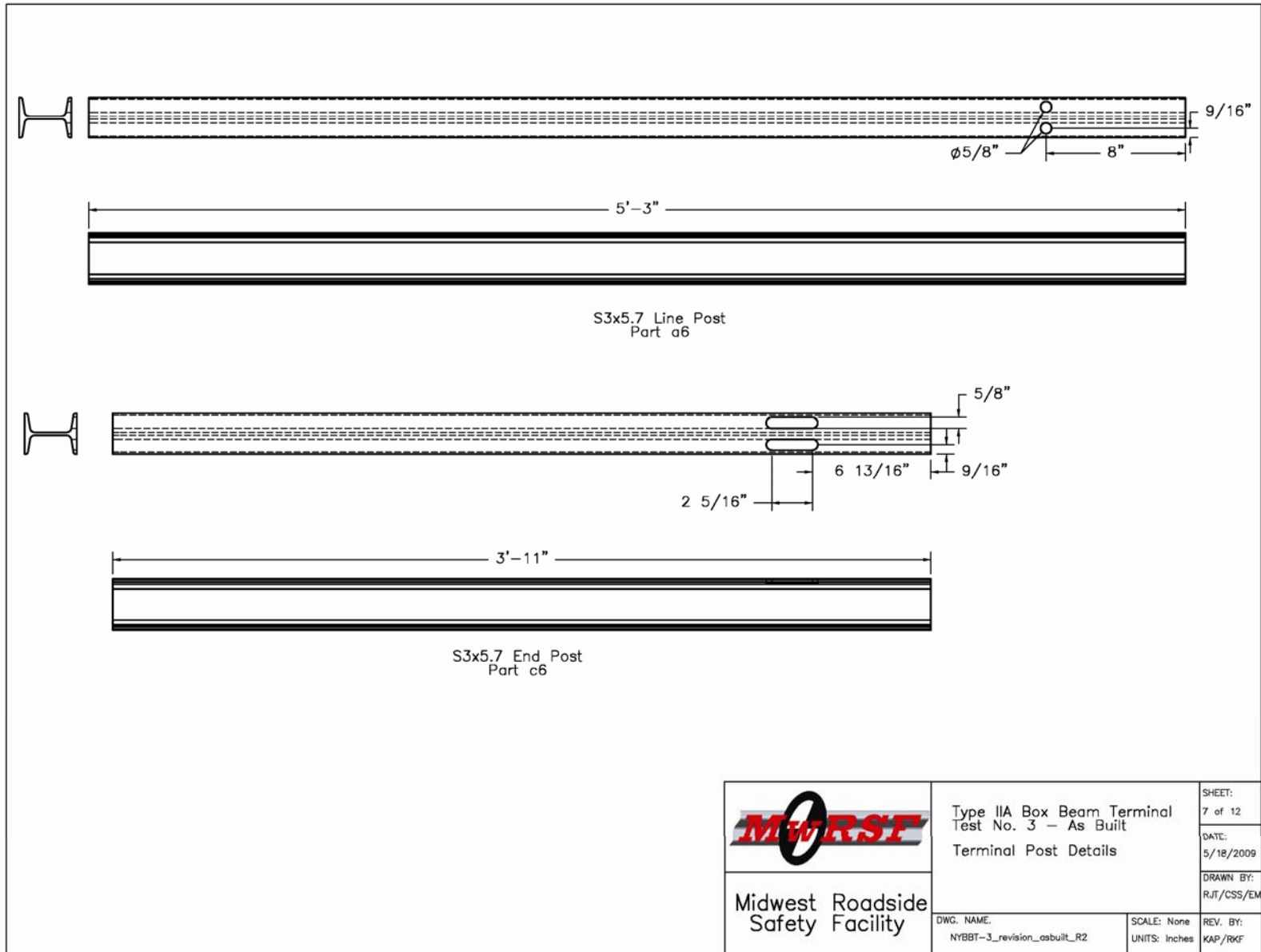


Figure G-19. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

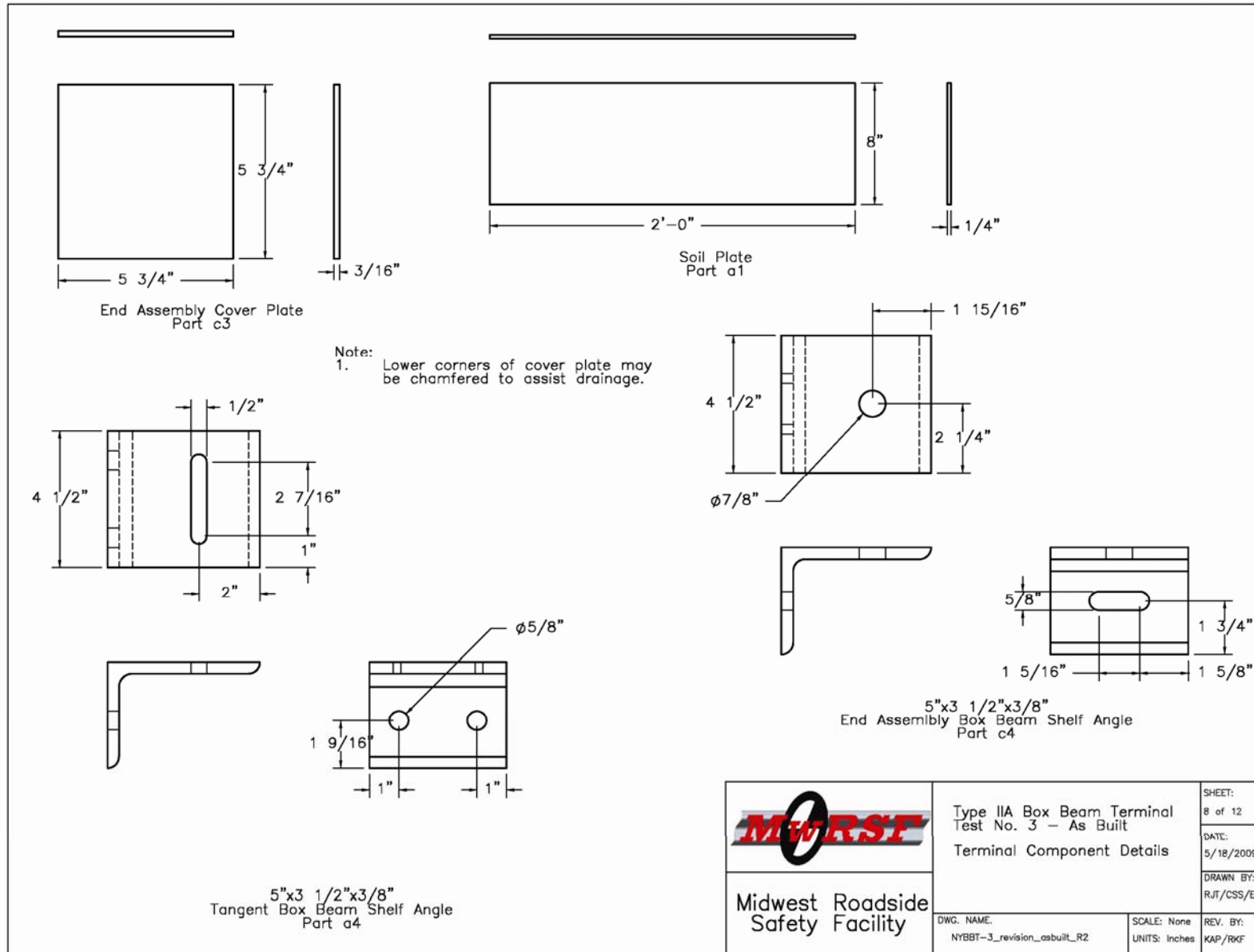


Figure G-20. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

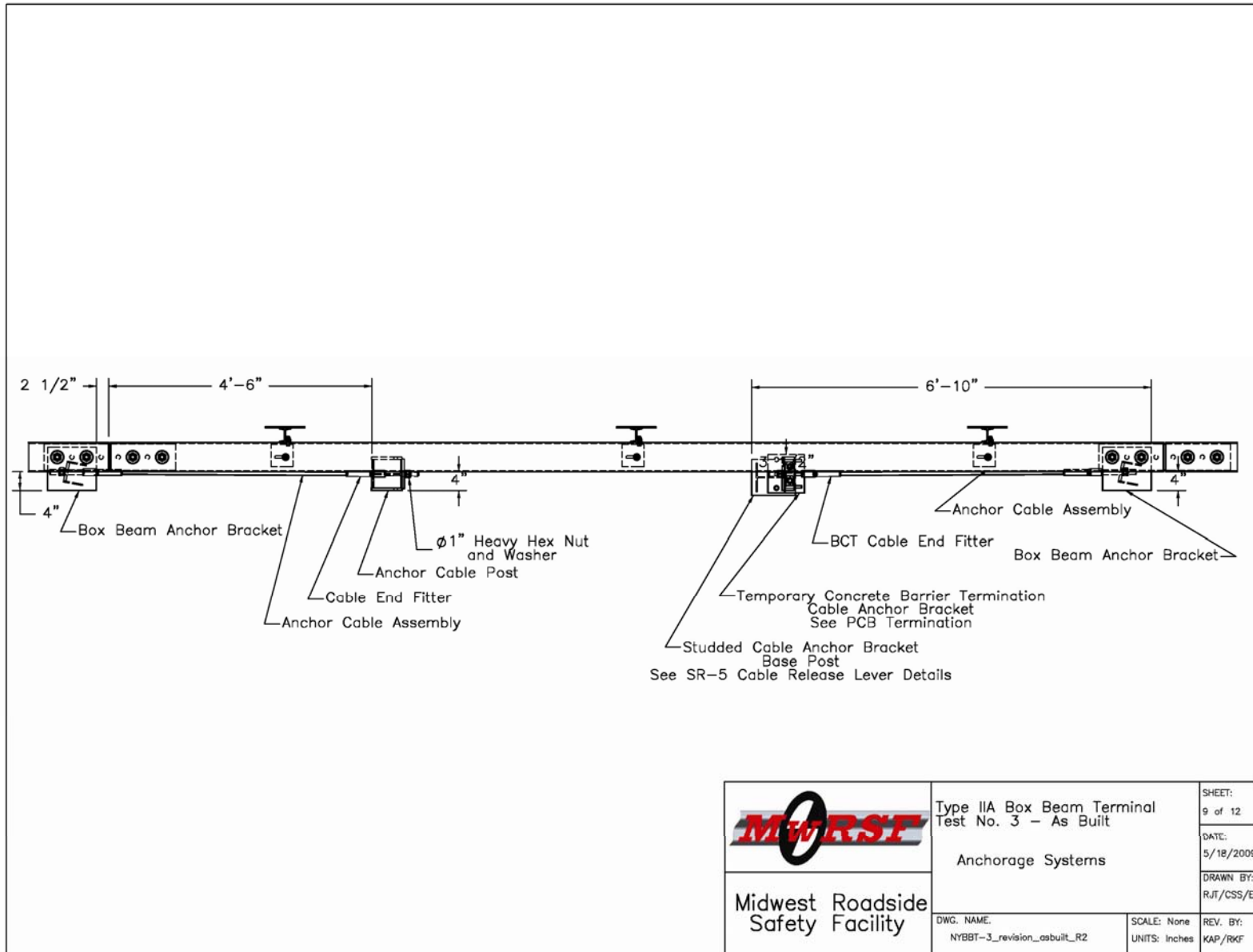
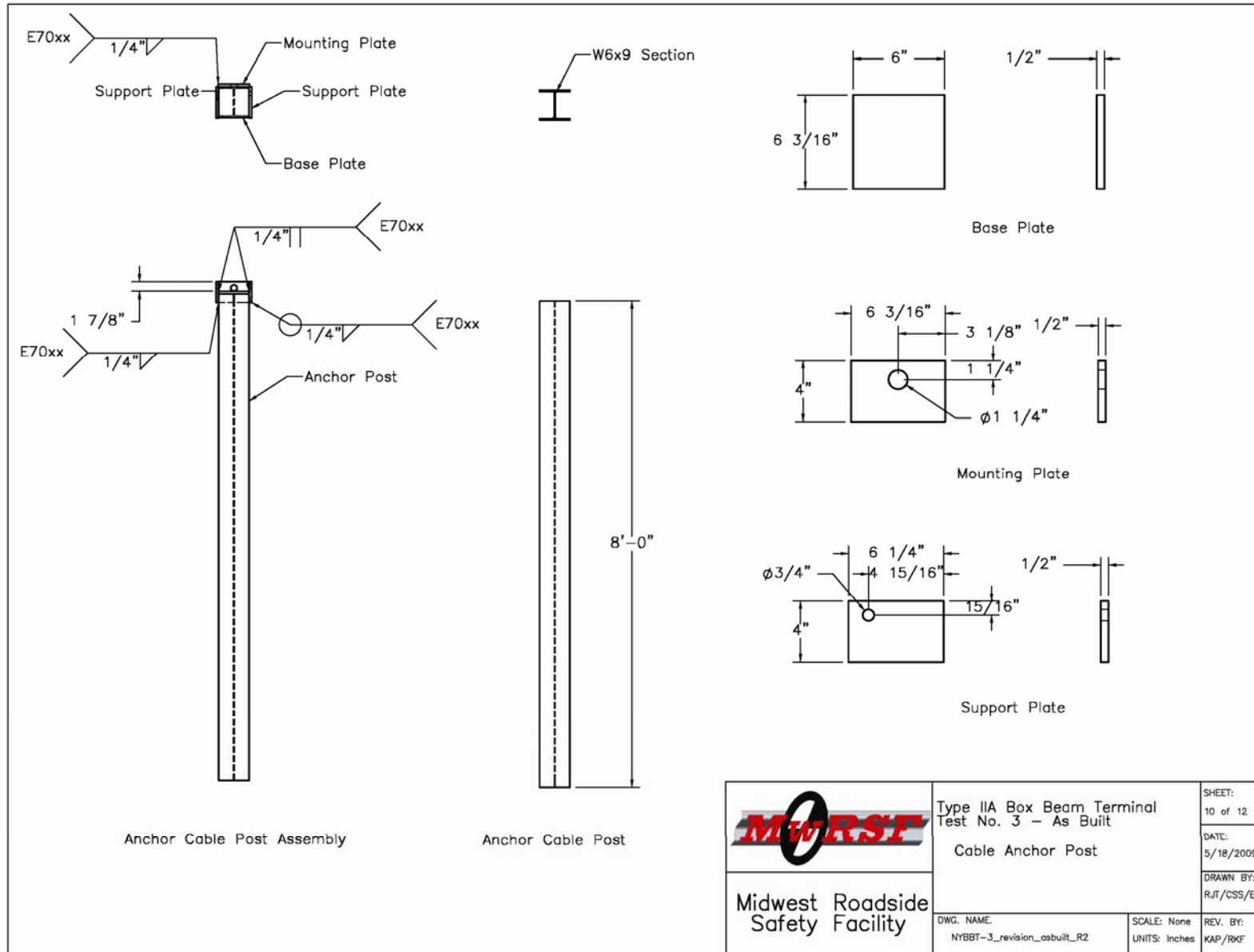


Figure G-21. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3




	Type IIA Box Beam Terminal Test No. 3 - As Built	SHEET: 10 of 12
	Cable Anchor Post	DATE: 5/18/2009
Midwest Roadside Safety Facility	DWG. NAME: NYBBT-3_revision_asbuilt_R2	DRAWN BY: R/JT/CSS/EM
	SCALE: None UNITS: Inches	REV. BY: KAP/RKF

Figure G-22. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

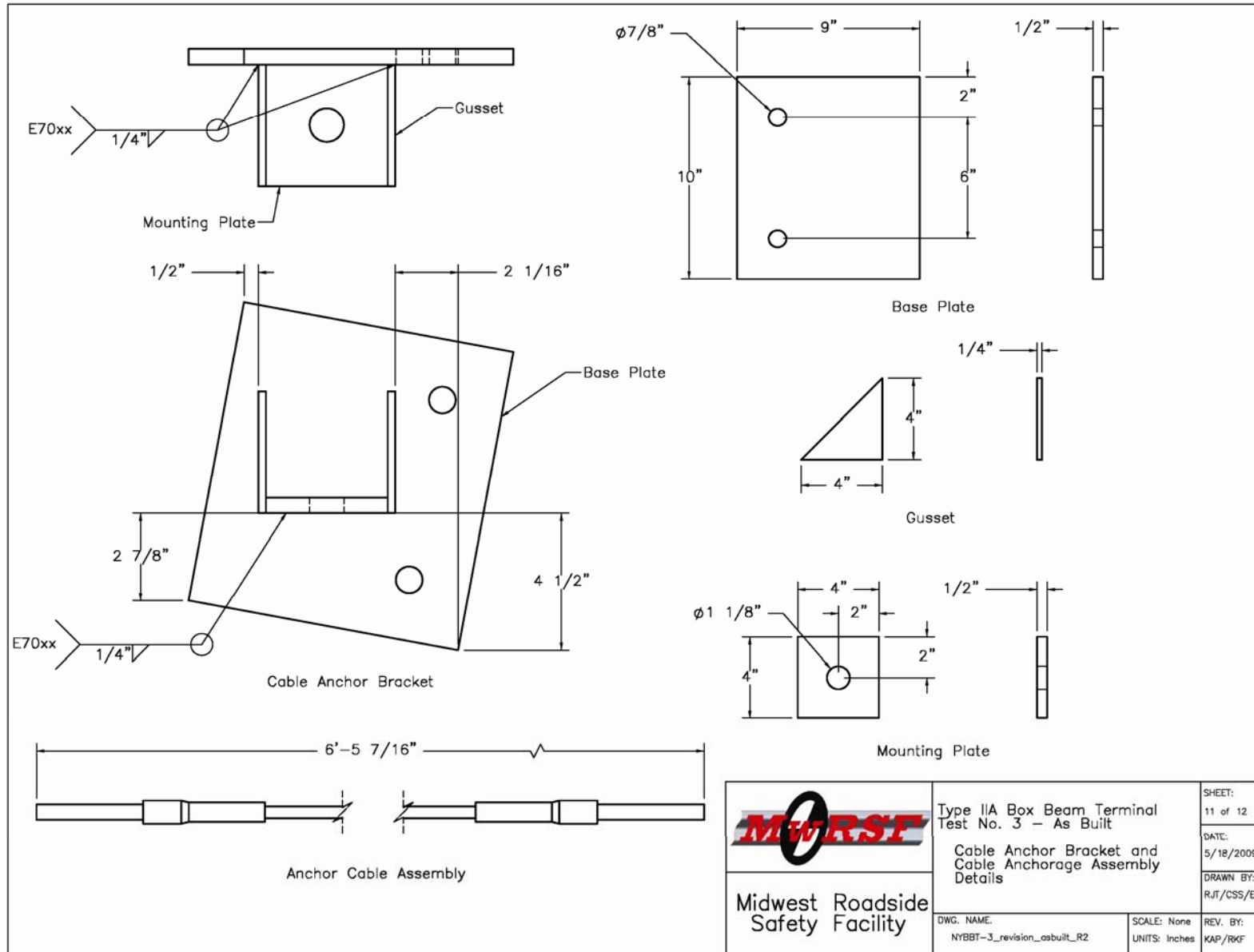


Figure G-23. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3

New York Type IIA Box Beam Terminal			
Item No.	QTY.	Description	Material Spec
a1	23	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	24	ø 1/2" coarse thread 2" long hex bolt	ASTM A307
a3	24	ø 1/2" hex nut	ASTM A307
a4	22	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	24	ø 1/2" narrow washer	ASTM A307
a6	22	S3 x 5.7 63" long post	A36 Steel
b1	22	ø 3/8" coarse thread 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	56	ø 3/4" hex nut	ASTM A325
b5	56	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread 2" long hex bolt	ASTM A307
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" 18' long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread 7 1/2" long hex bolt	ASTM A307
c6	1	S3 x 5.7 47" long post	A36 Steel
c7	1	6" x 6" x 3/16" R35' Curved Box Beam	ASTM A500 Grade B


 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal Test No. 3 – As Built Bill of Materials		SHEET: 12 of 12
	DWG. NAME: NYBBT-3_revision_asbuilt_R2	SCALE: None UNITS: Inches	DATE: 5/18/2009 DRAWN BY: RJT/CSS/EMK REV. BY: KAP/RKF

Figure G-24. Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-3



**APPENDIX H Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-2**

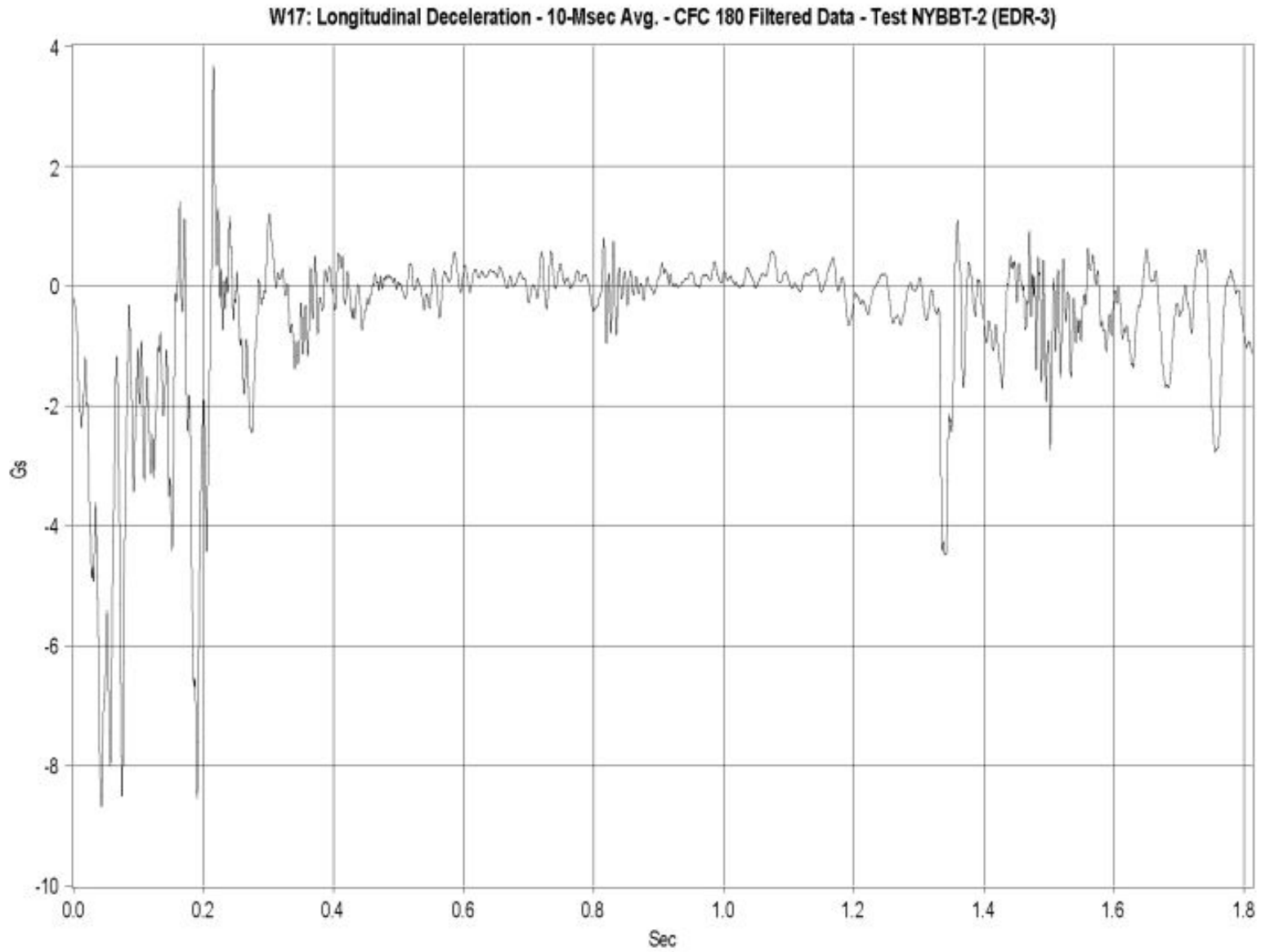


Figure H-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-2

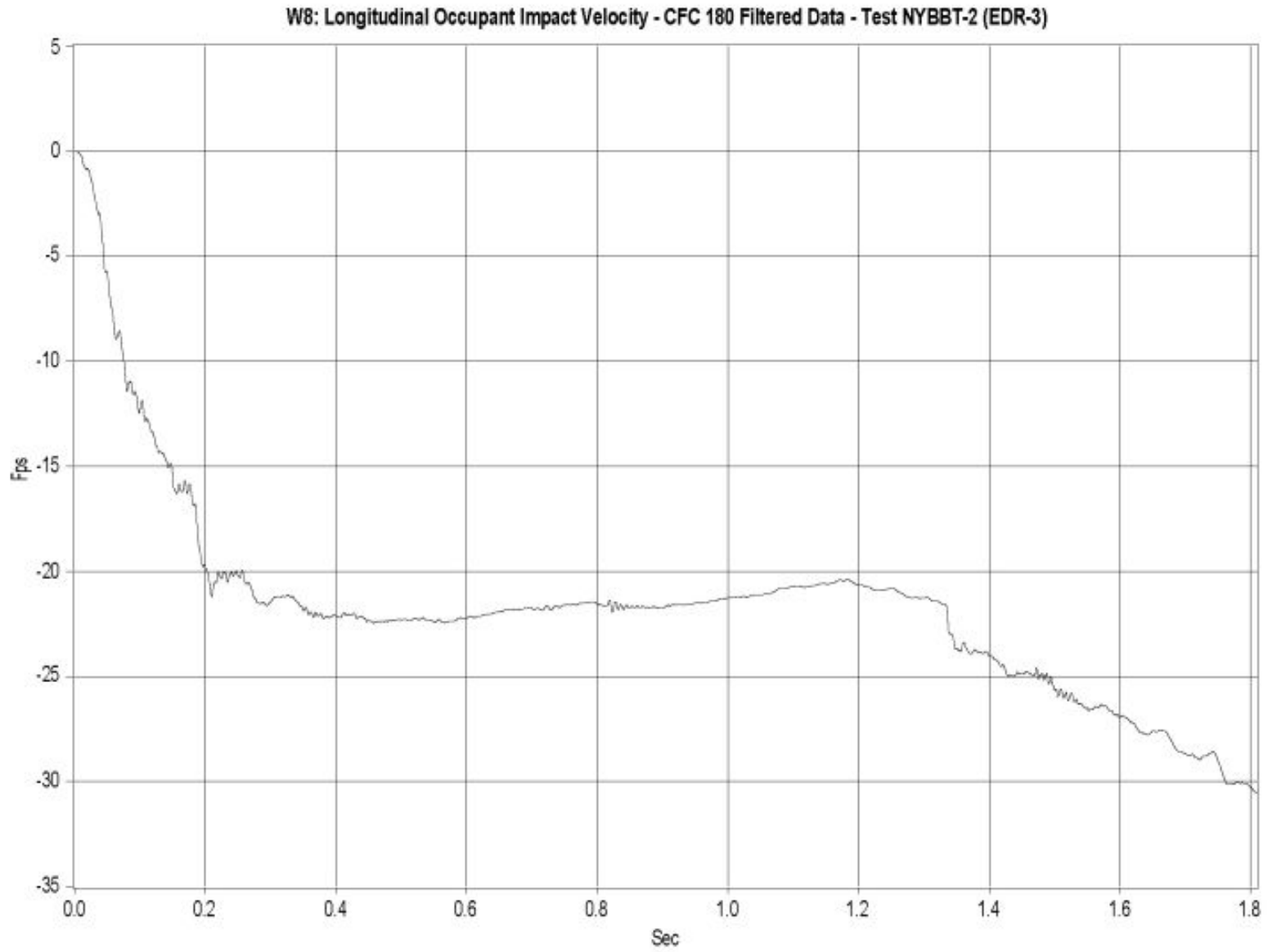


Figure H-2. Graph of Longitudinal Occupant Velocity (EDR-3), Test No. NYBBT-2

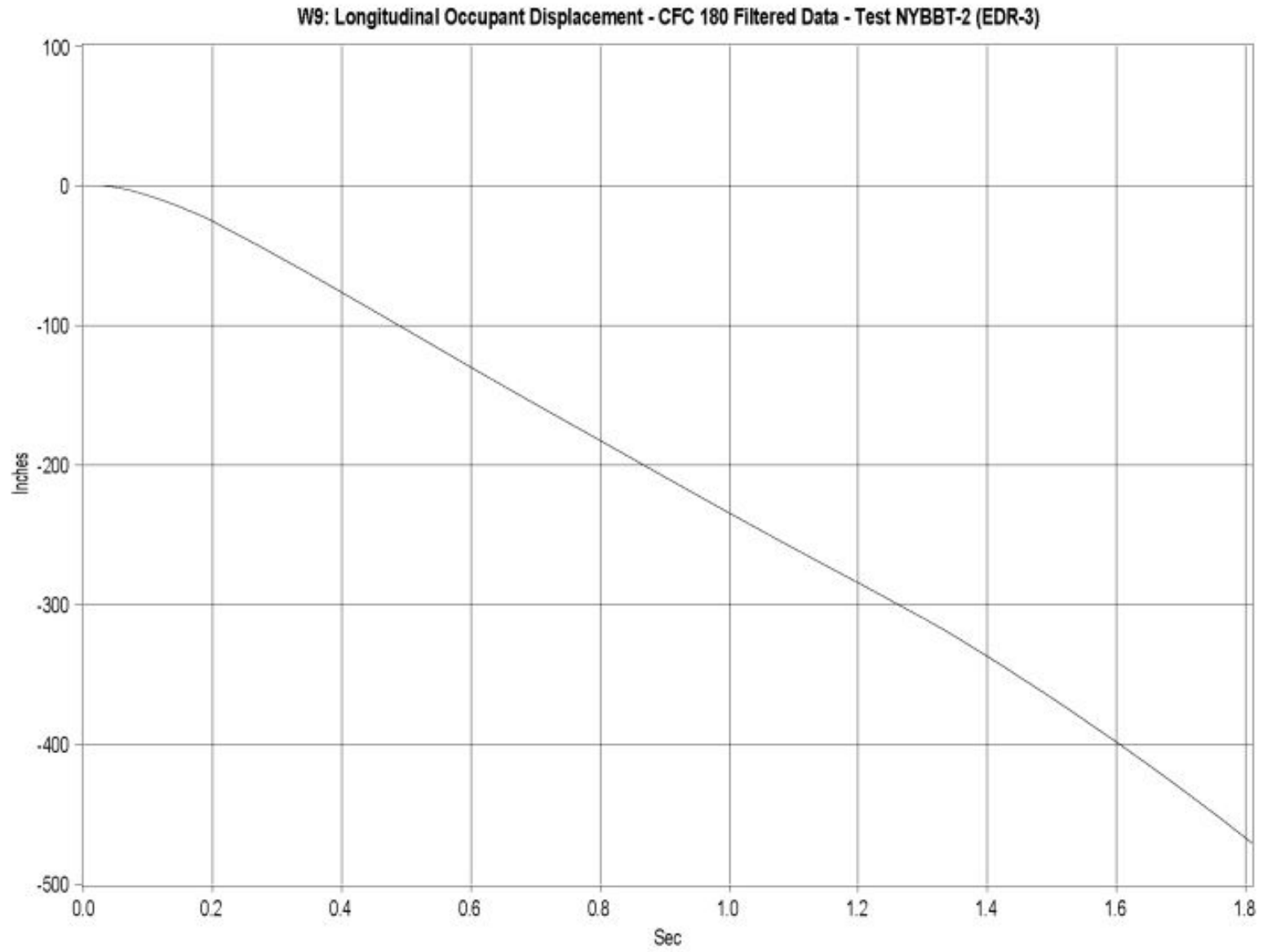


Figure H-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-2

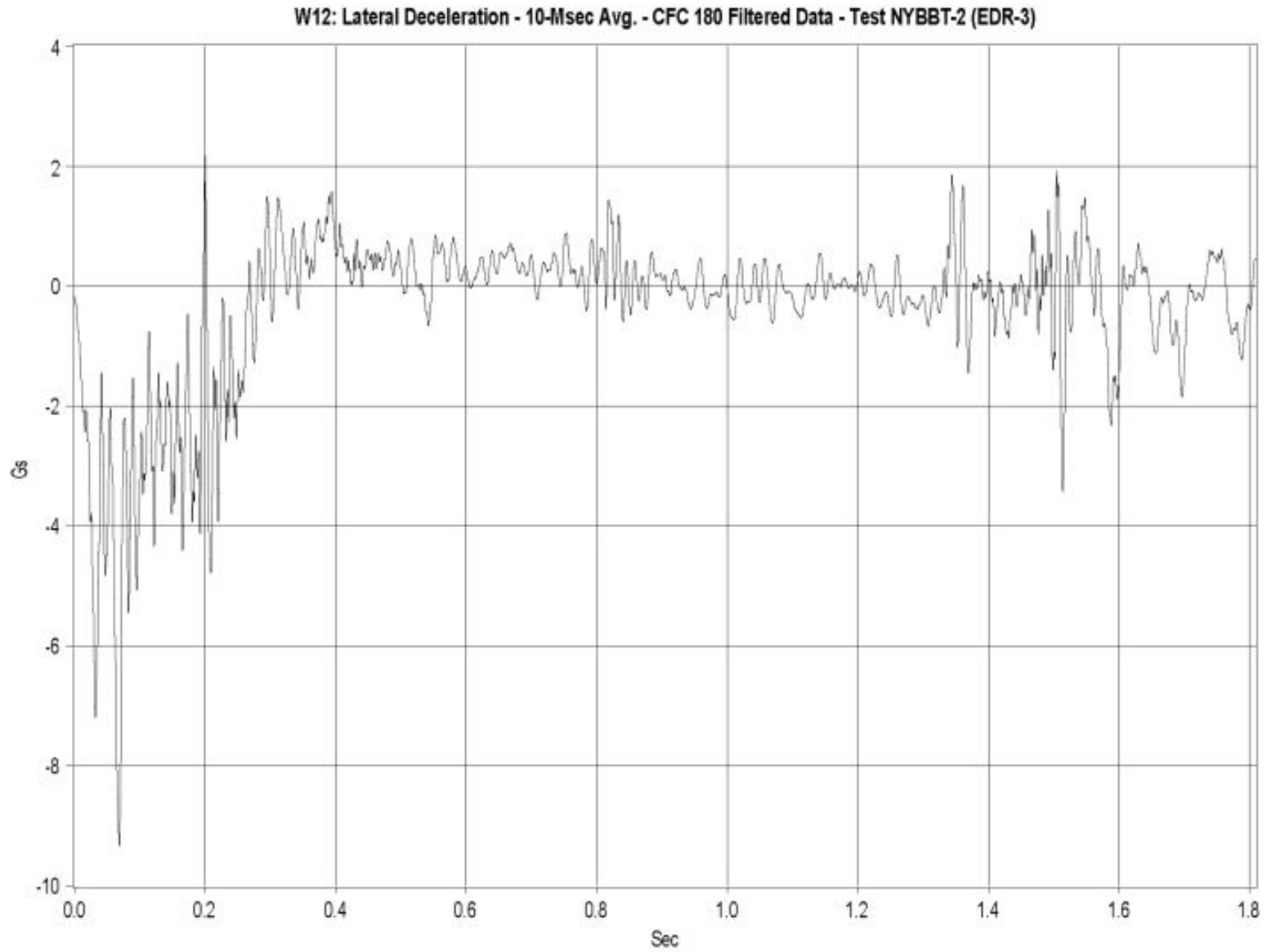


Figure H-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-2

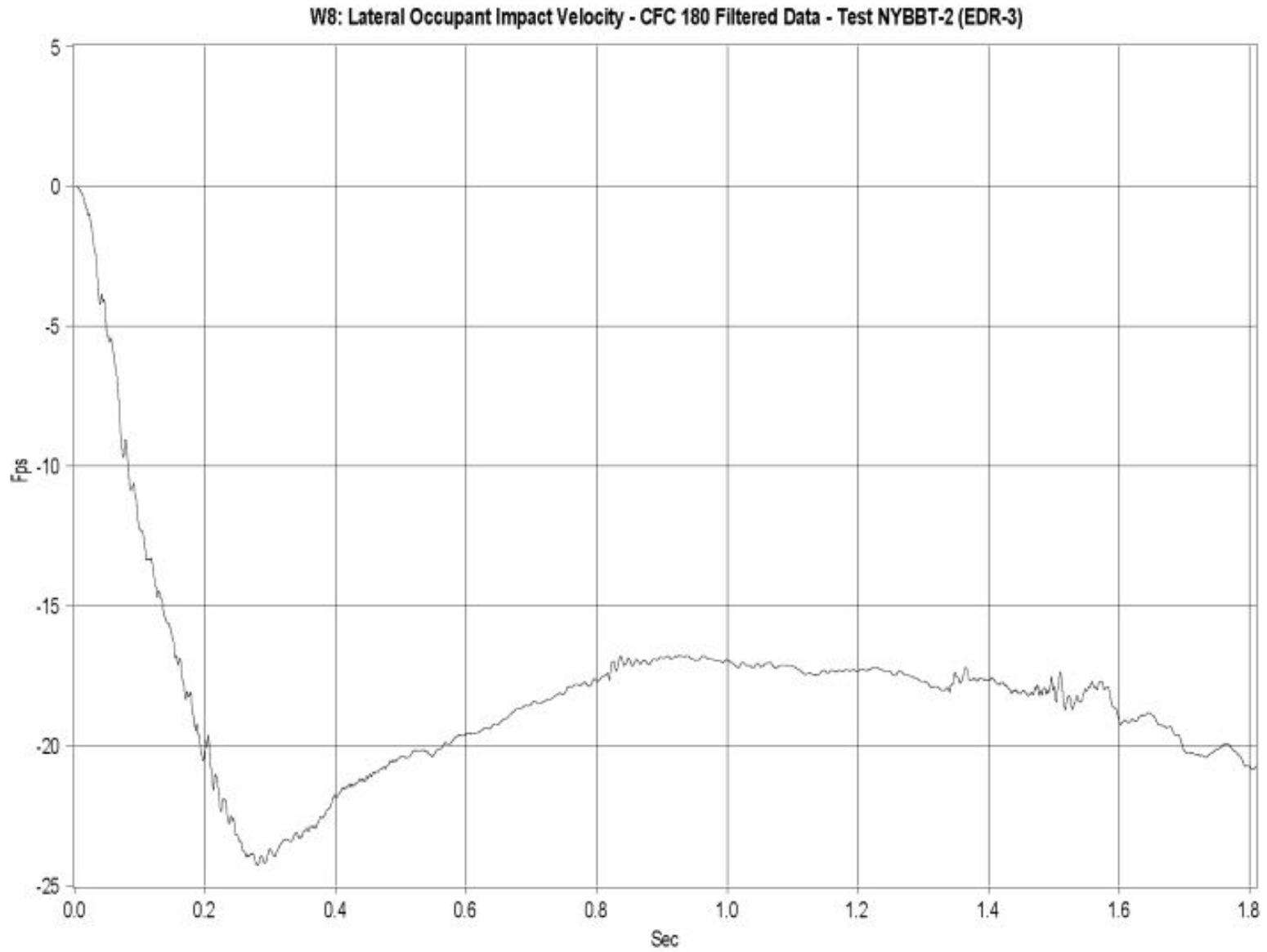


Figure H-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-2

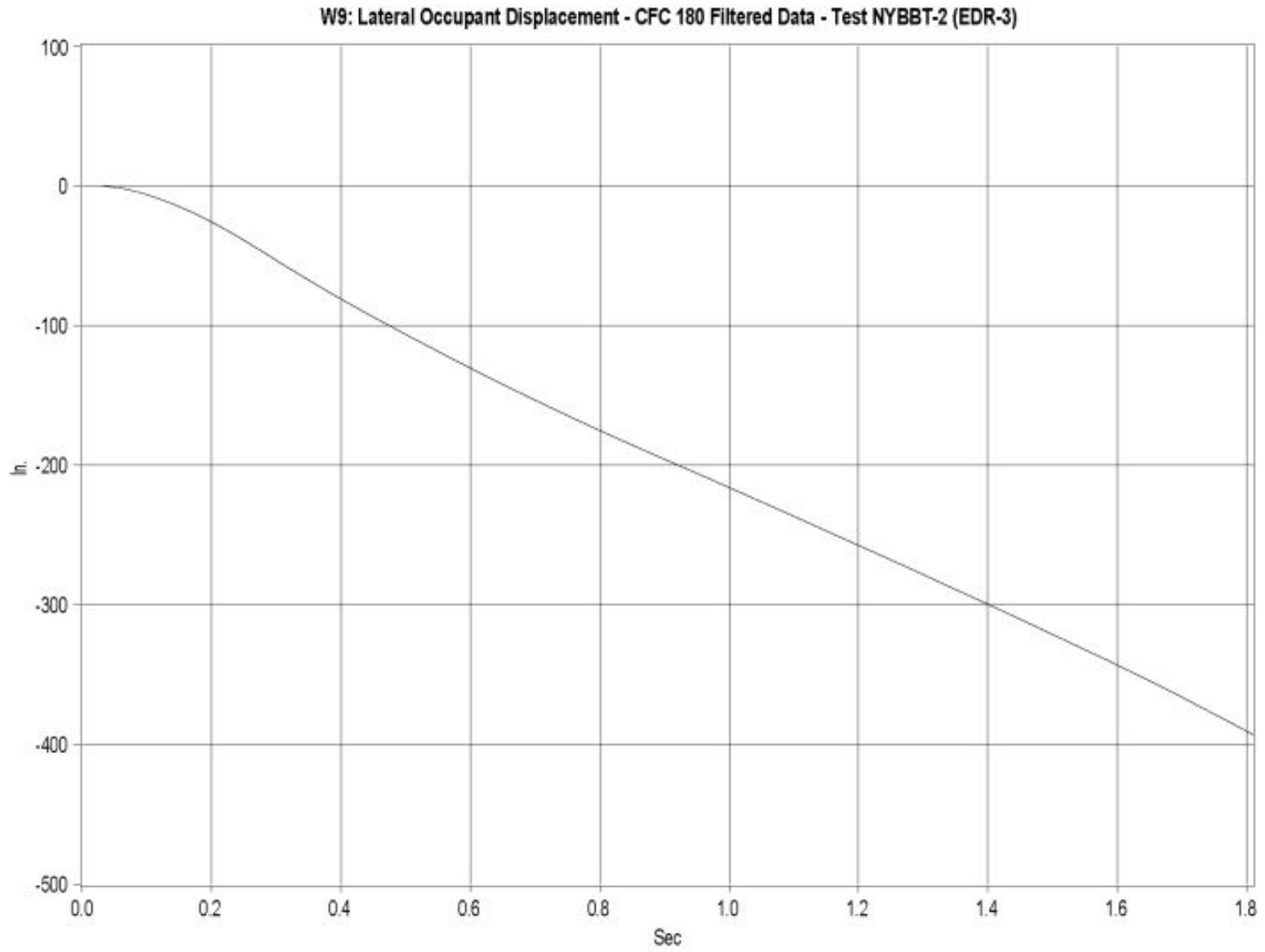


Figure H-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-2

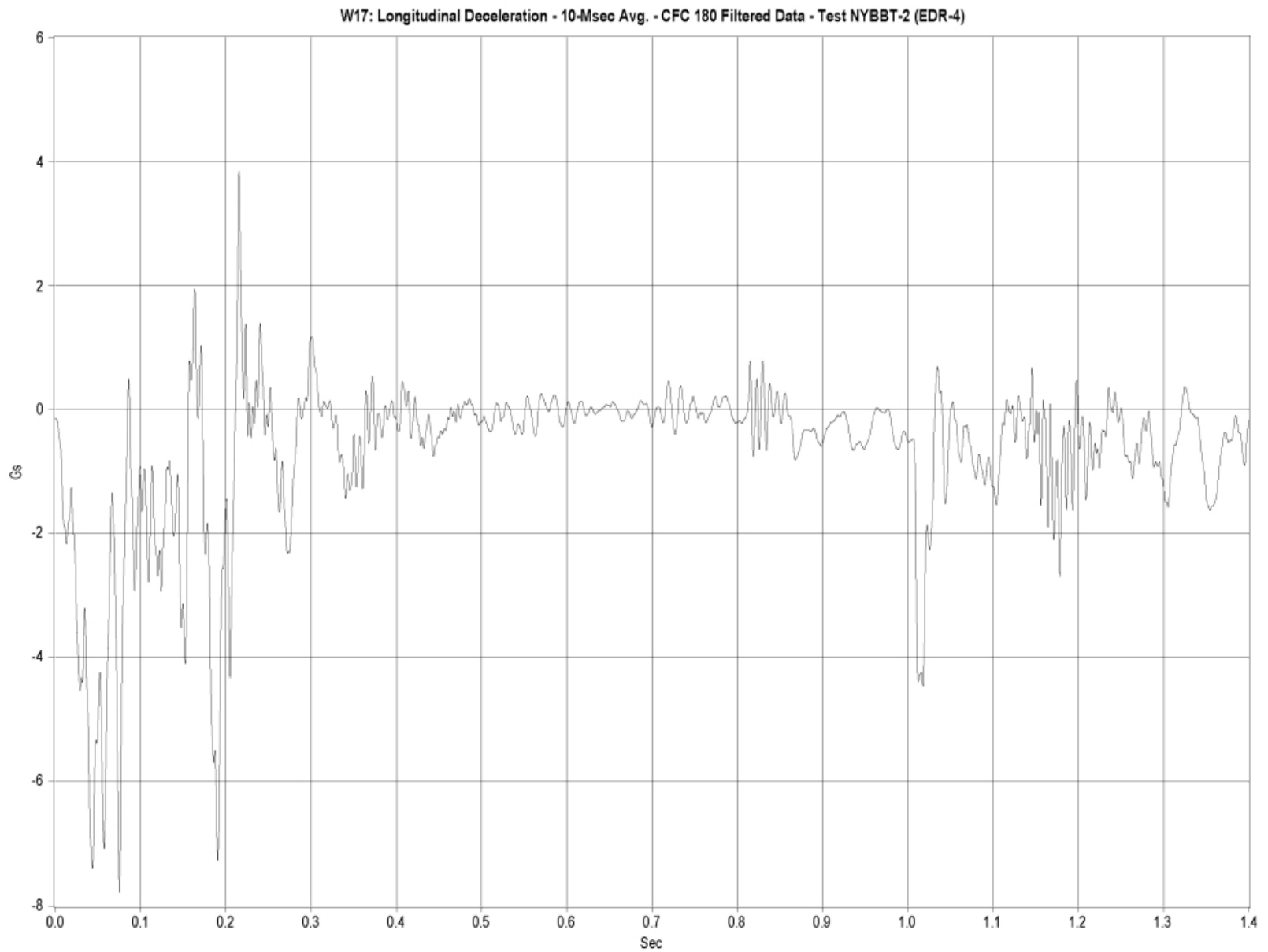


Figure H-7. Graph of Longitudinal Occupant Deceleration (EDR-4), Test No. NYBBT-2



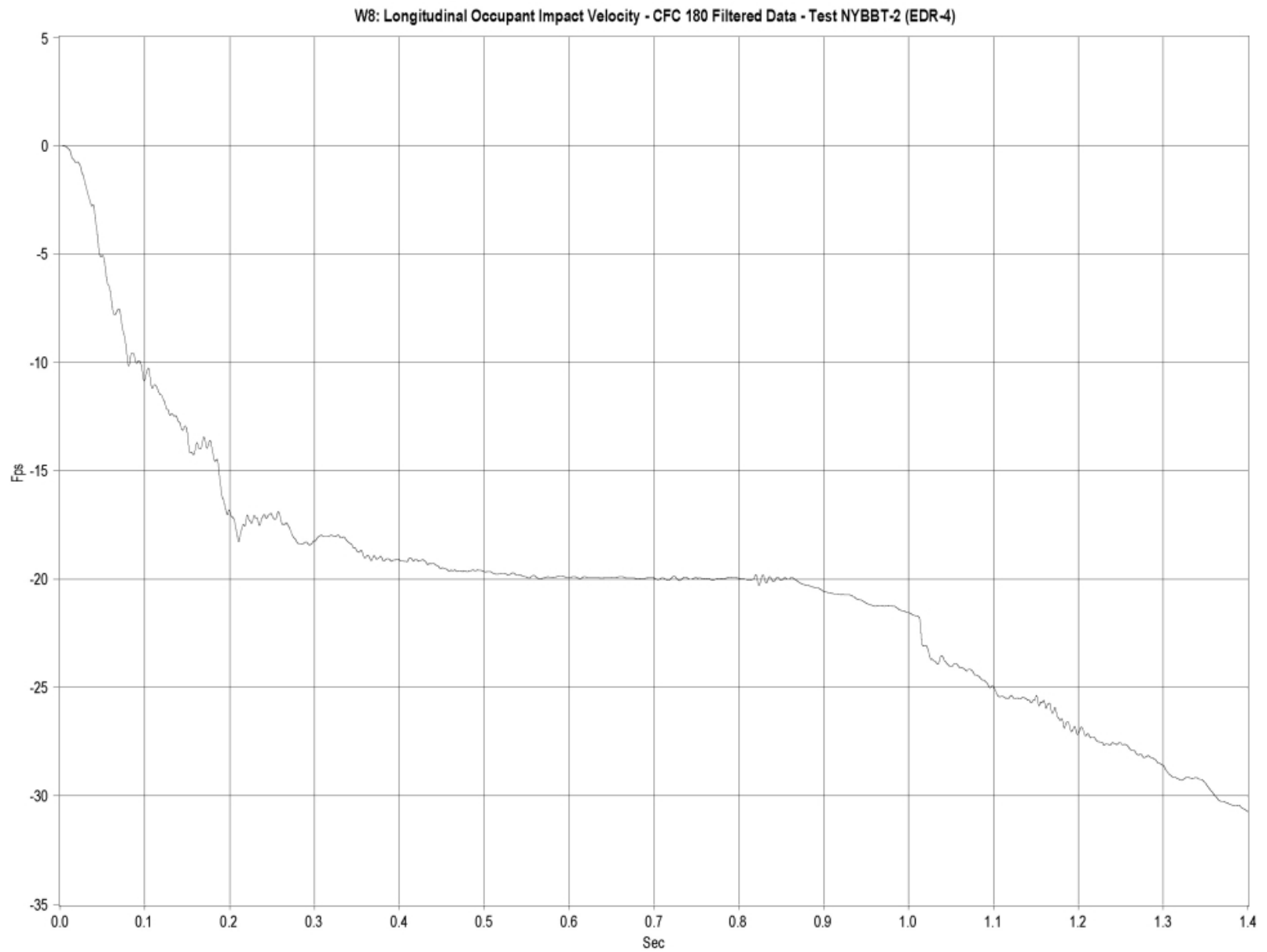


Figure H-8. Graph of Longitudinal Occupant Velocity (EDR-4), Test No. NYBBT-2

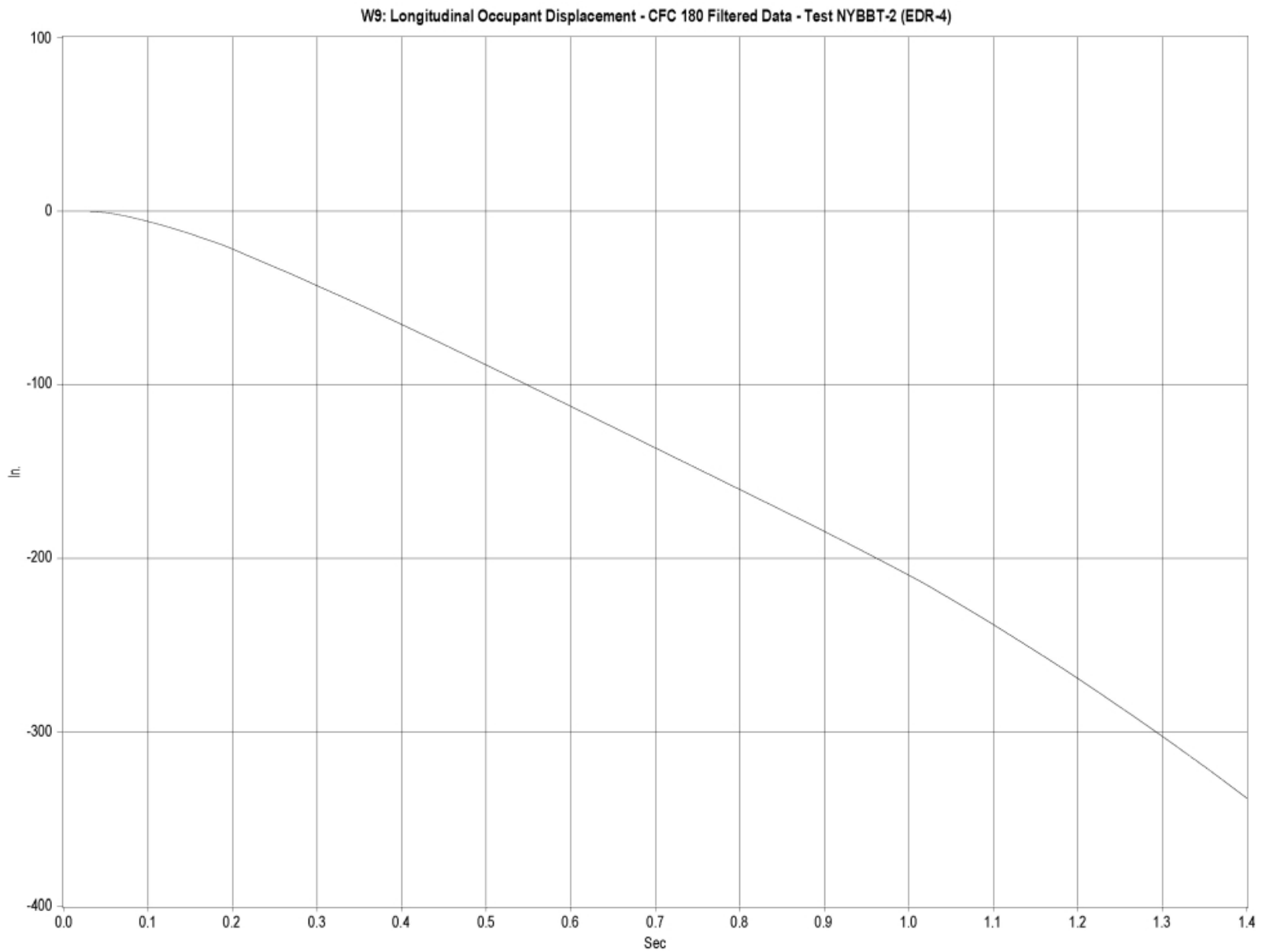


Figure H-9. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-2

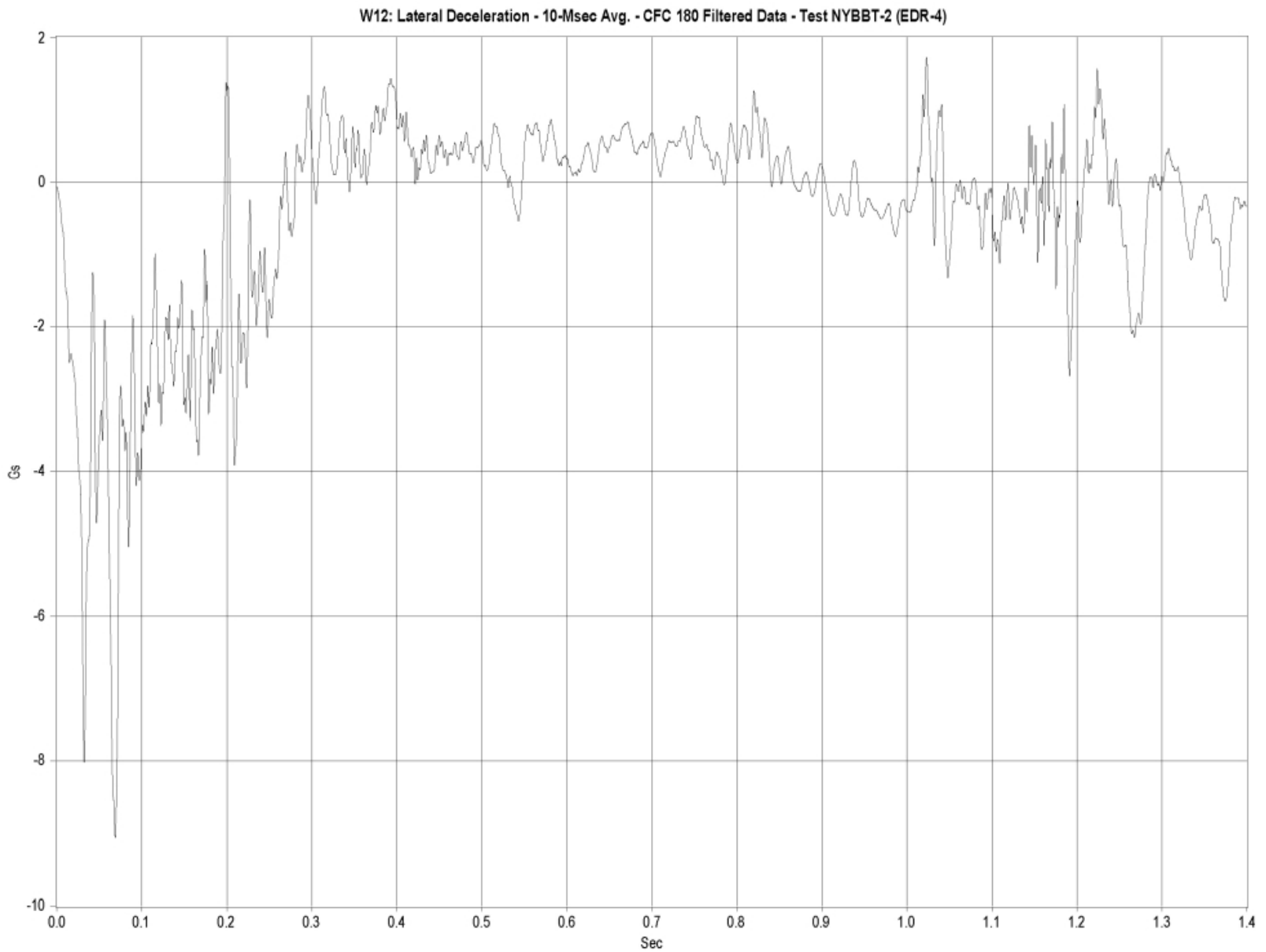


Figure H-10. Graph of Lateral Occupant Deceleration (EDR-4), Test No. NYBBT-2

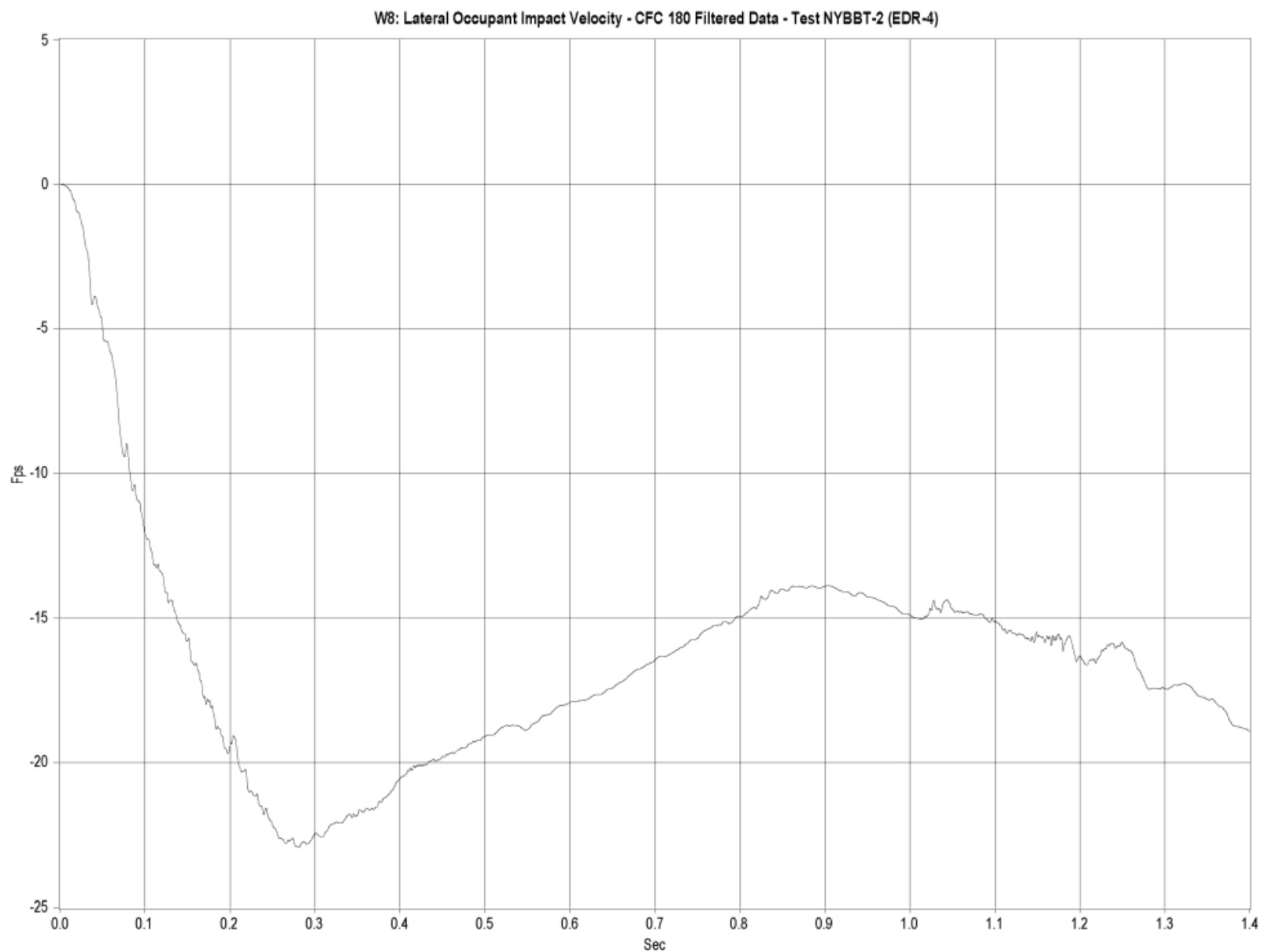


Figure H-11. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-2

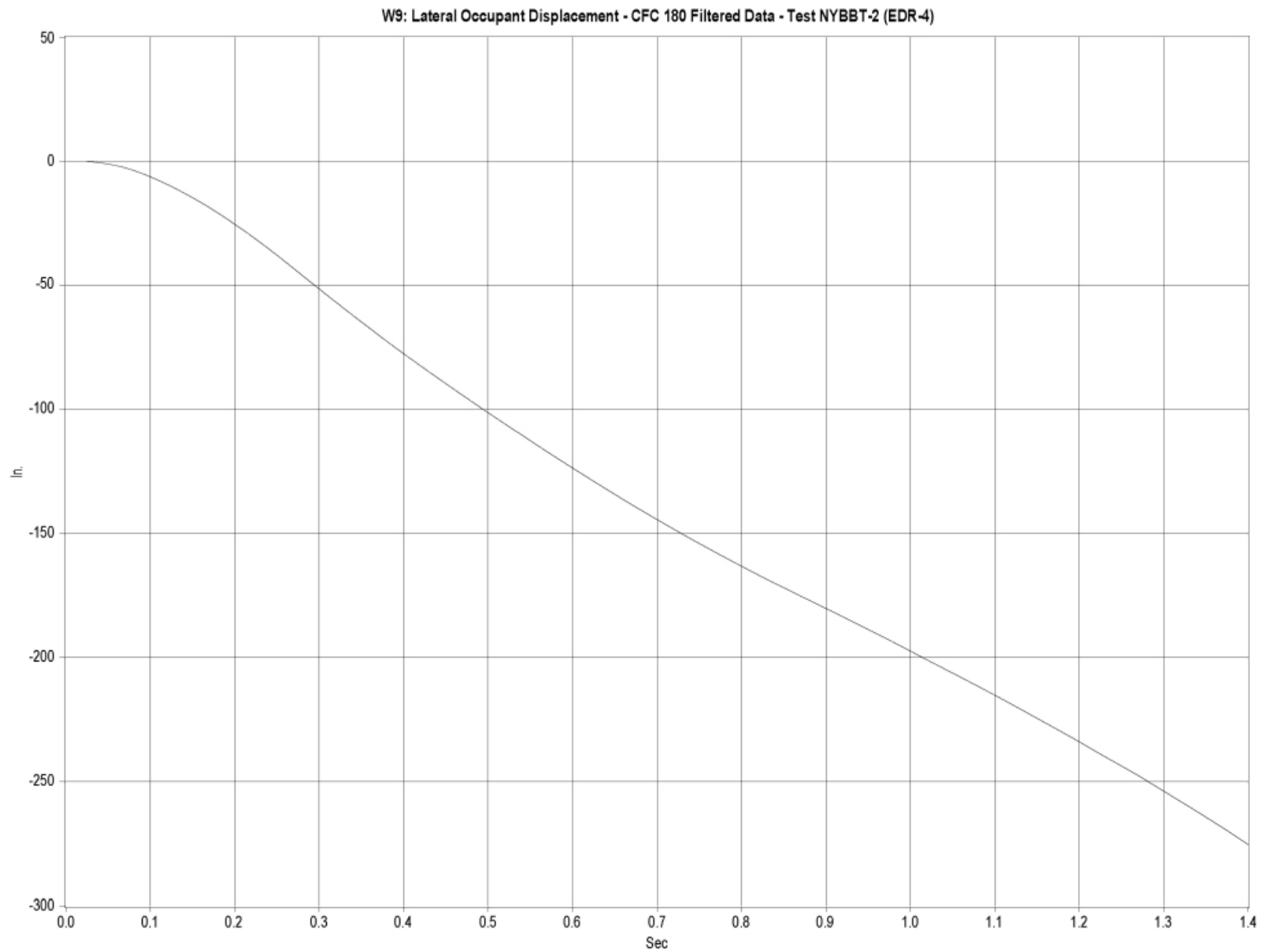


Figure H-12. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-2

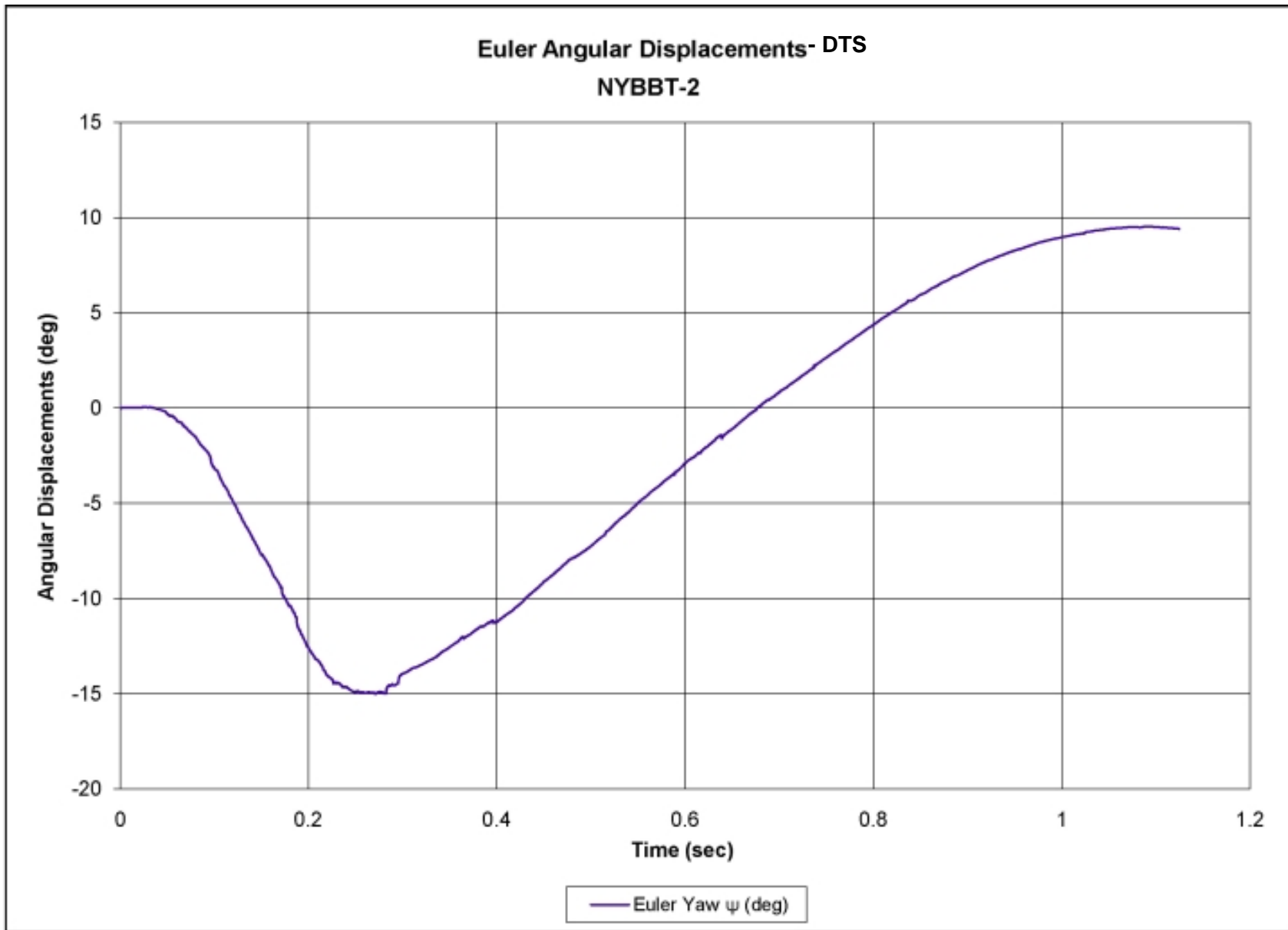


Figure H-13. Graph of Yaw Angular Displacement (DTS), Test No. NYBBT-2

**APPENDIX I Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-3**

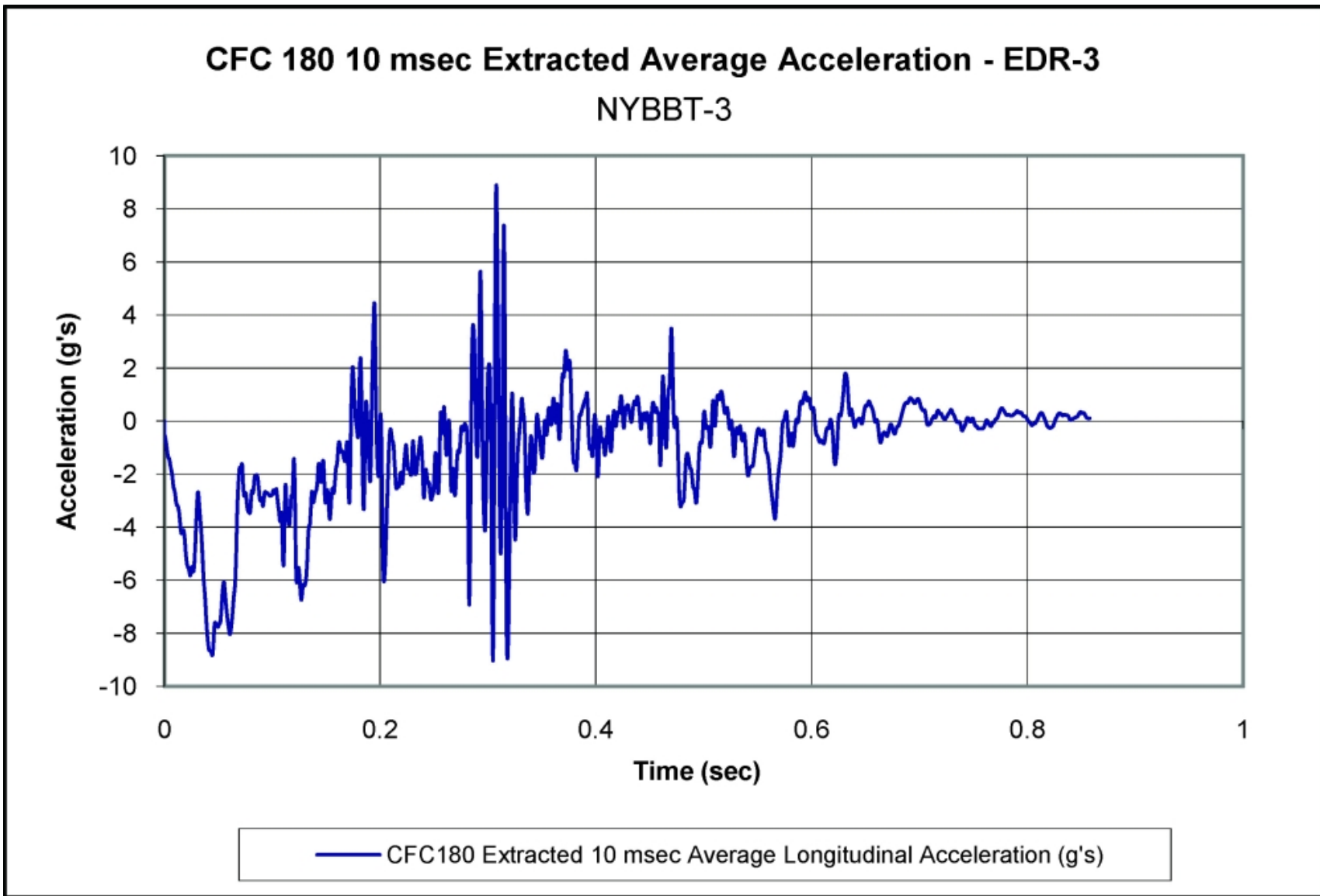


Figure I-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-3



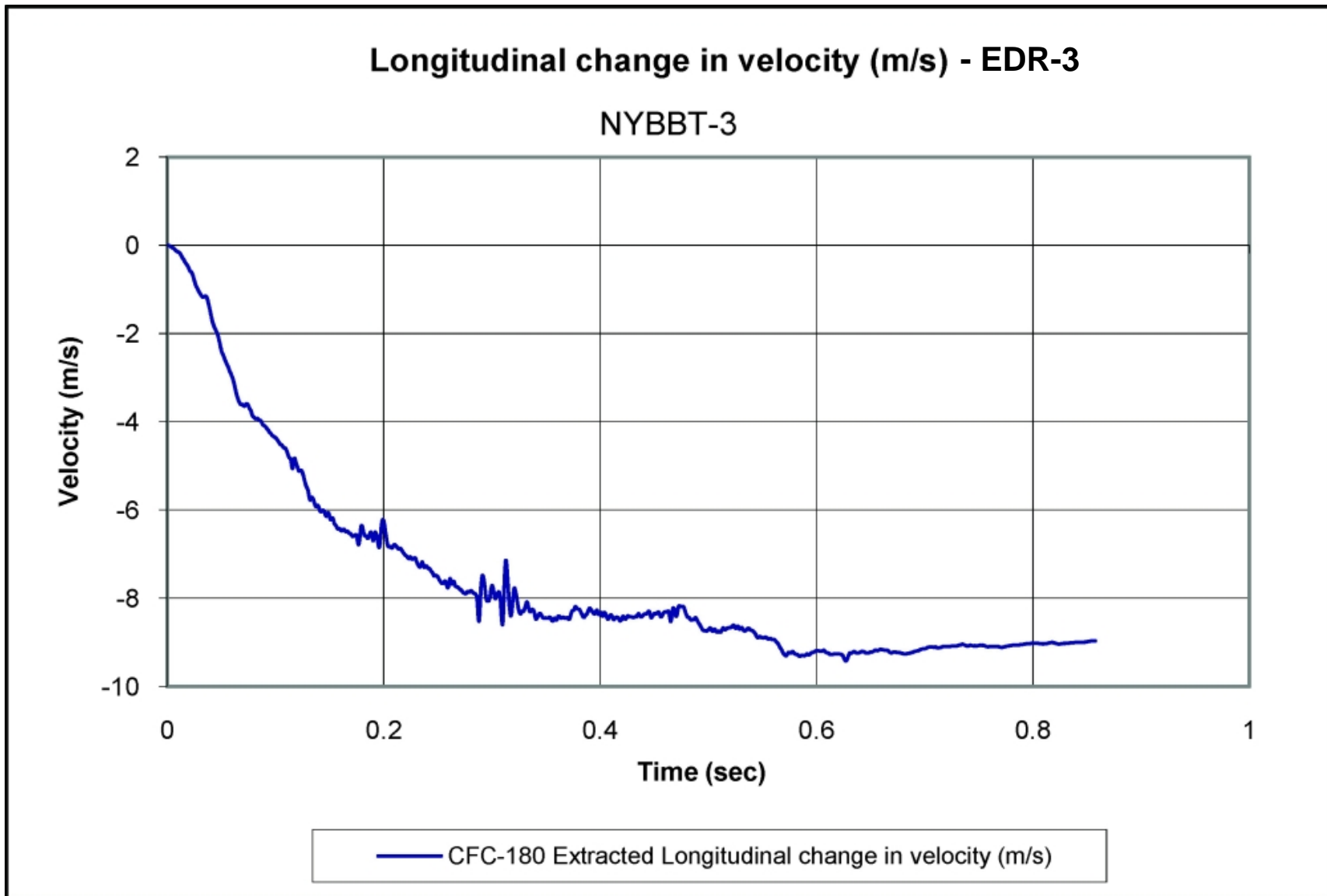


Figure I-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-3

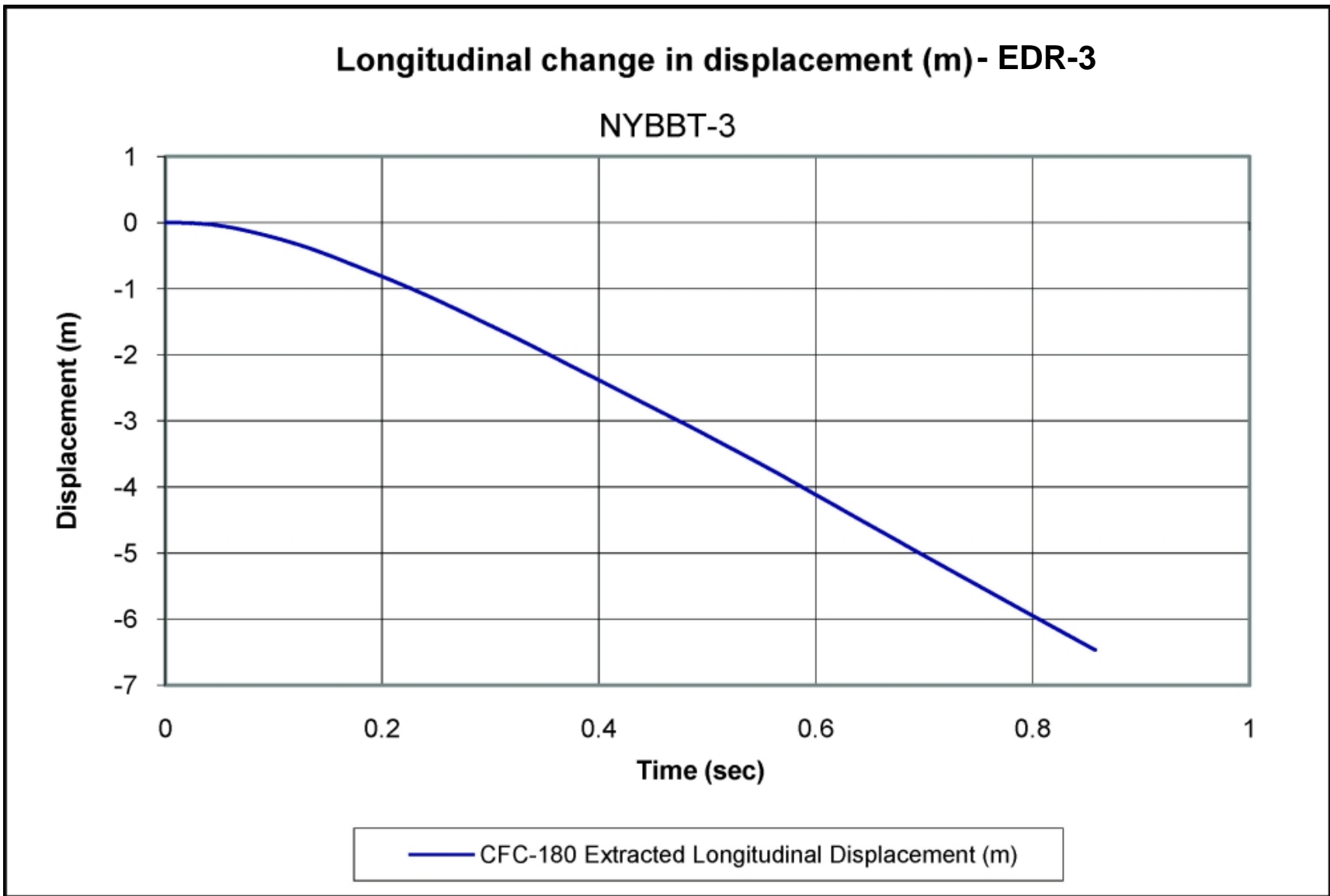


Figure I-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-3

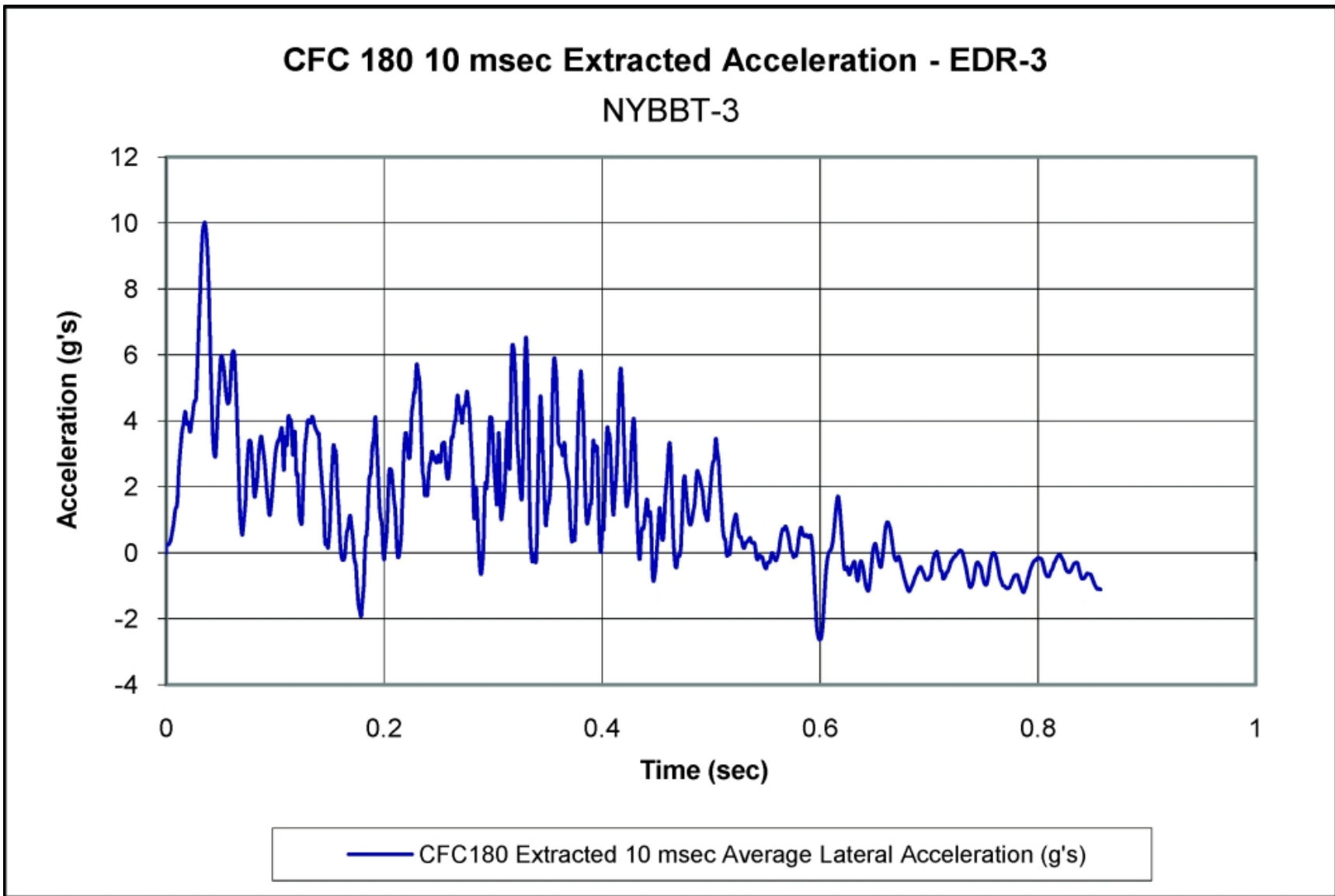


Figure I-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-3

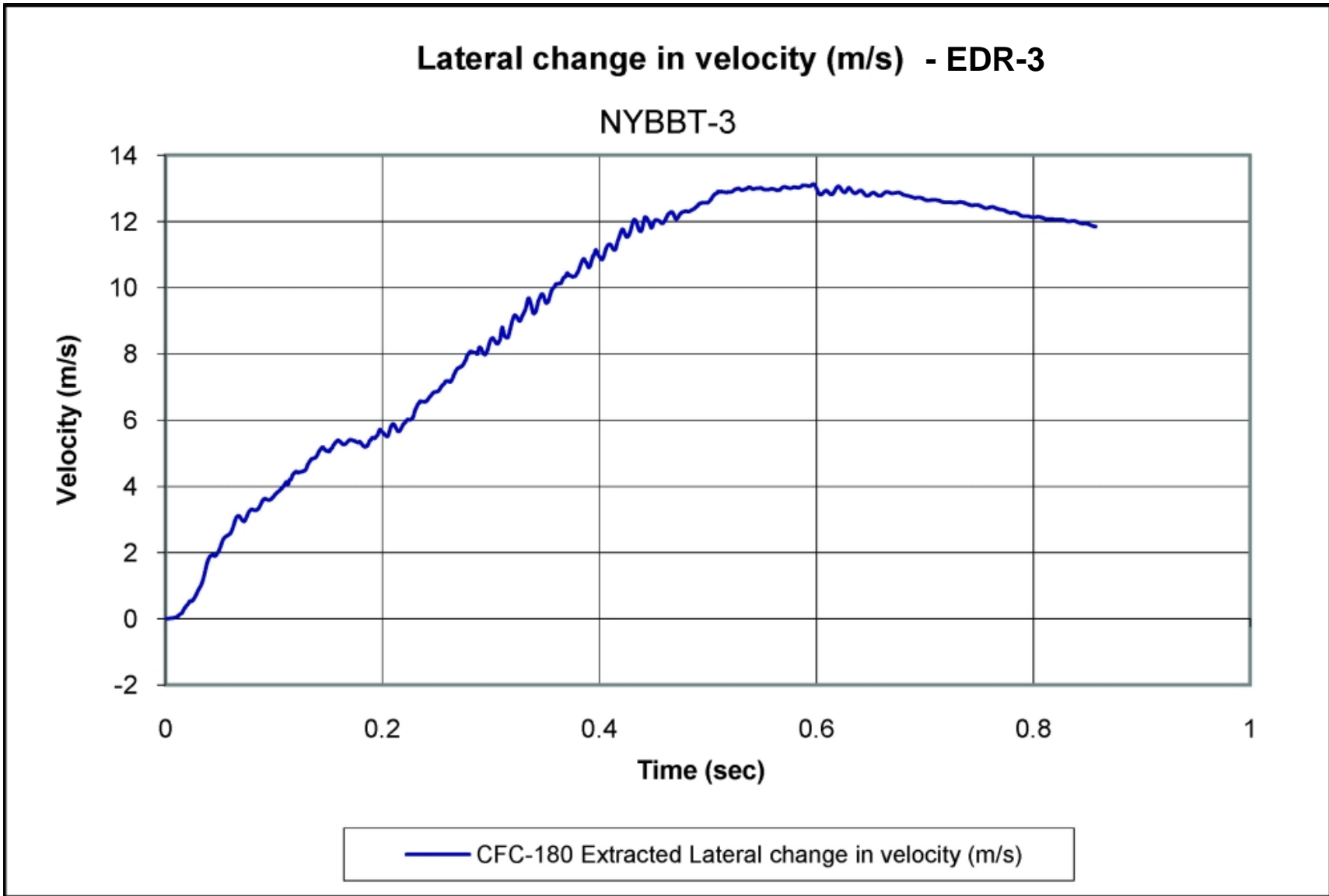


Figure I-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-3

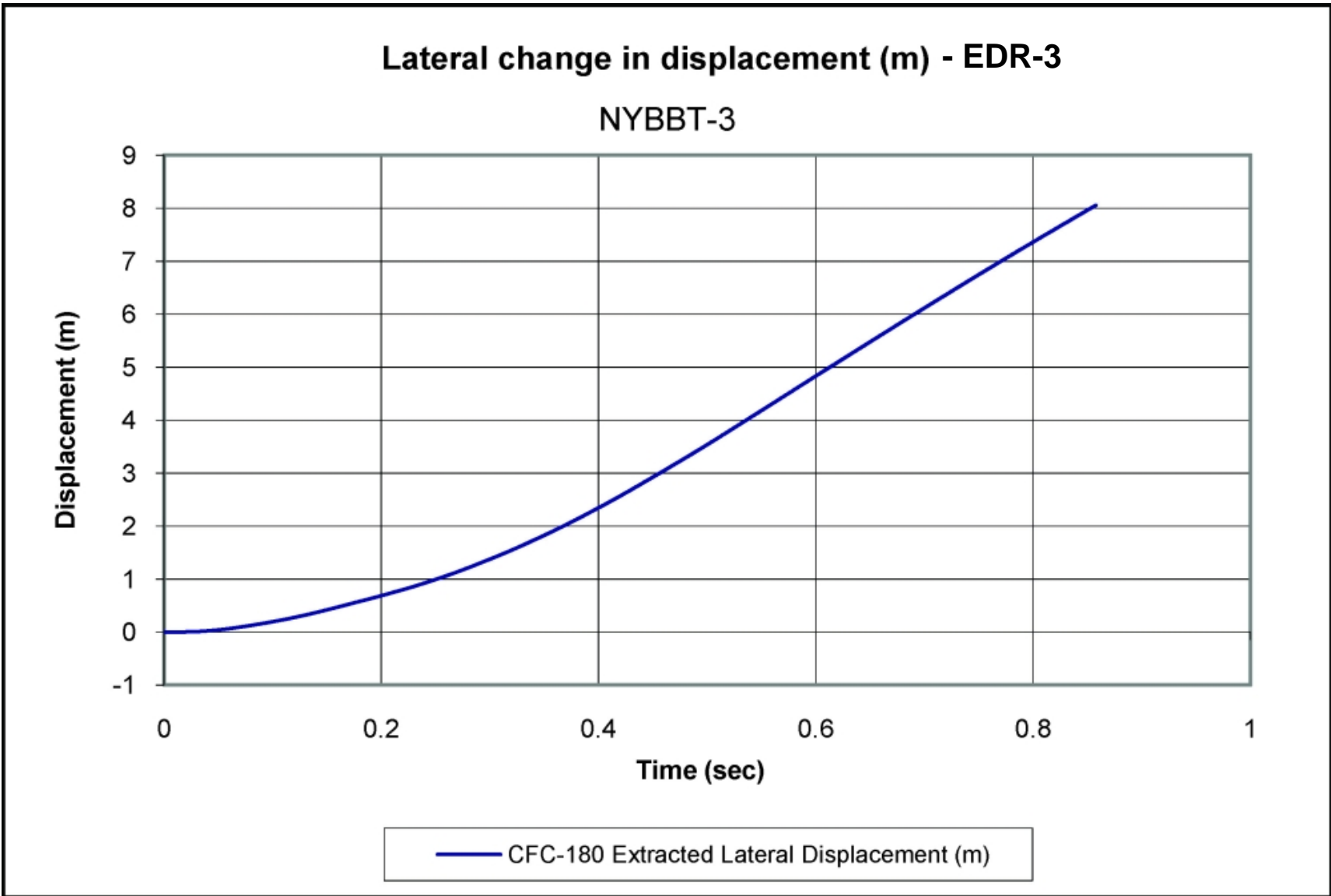


Figure I-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-3

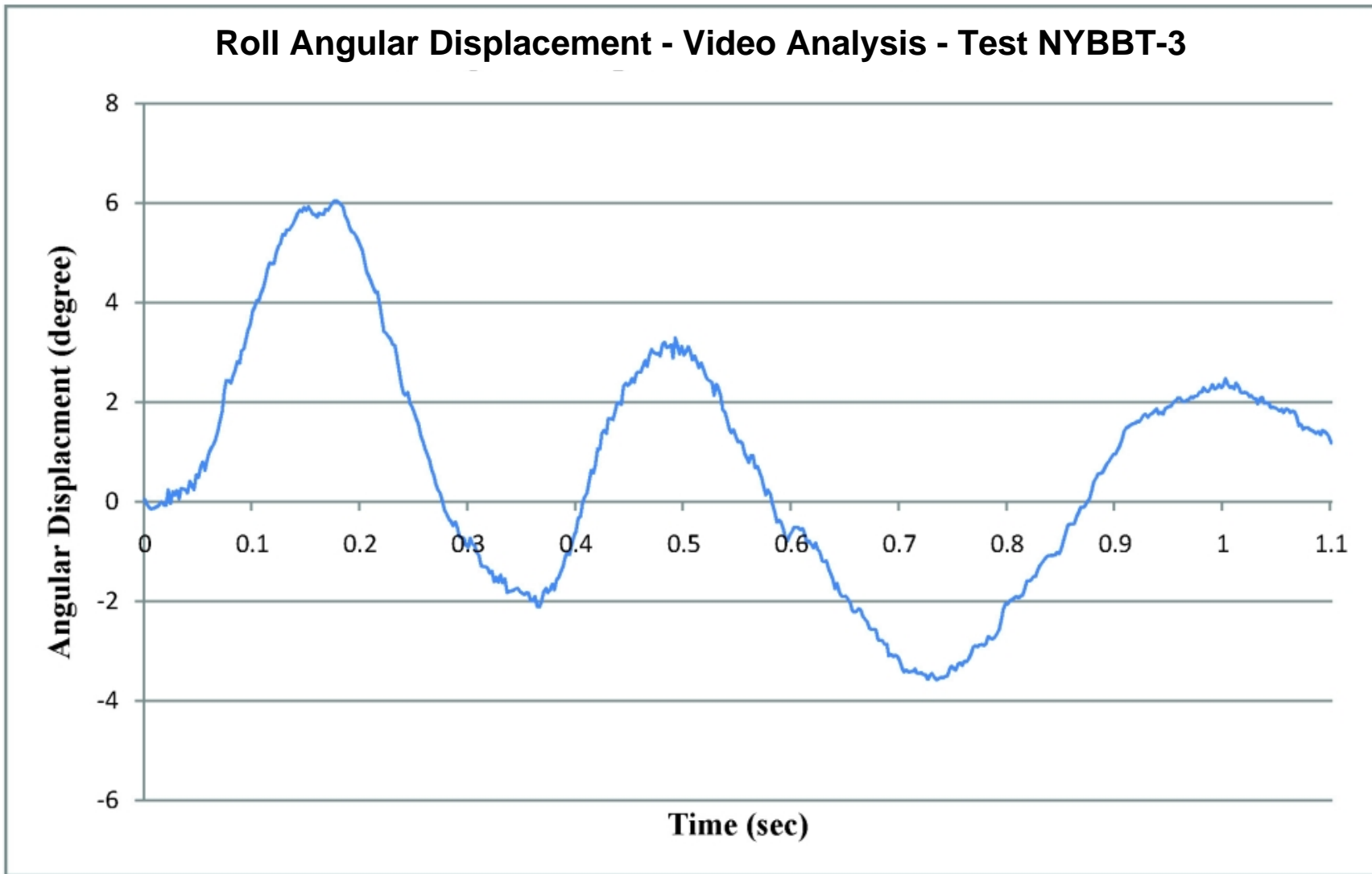


Figure I-7. Graph of Roll Angular Displacement (Video Analysis), Test No. NYBBT-3

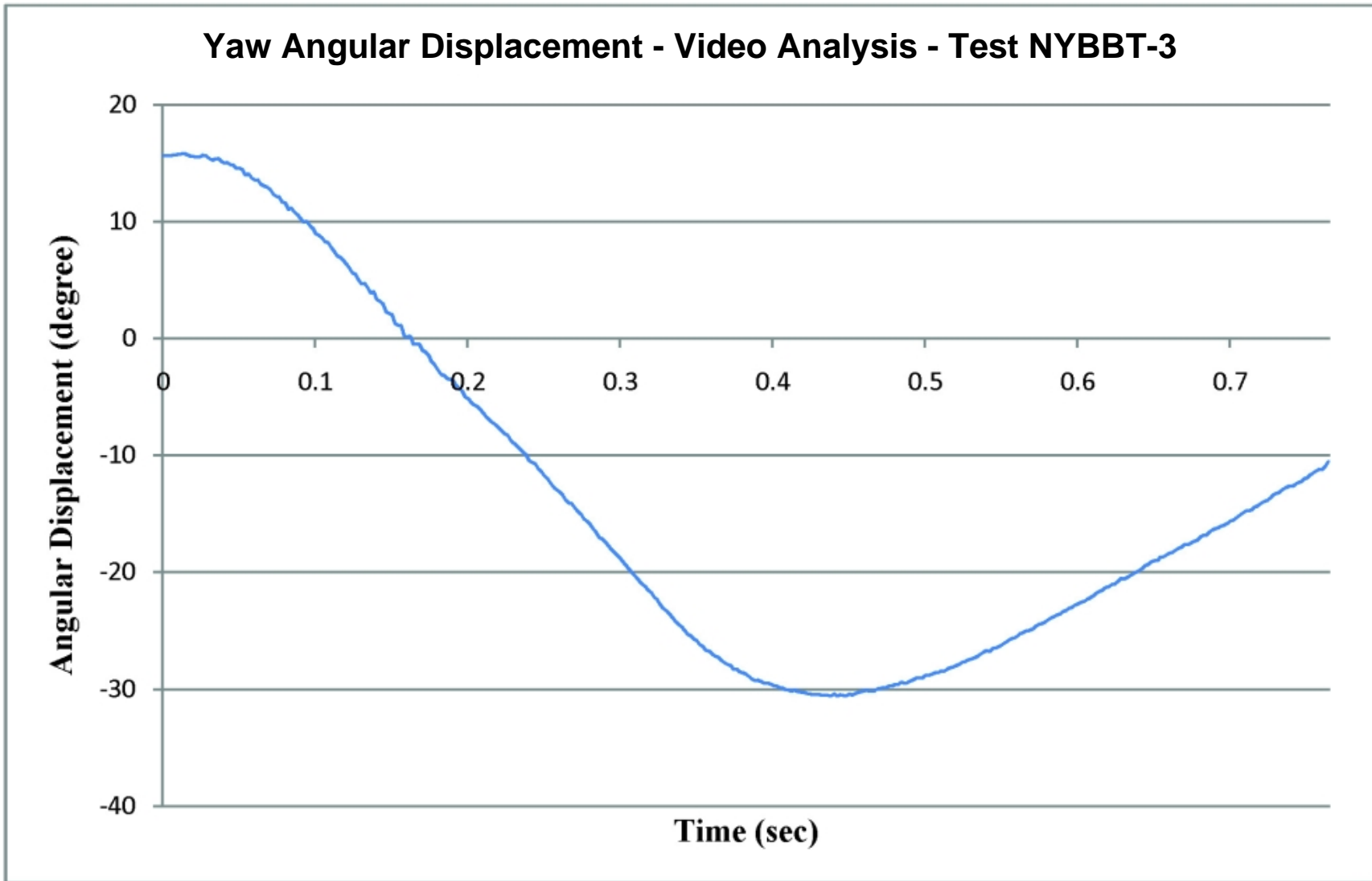


Figure I-8. Graph of Yaw Angular Displacement (Video Analysis), Test No. NYBBT-3

**APPENDIX J Modified Type IIA Box Beam Terminal System Details - Metric and English  
Units, Test No. NYBBT-4**



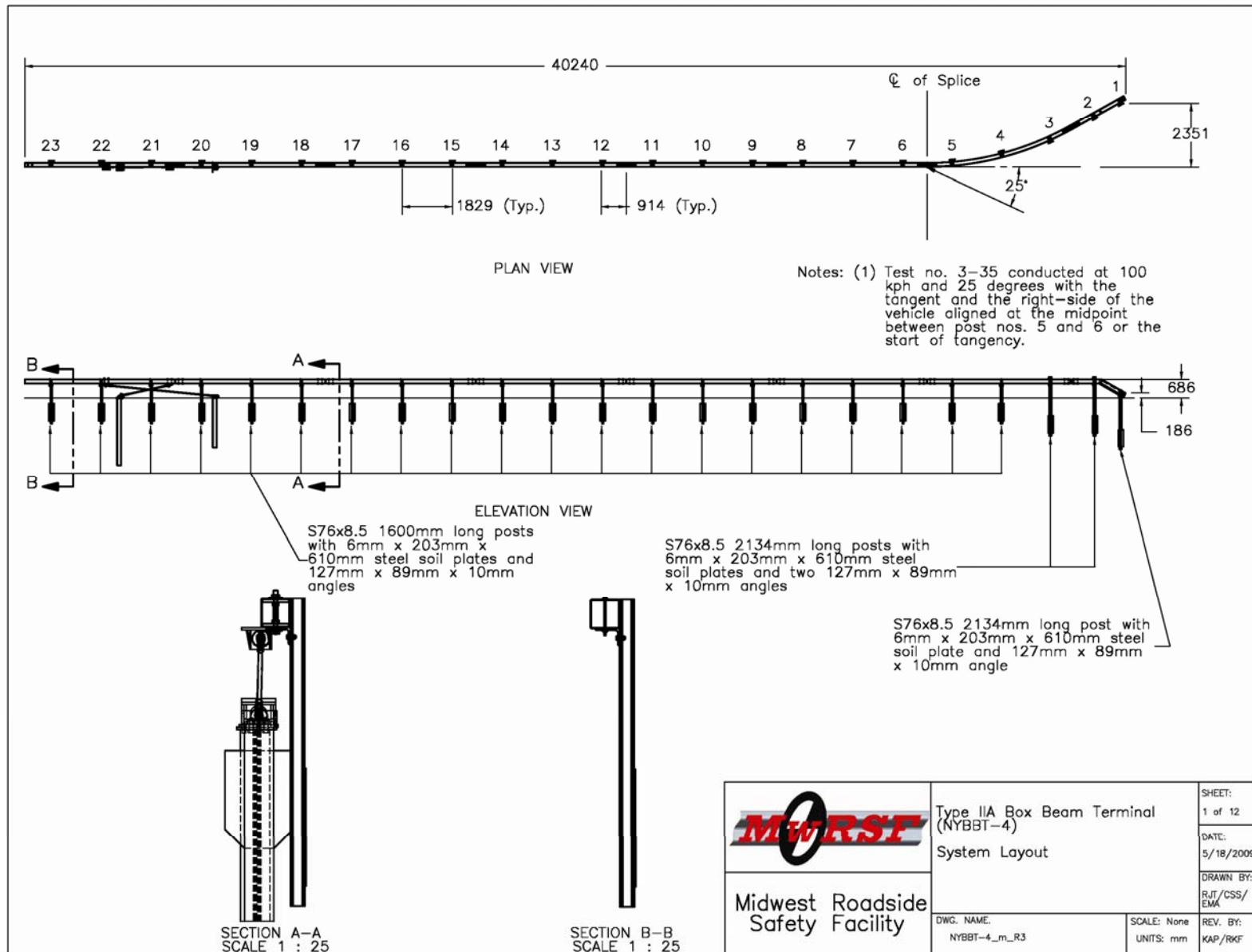


Figure J-1. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

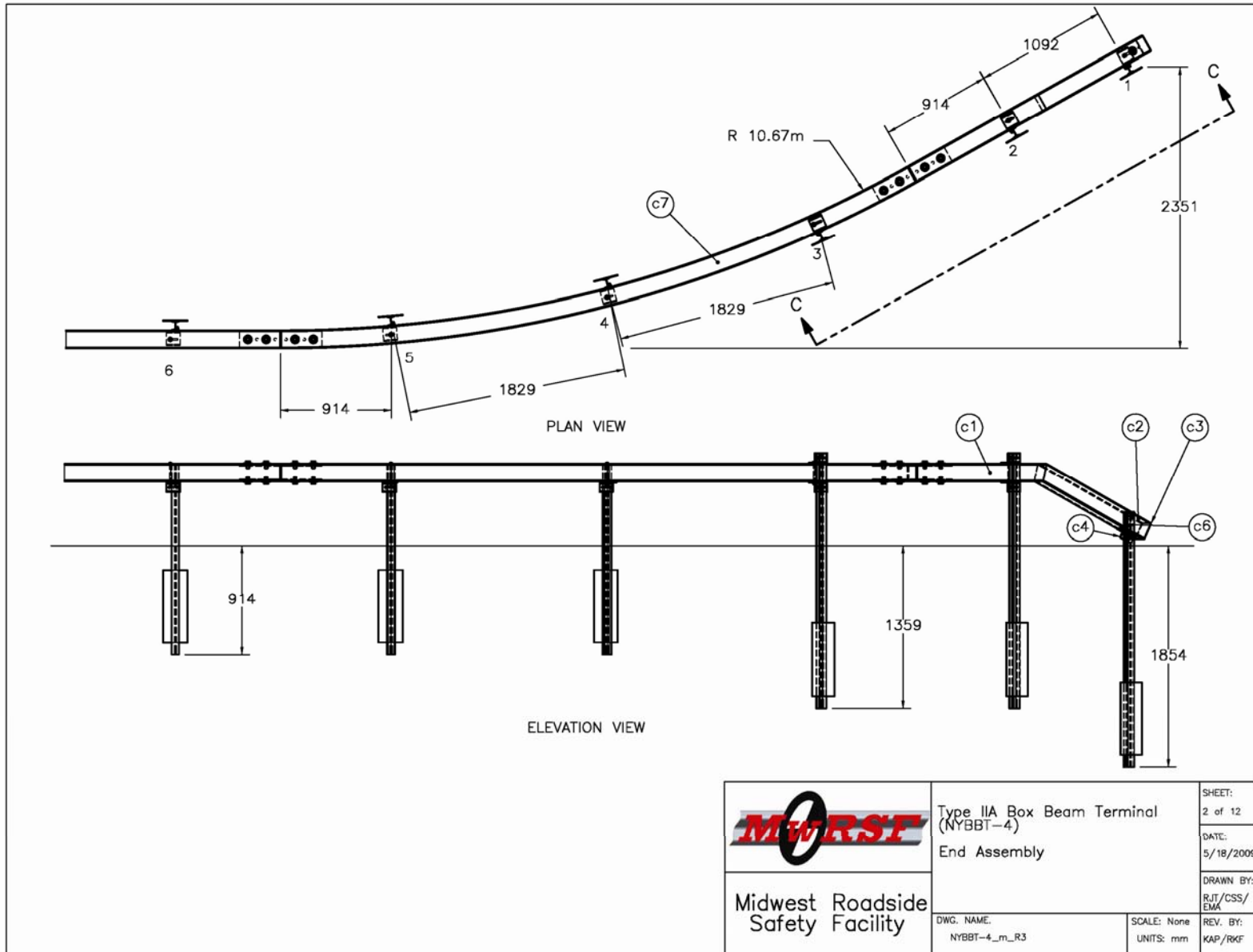


Figure J-2. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

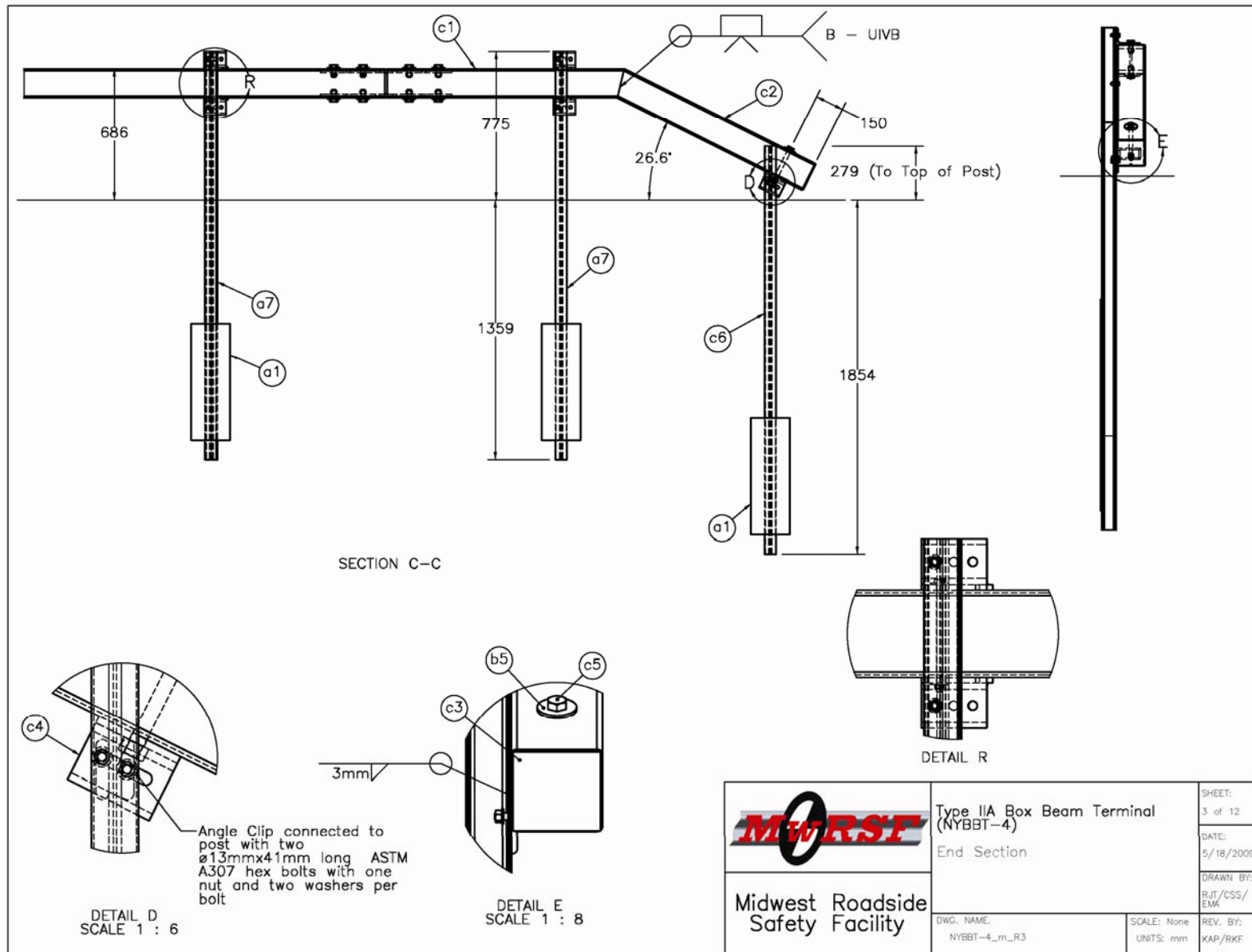


Figure J-3. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

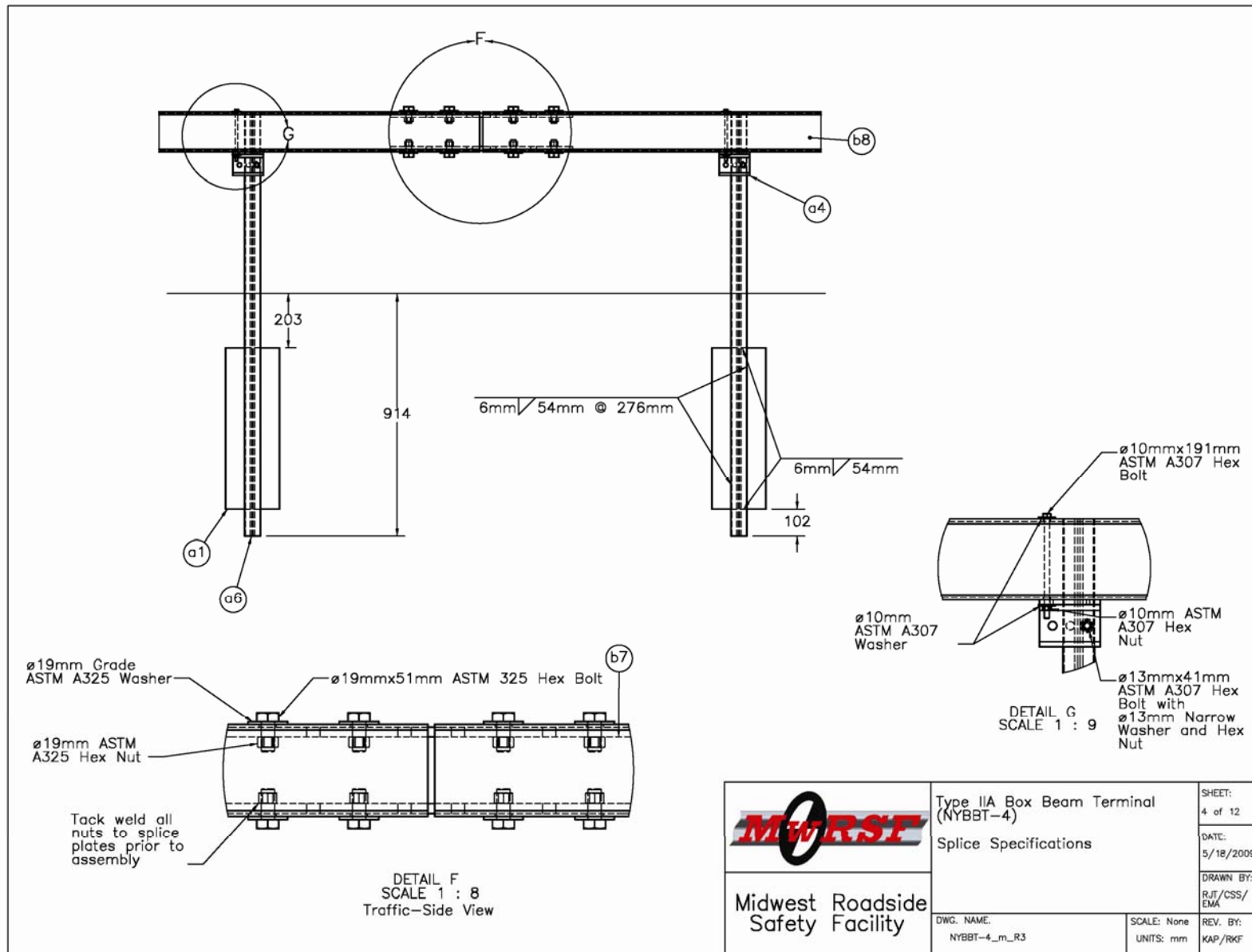


Figure J-4. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

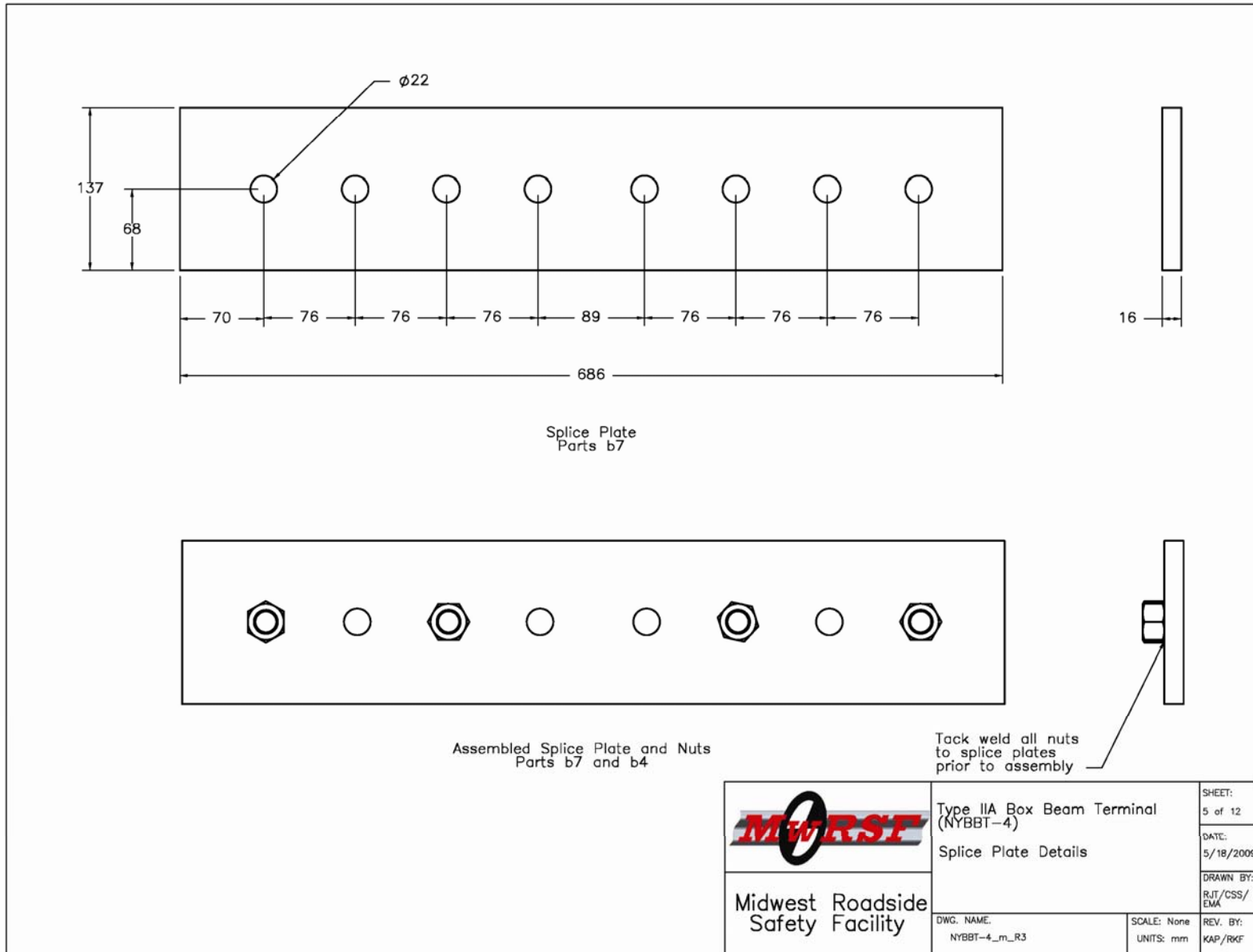


Figure J-5. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

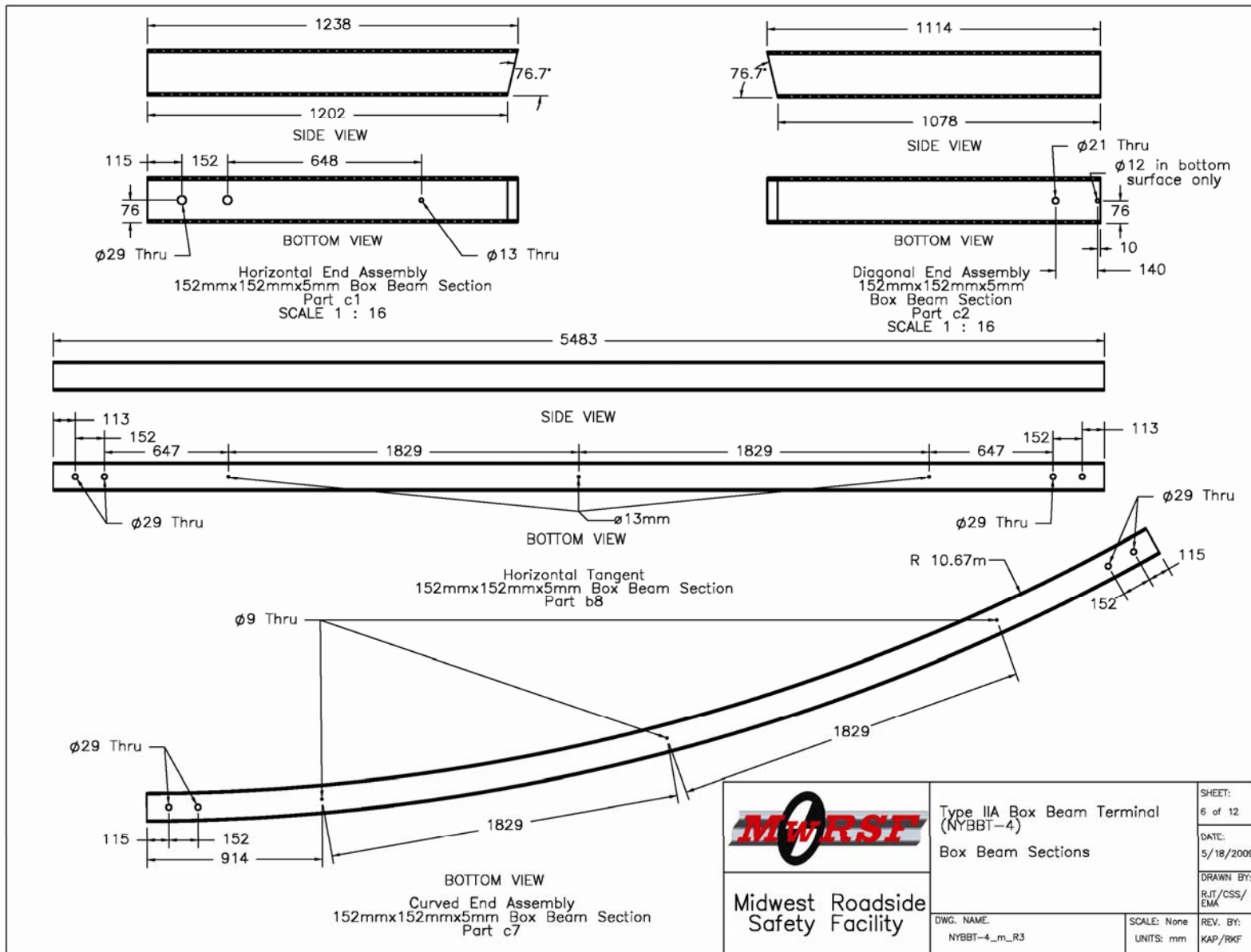


Figure J-6. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

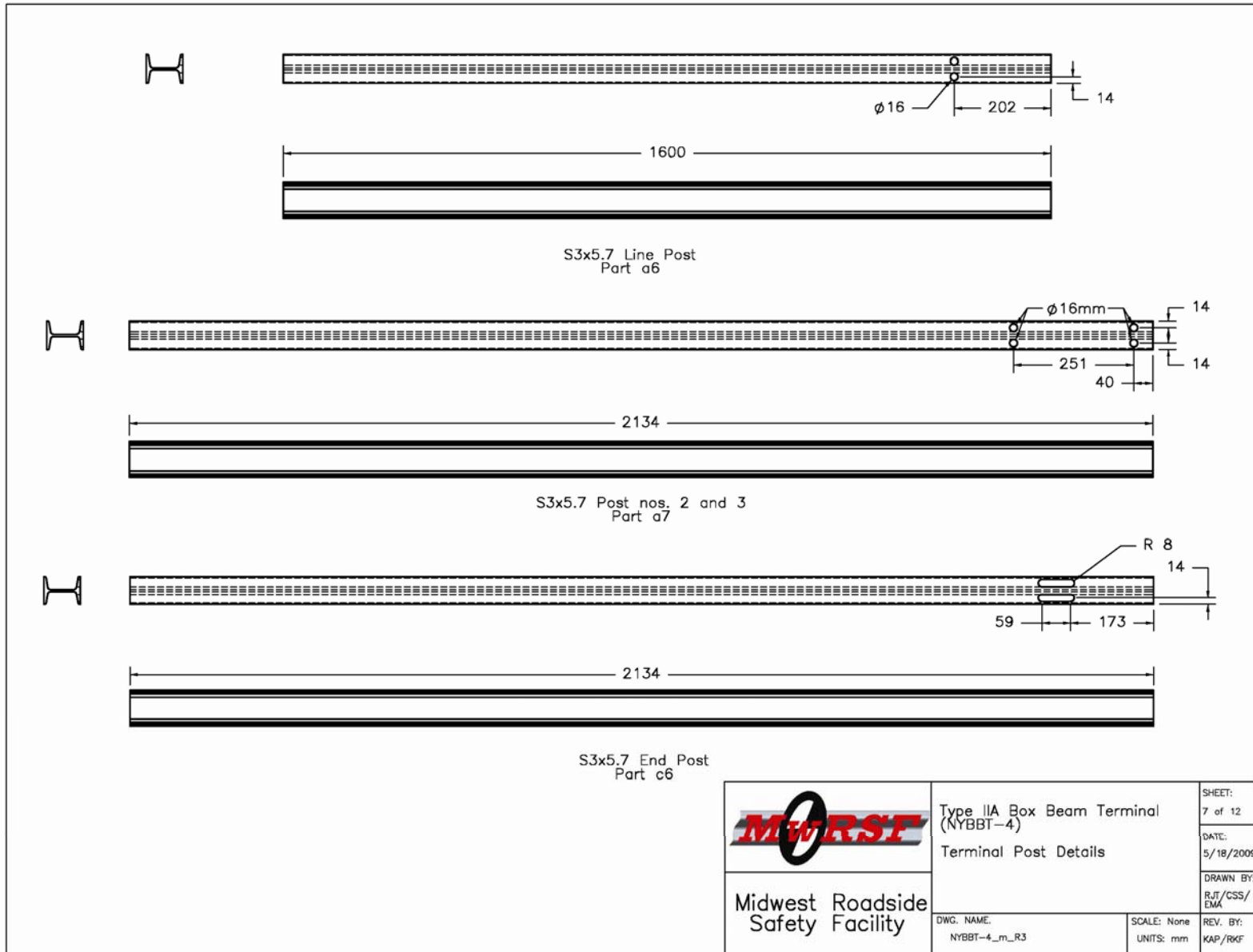


Figure J-7. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

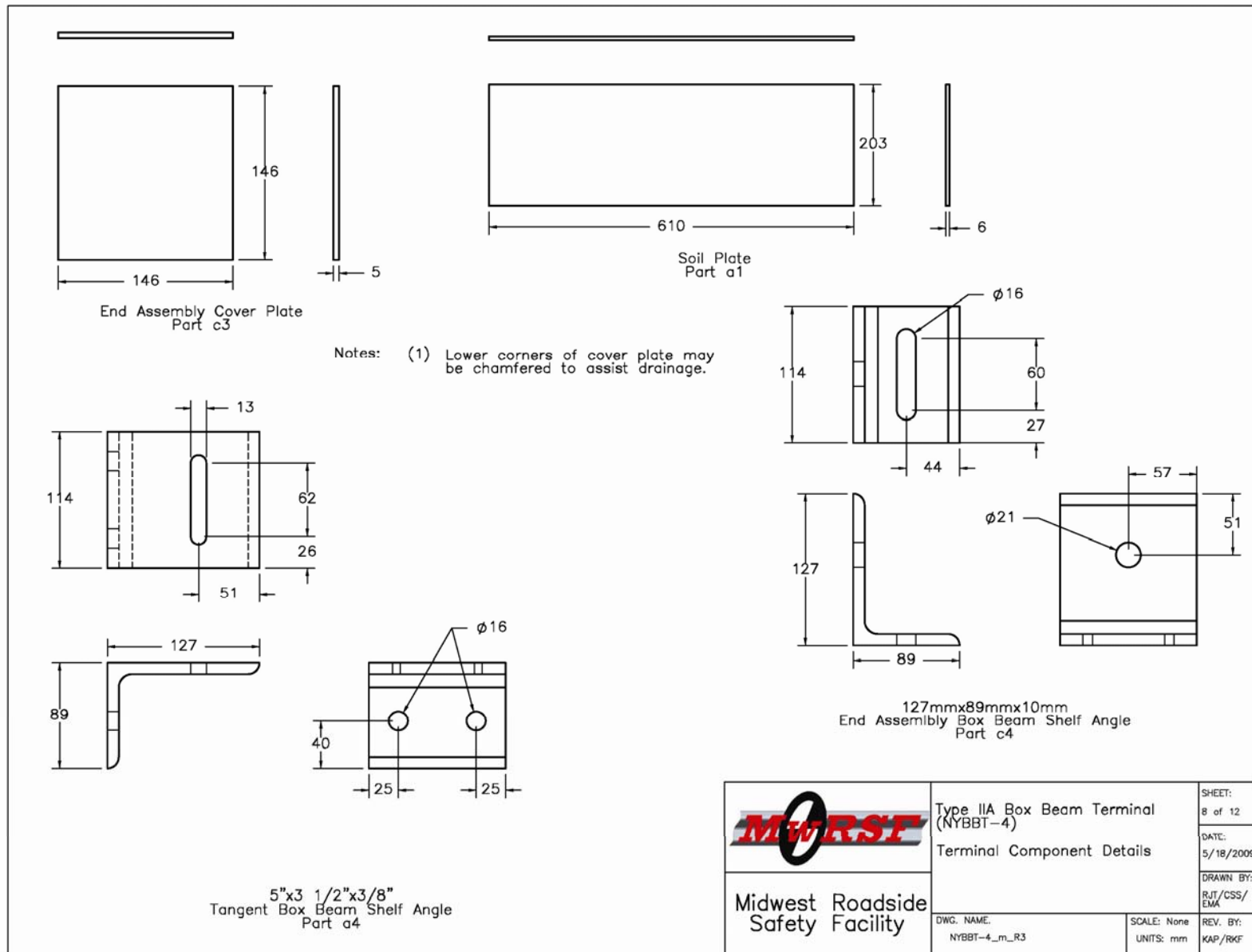


Figure J-8. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4



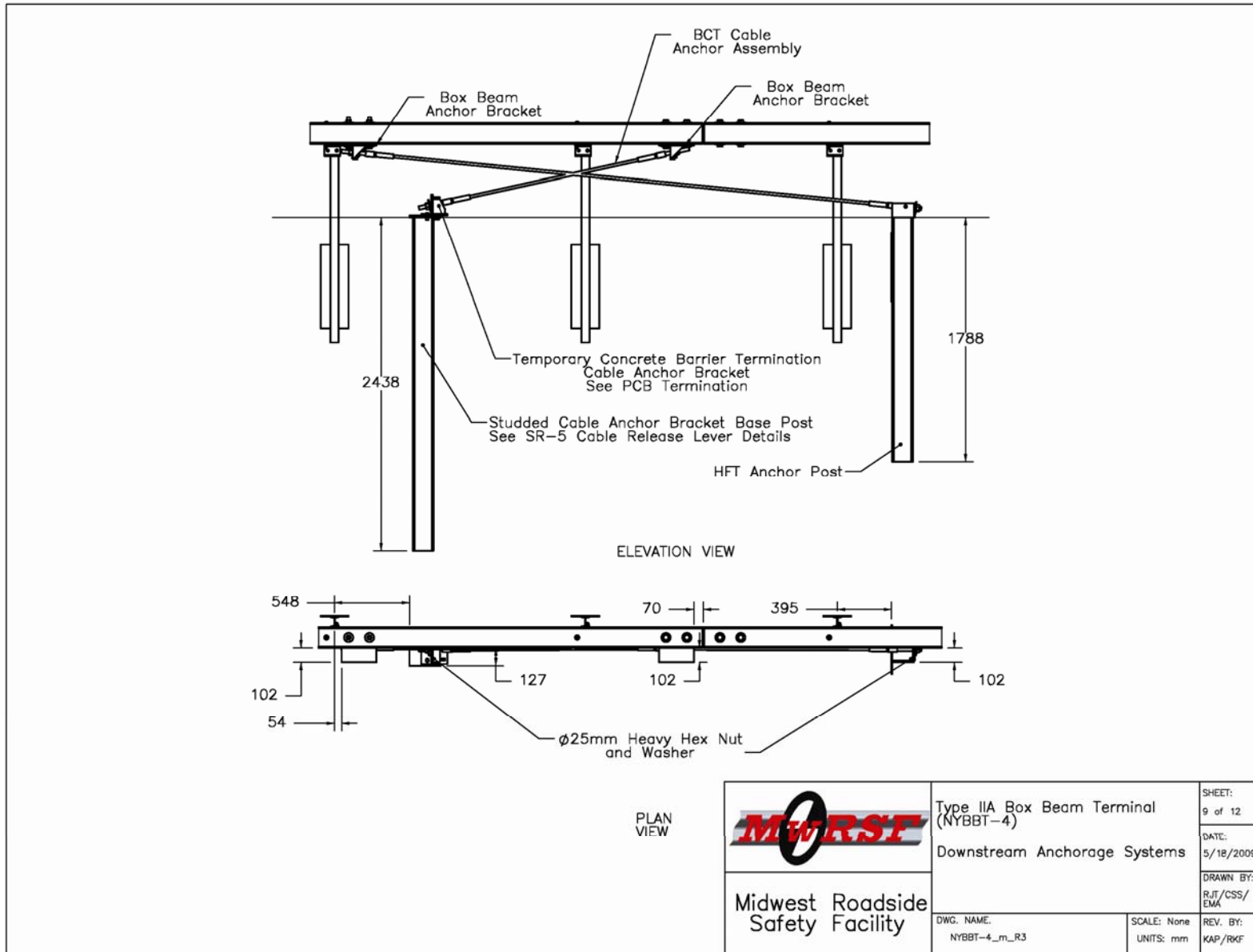


Figure J-9. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

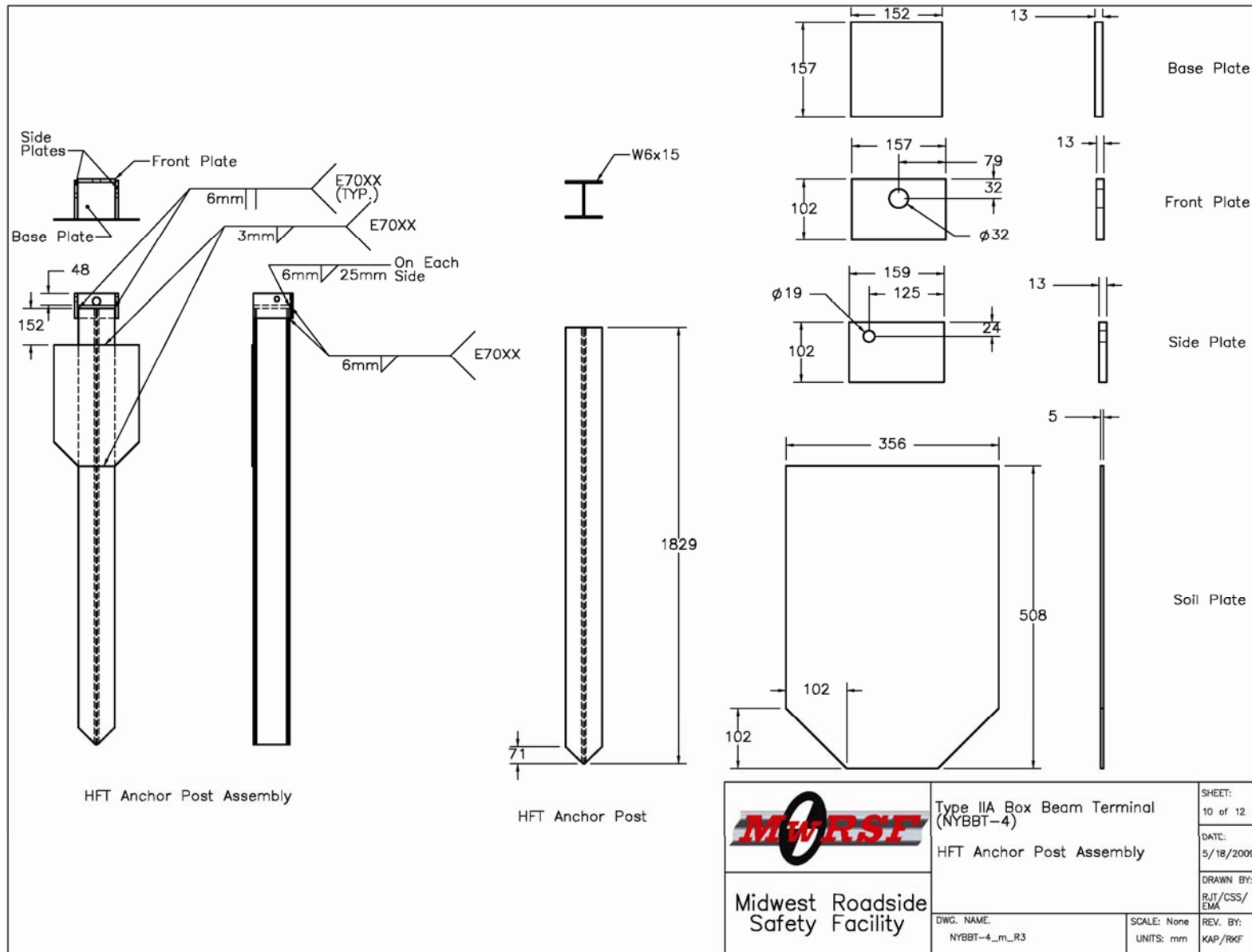


Figure J-10. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4



NYBBT-4			
Item No.	QTY.	Description	Material Spec
a1	23	6mm x 203mm x 610mm steel soil plate	A36 Steel
a2	26	∅ 13mm coarse thread 41mm long hex bolt	ASTM A307
a3	26	∅ 13mm hex nut	ASTM A307
a4	24	127mm x 89mm x 10mm box beam shelf angle	A36 Steel
a5	28	∅ 13mm narrow washer	ASTM A307
a6	20	S76 x 8.5 1600mm long post	A36 Steel
a7	2	S76 x 8.5 2134mm long post	A36 Steel
b1	22	∅ 10mm coarse thread 191mm long hex bolt	ASTM A307
b2	22	∅ 10mm hex nut	ASTM A307
b3	44	∅ 10mm wide washer	ASTM A307
b4	59	∅ 19mm hex nut	ASTM A325
b5	61	∅ 19mm wide washer	ASTM A325
b6	56	∅ 19mm coarse thread 51mm long hex bolt	ASTM A307
b7	14	686mm x 137mm x 16mm splice plate	A36 Steel
b8	6	152mmx152mmx5mm by 5483mm long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 152mmx152mmx5mm box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 152mmx152mmx5mm box beam	ASTM A500 Grade B
c3	1	End assembly 5mm thick cover plate	A36 Steel
c4	1	127mm x 89mm x 10mm box beam anchor post shelf angle	A36 Steel
c5	1	∅ 19mm coarse thread 197mm long hex bolt	ASTM A307
c6	1	S76 x 8.5 2134mm long post anchor post	A36 Steel
c7	1	152mmx152mmx5mm R 10.67m Curved Box Beam	ASTM A500 Grade B

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-4) Bill of Materials	SHEET: 12 of 12 DATE: 5/18/2009 DRAWN BY: RJT/CSS/ EMA
	DWG. NAME: NYBBT-4_m_R3	SCALE: None UNITS: mm

Figure J-12. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-4

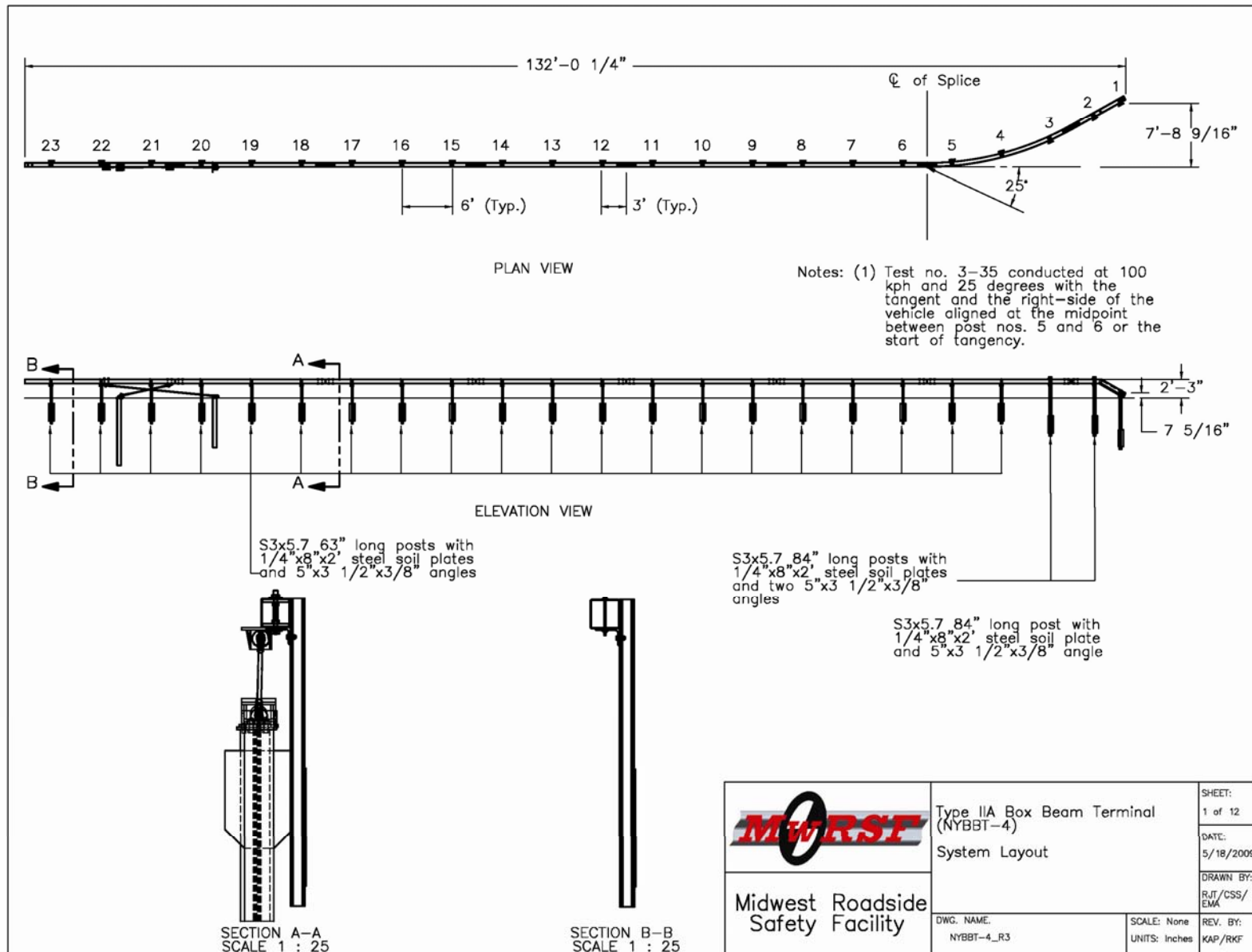


Figure J-13. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4

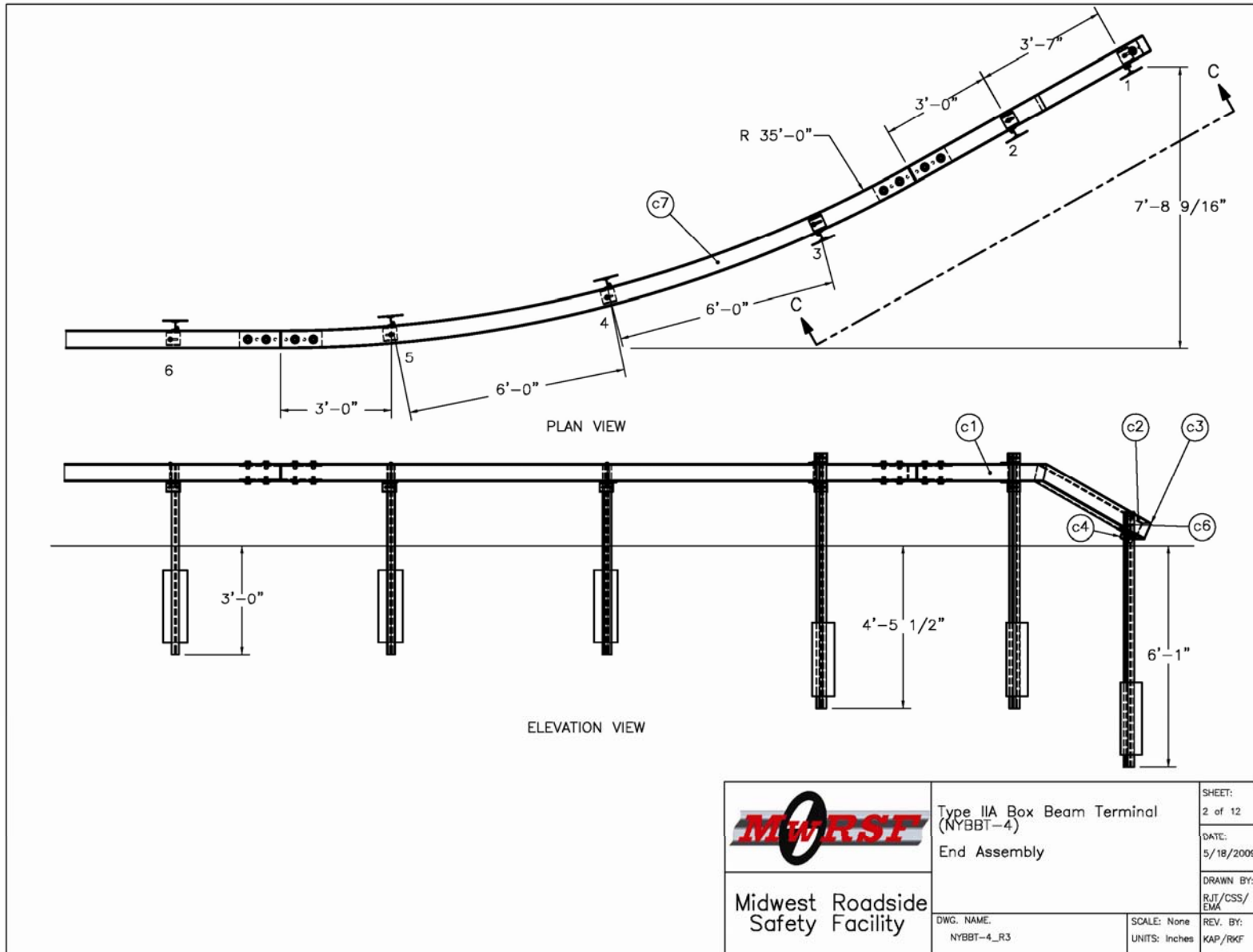


Figure J-14. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4

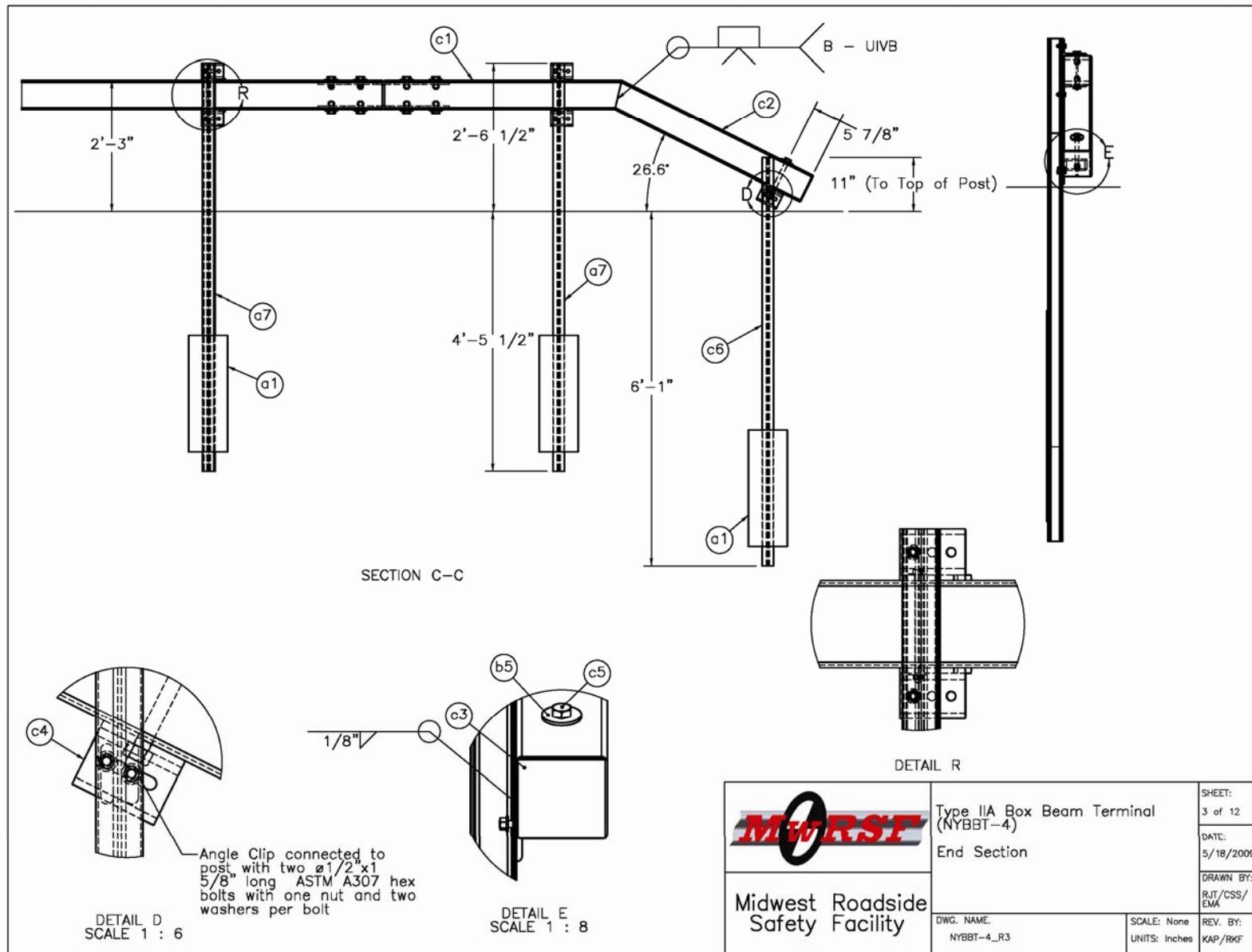


Figure J-15. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4

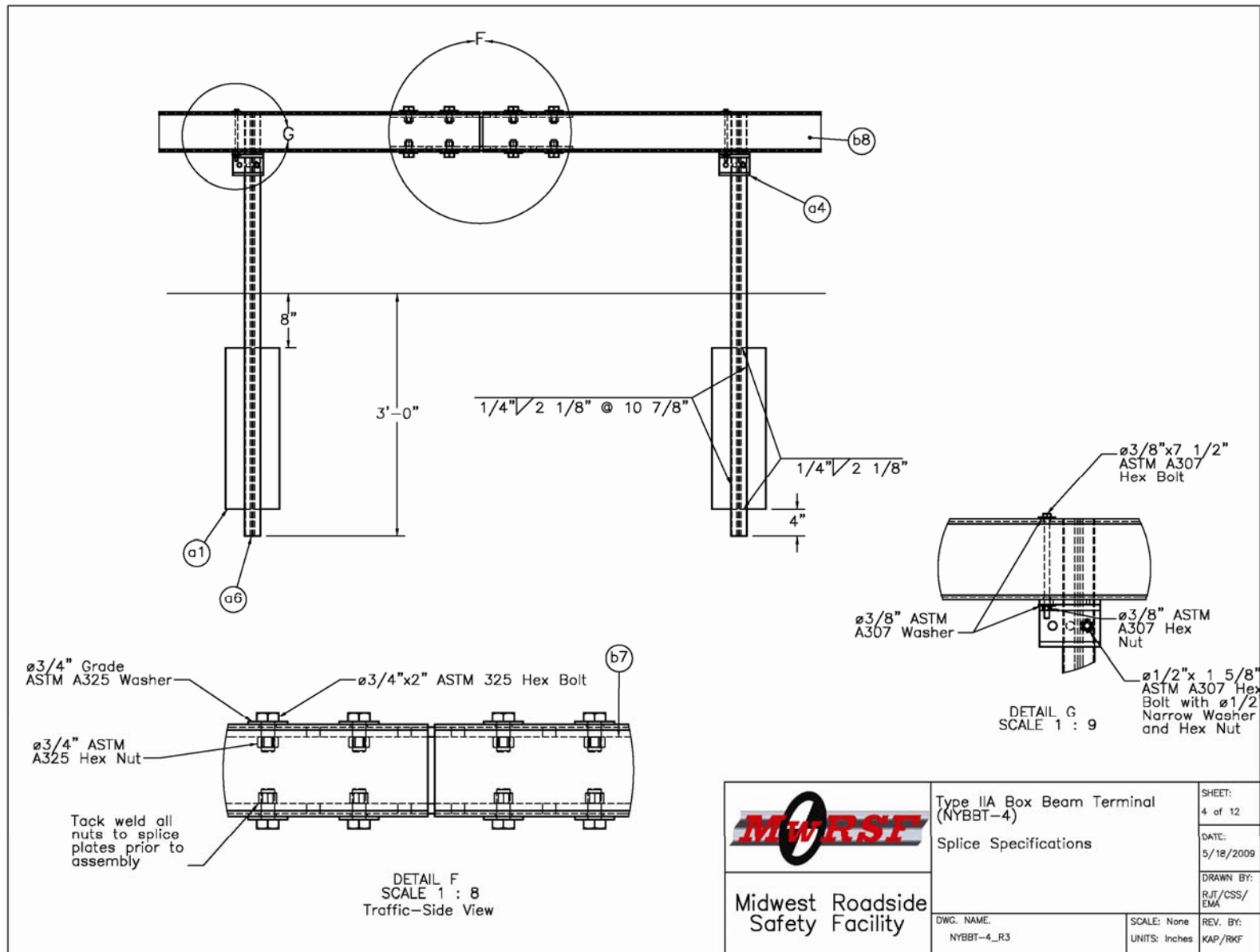


Figure J-16. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4



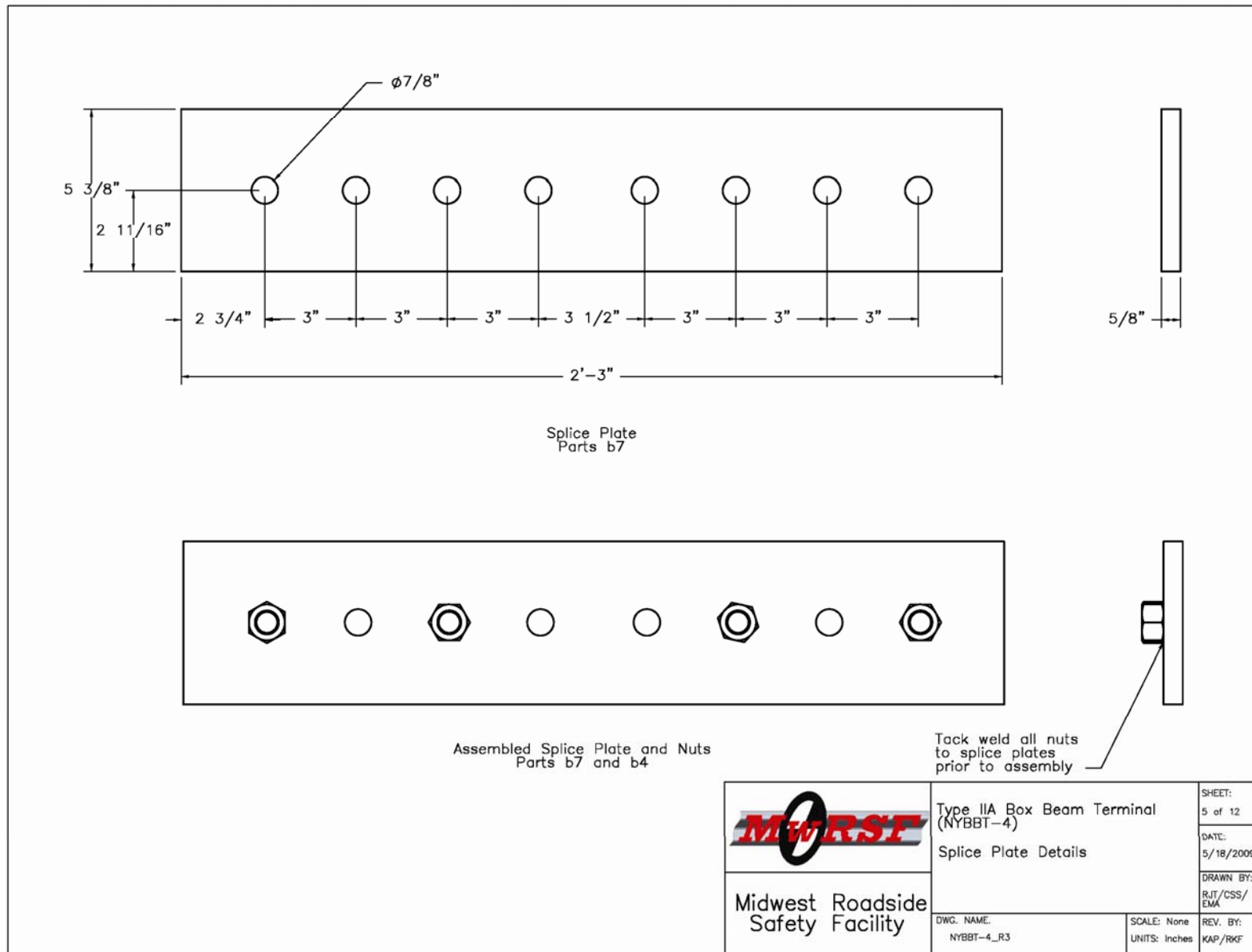


Figure J-17. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4



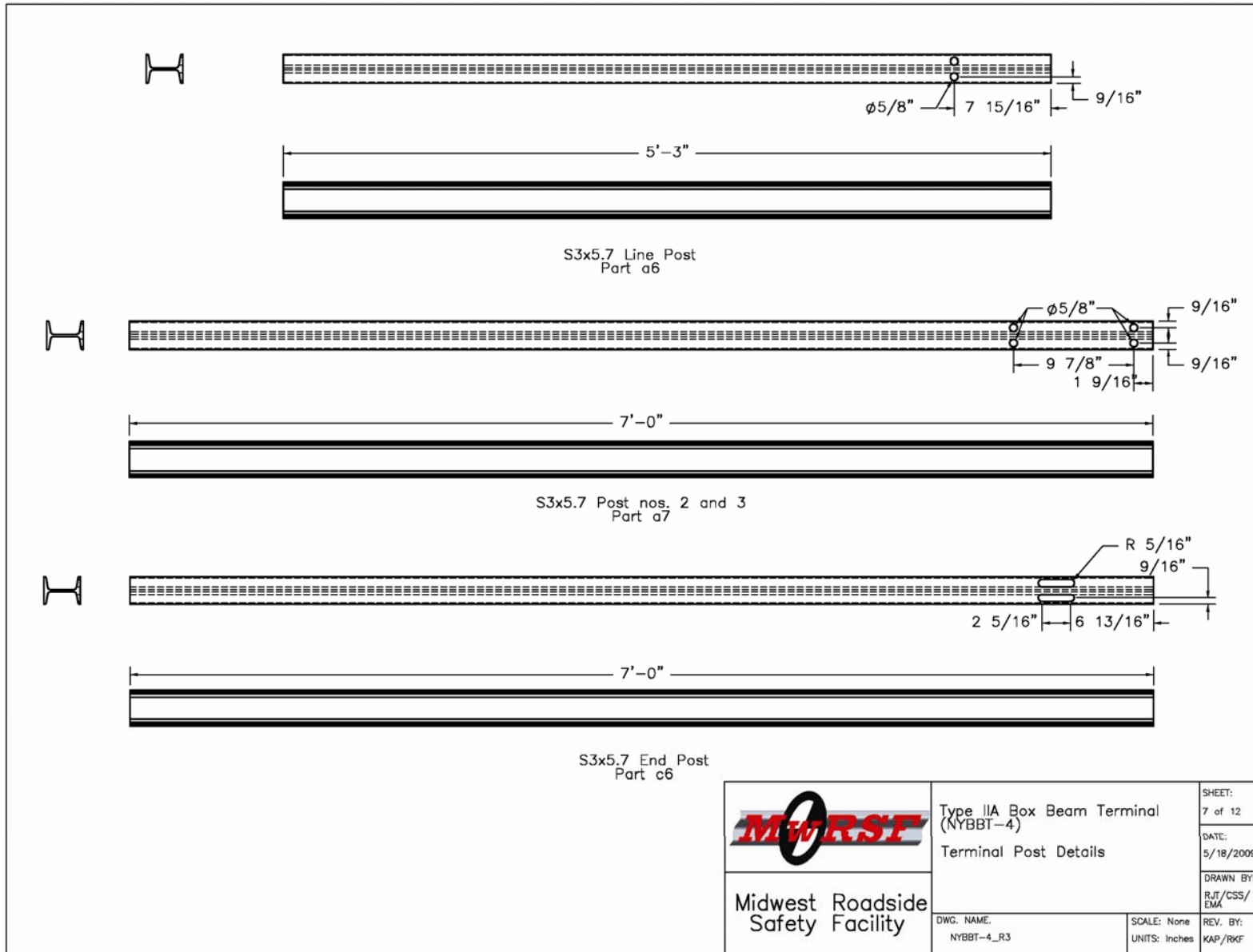


Figure J-19. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4

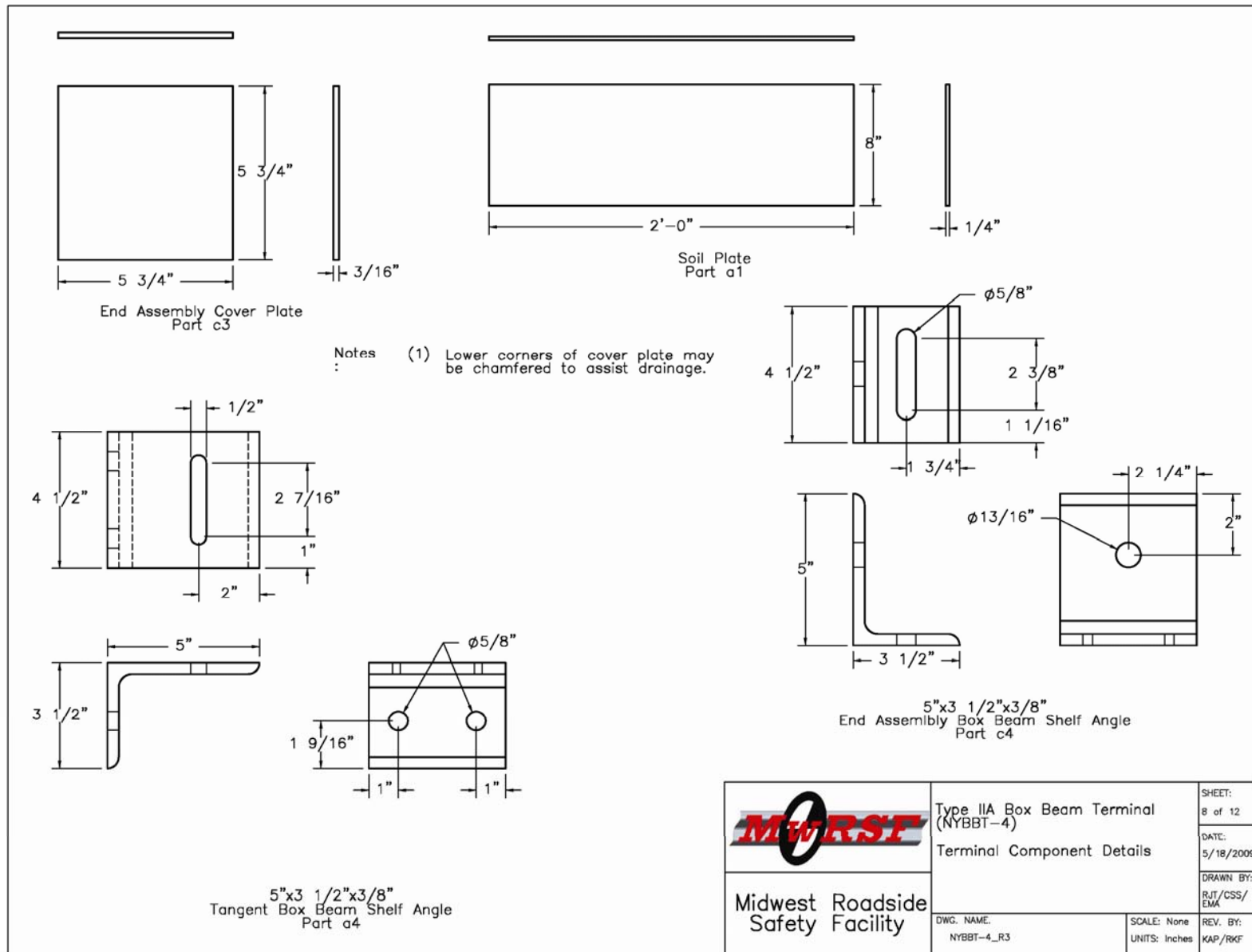


Figure J-20. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4

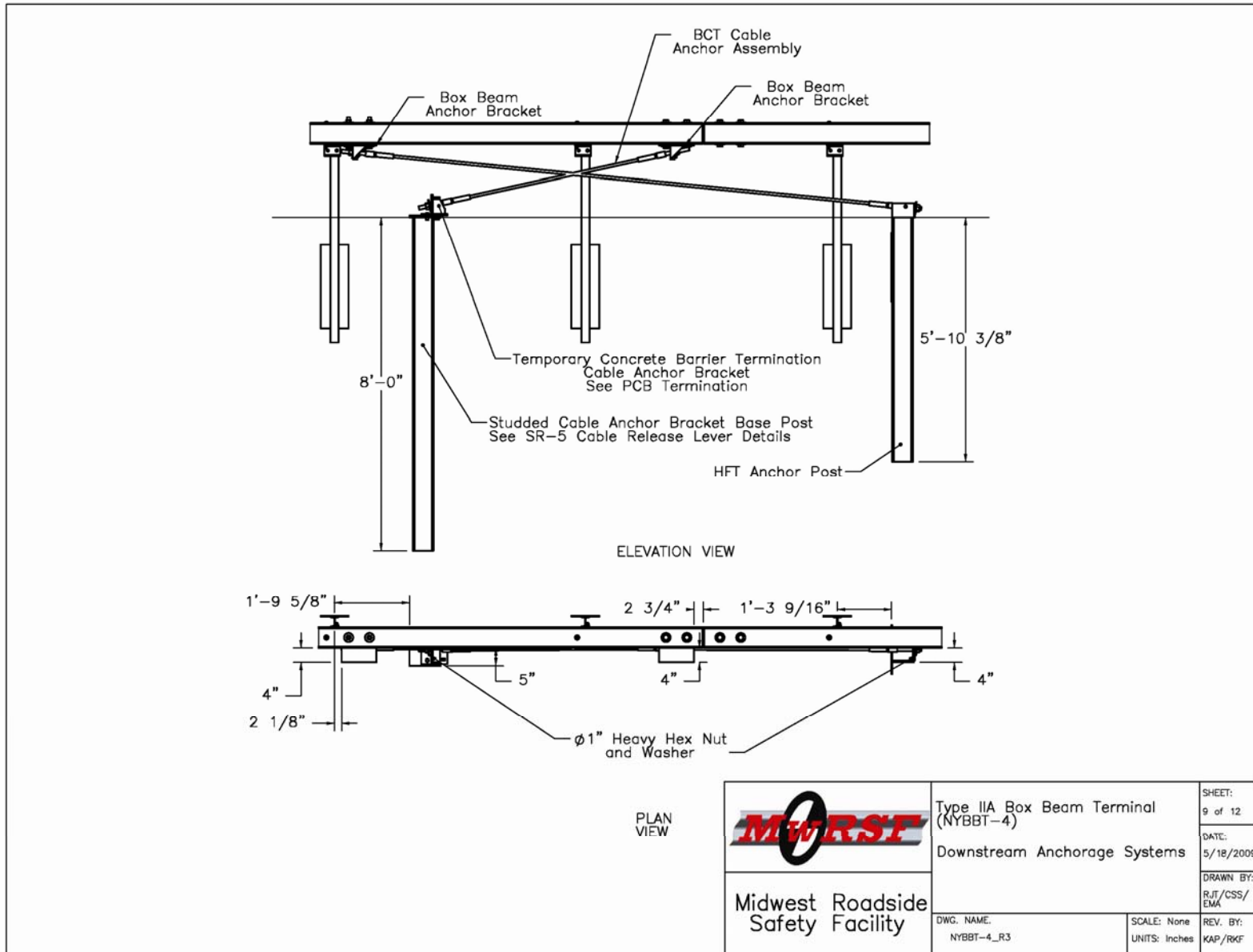


Figure J-21. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4

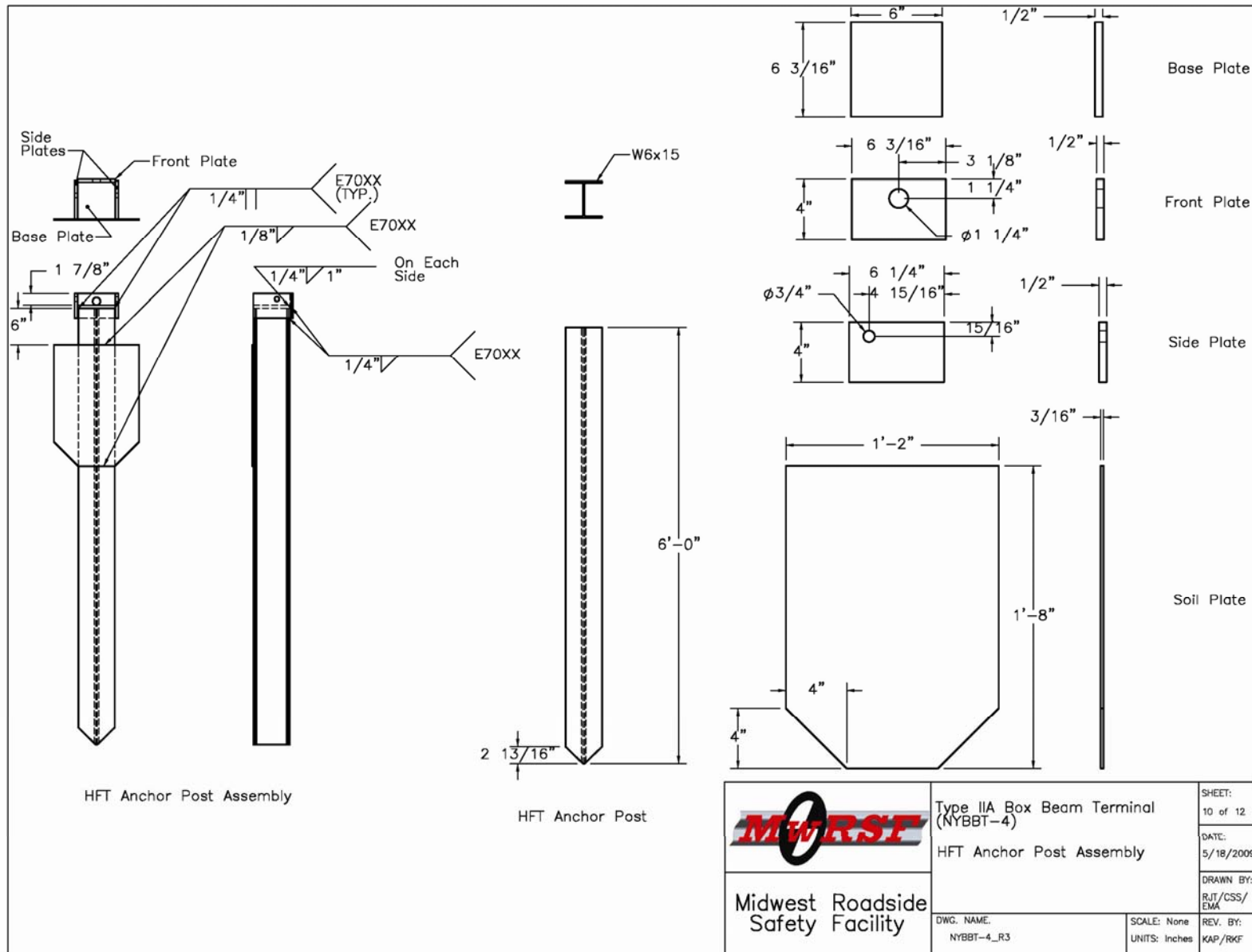
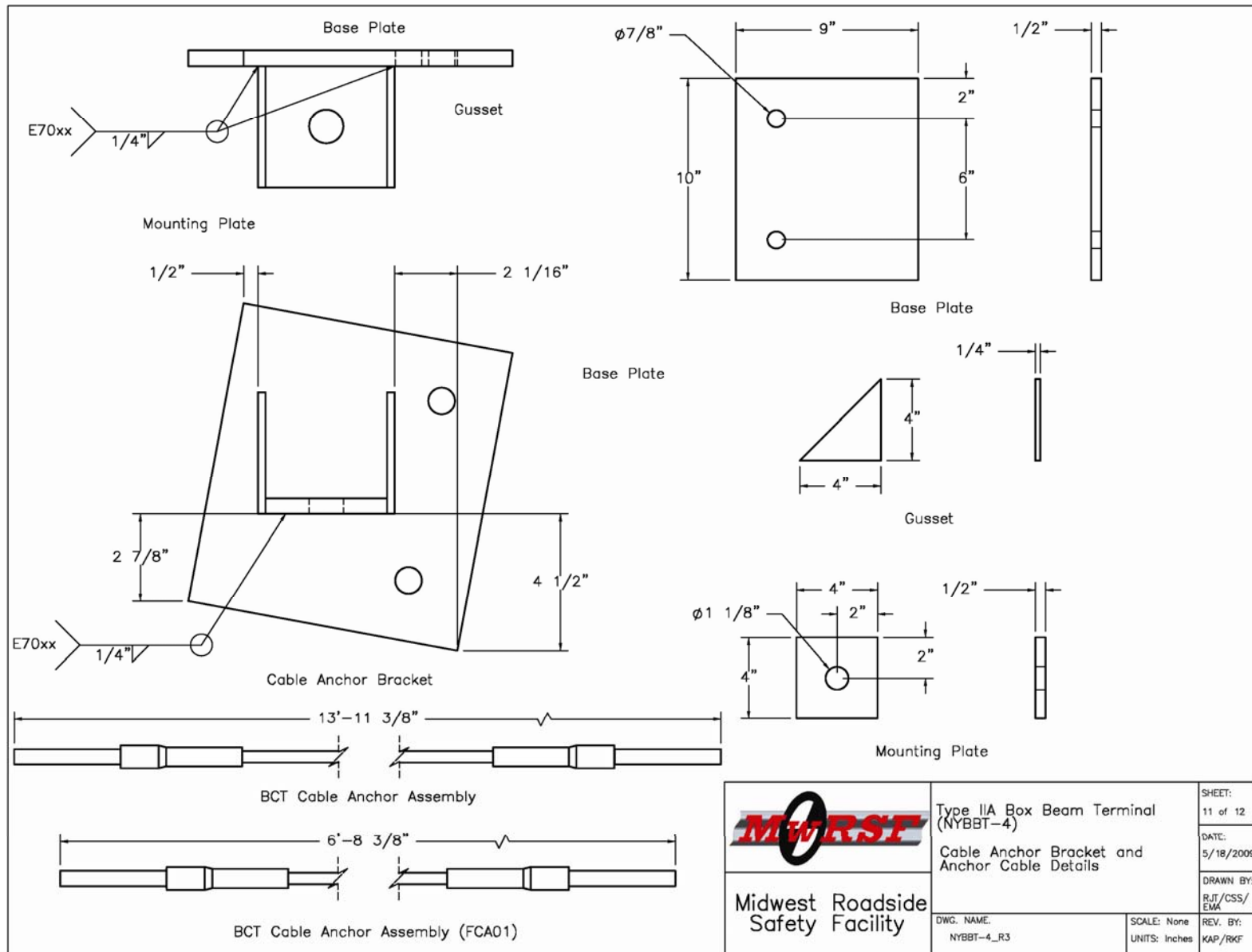


Figure J-22. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4




 <b>Midwest Roadside Safety Facility</b>	Type IIA Box Beam Terminal (NYBBT-4) Cable Anchor Bracket and Anchor Cable Details		SHEET: 11 of 12
	DWG. NAME: NYBBT-4_R3		DATE: 5/18/2009
SCALE: None UNITS: Inches		DRAWN BY: RJT/CSS/EMA	REV. BY: KAP/RKF

Figure J-23. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4

NYBBT-4			
Item No.	QTY.	Description	Material Spec
a1	23	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	26	ø 1/2" coarse thread 1 5/8" long hex bolt	ASTM A307
a3	26	ø 1/2" hex nut	ASTM A307
a4	24	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	28	ø 1/2" narrow washer	ASTM A307
a6	20	S3 x 5.7 63" long post	A36 Steel
a7	2	S3 x 5.7 84" long post	A36 Steel
b1	22	ø 3/8" coarse thread 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	59	ø 3/4" hex nut	ASTM A325
b5	61	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread 2" long hex bolt	ASTM A307
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" by 17'- 11 7/8" long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam anchor post shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread 7 3/4" long hex bolt	ASTM A307
c6	1	S3 x 5.7 84" long post anchor post	A36 Steel
c7	1	6"x6"x3/16" R 35' Curved Box Beam	ASTM A500 Grade B

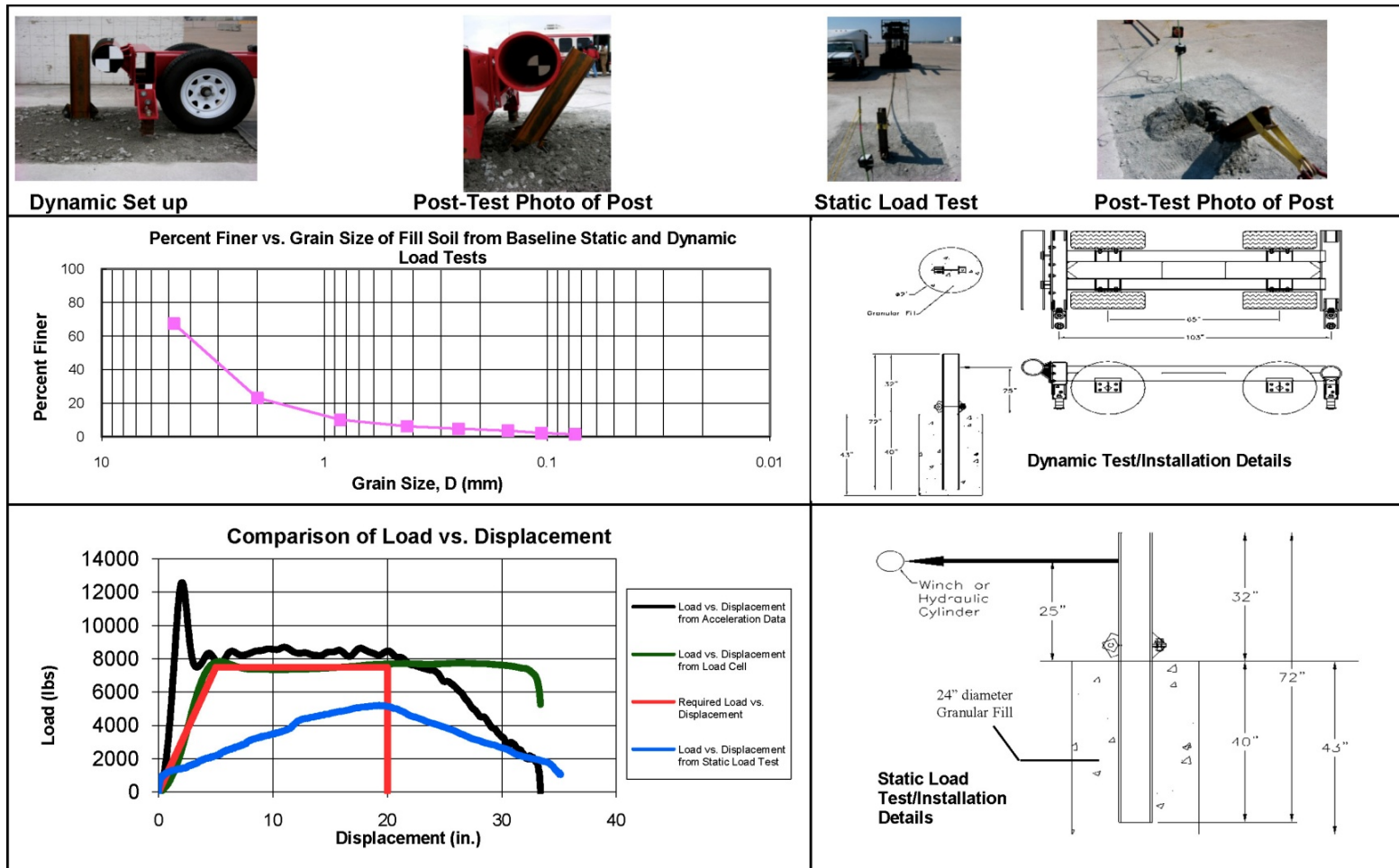
  

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-4) Bill of Materials	SHEET: 12 of 12
	DWG. NAME: NYBBT-4_R3	DATE: 5/18/2009
SCALE: None UNITS: Inches	DRAWN BY: RJT/CSS/ EMA	REV. BY: KAP/RKF

Figure J-24. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-4



**APPENDIX K Static Soil Tests**



Date.....	7/7/2005
Test Facility & Site Location.....	Midwest Road Side Safety Facility (see attached site map)
In situ soil description (ASTM D2487).....	Well Graded Gravel (GW)
Fill material description (ASTM D2487) & sieve analysis.....	Well Graded Gravel (GW)
Description of fill placement procedure.....	6-inch lifts tamped with a pneumatic compactor
Bogie Weight.....	1605 lbs
Impact Velocity.....	19.08 mph

Figure K-1. Soil Strength, Initial Calibration Tests

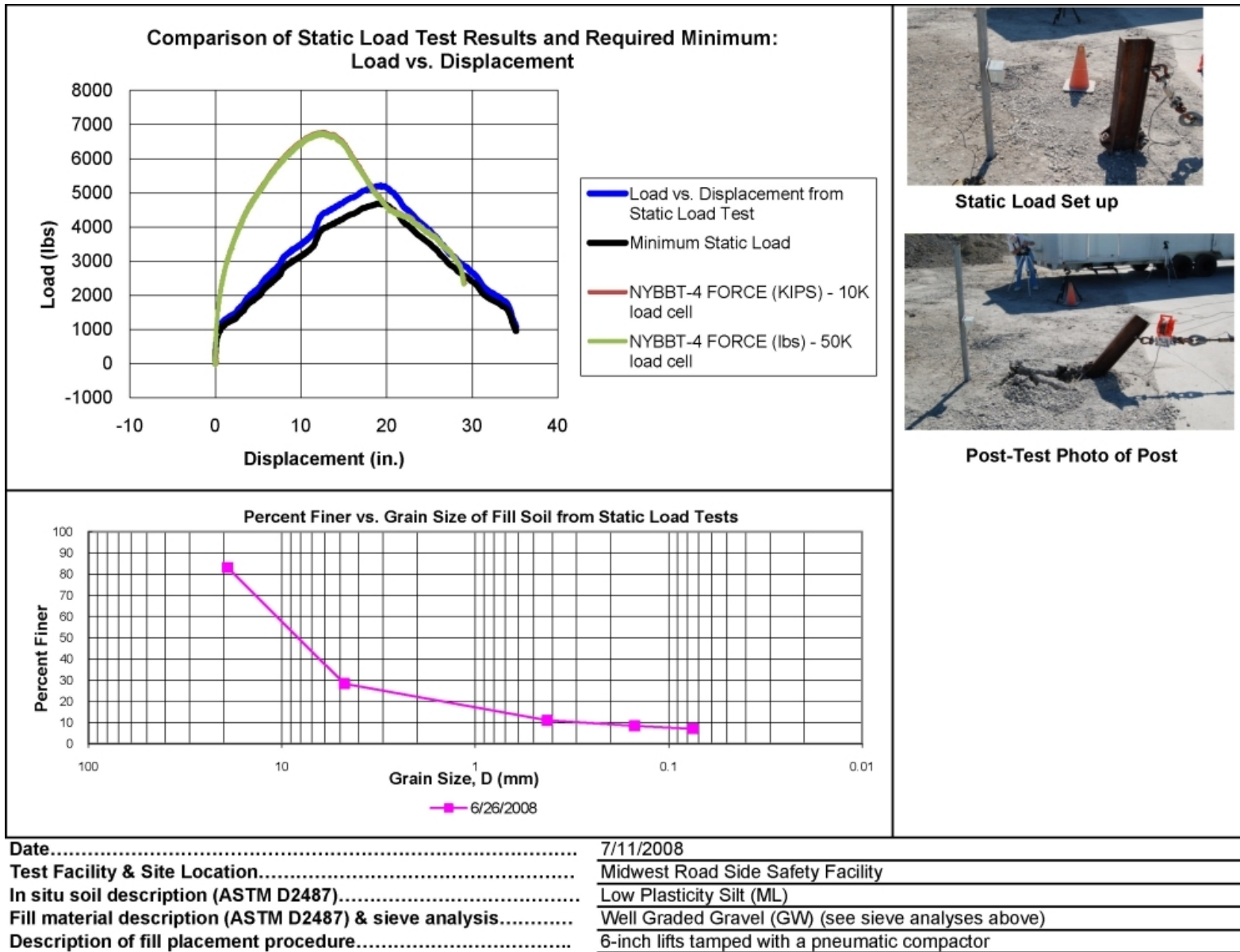
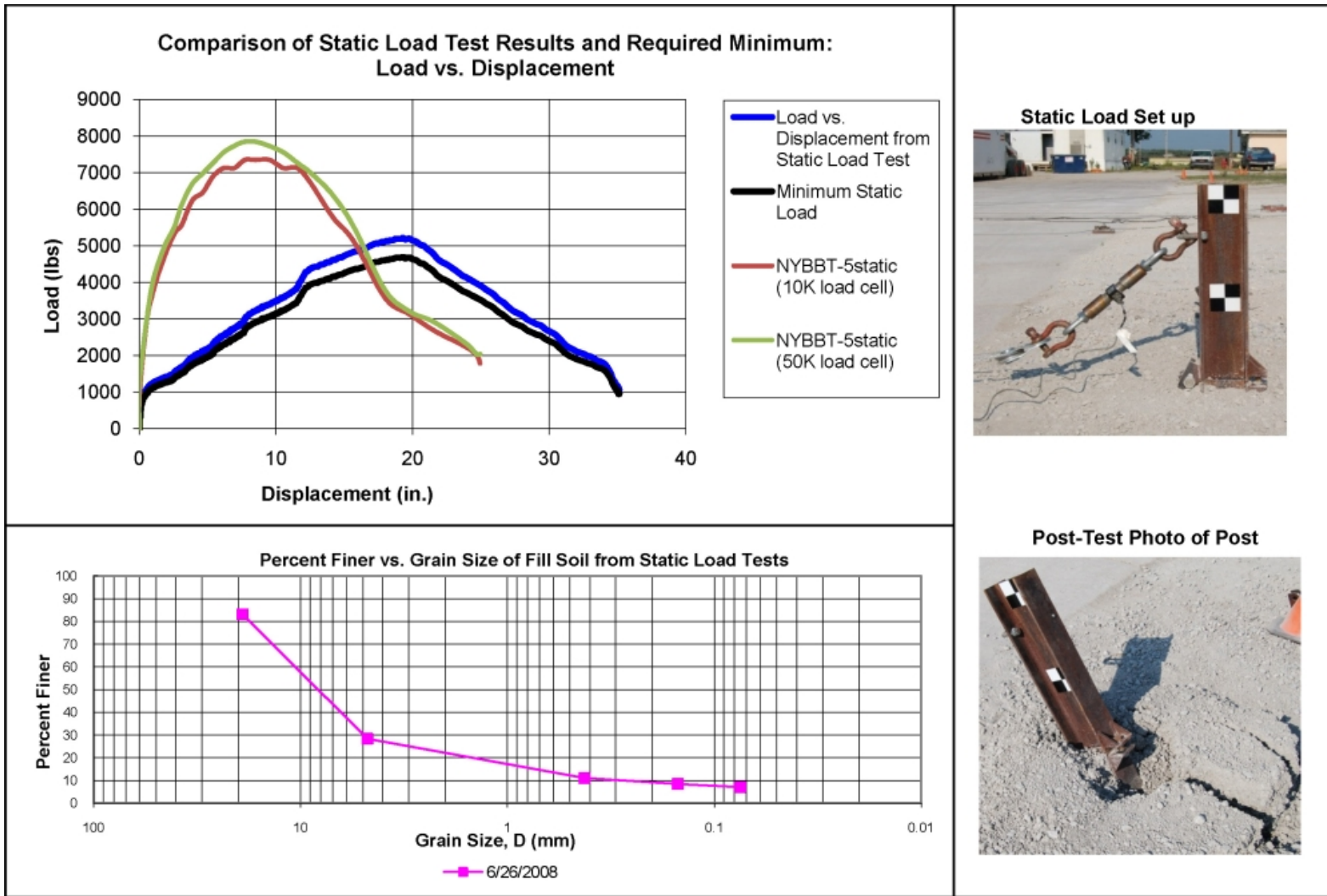


Figure K-2. Static Soil Test, Test No. NYBBT-4



Date.....	7/31/2008
Test Facility & Site Location.....	Midwest Road Side Safety Facility
In situ soil description (ASTM D2487).....	Low Plasticity Silt (ML)
Fill material description (ASTM D2487) & sieve analysis.....	Well Graded Gravel (GW) (see sieve analyses above)
Description of fill placement procedure.....	6-inch lifts tamped with a pneumatic compactor

Figure K-3. Static Soil Test, Test No. NYBBT-5

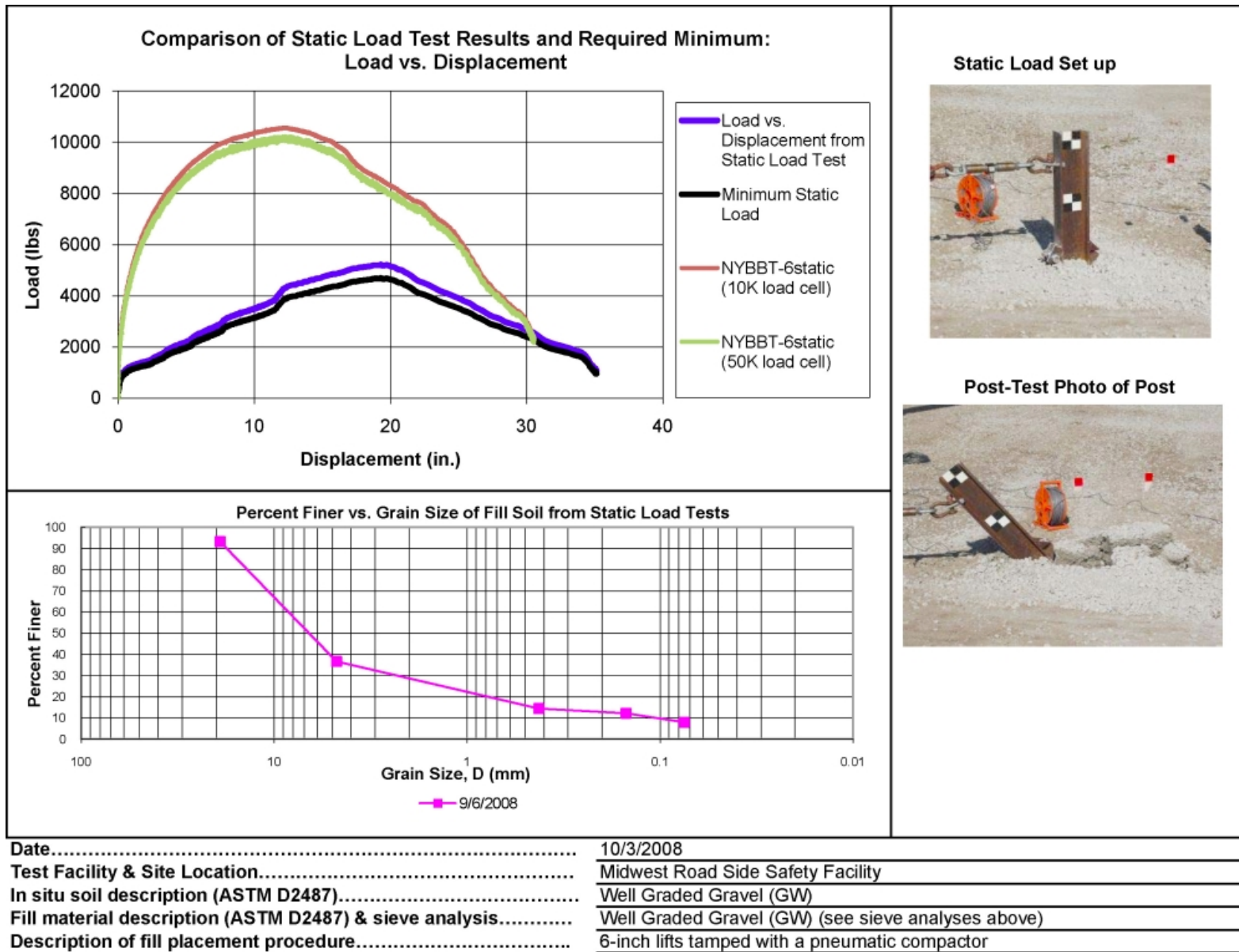


Figure K-4. Static Soil Test, Test No. NYBBT-6



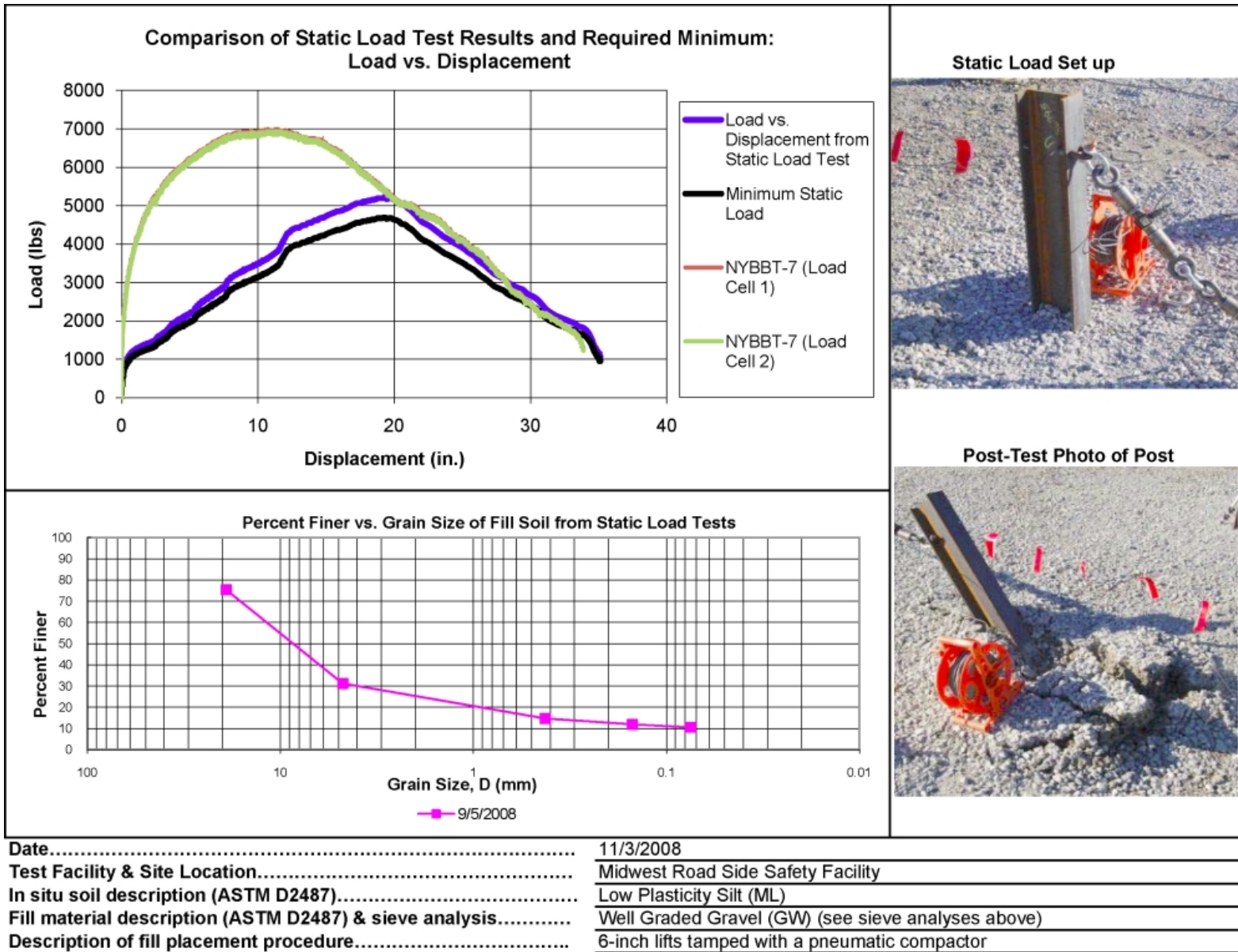
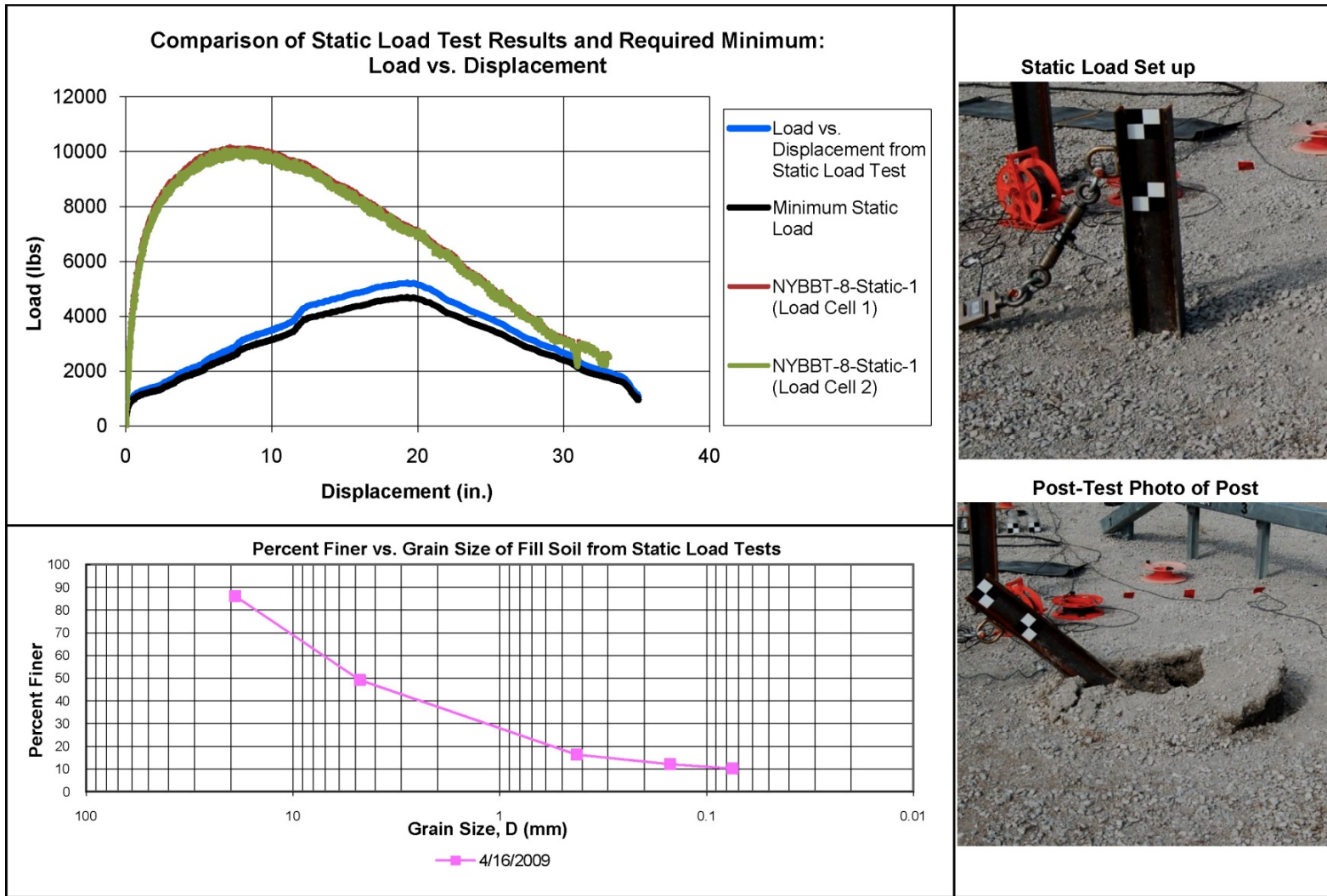
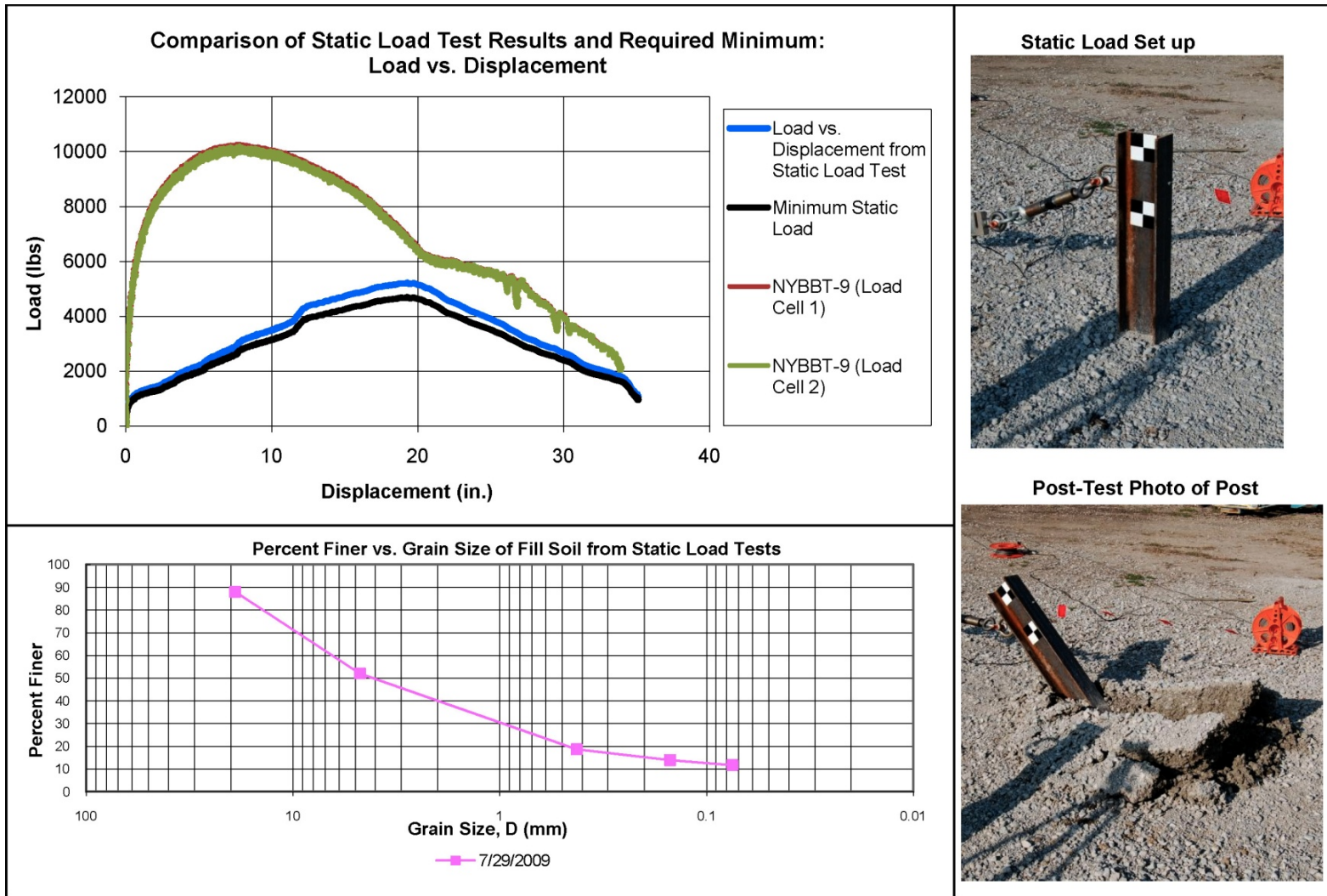


Figure K-5. Static Soil Test, Test No. NYBBT-7



Date.....	7/15/2009
Test Facility & Site Location.....	Midwest Road Side Safety Facility
In situ soil description (ASTM D2487).....	Low Plasticity Silt (ML)
Fill material description (ASTM D2487) & sieve analysis.....	Well Graded Gravel (GW) (see sieve analyses above)
Description of fill placement procedure.....	8-inch lifts tamped with a pneumatic compactor

Figure K-6. Static Soil Test, Test No. NYBBT-8



Date.....	8/6/2009
Test Facility & Site Location.....	Midwest Road Side Safety Facility
In situ soil description (ASTM D2487).....	Low Plasticity Silt (ML)
Fill material description (ASTM D2487) & sieve analysis.....	Well Graded Gravel (GW) (see sieve analyses above)
Description of fill placement procedure.....	8-inch lifts tamped with a pneumatic compactor

Figure K-7. Static Soil Test, Test No. NYBBT-9



**APPENDIX L Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-4**

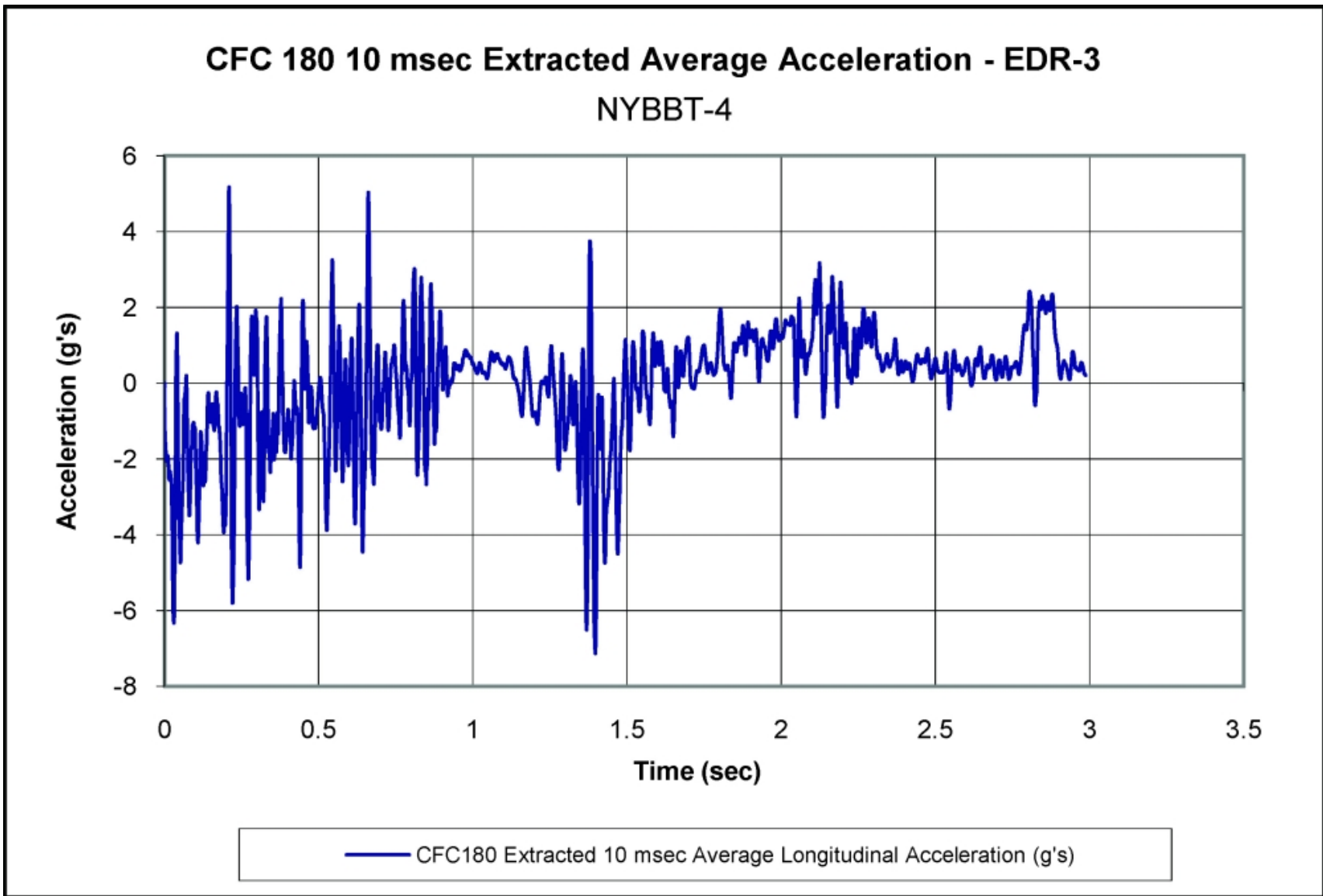


Figure L-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-4

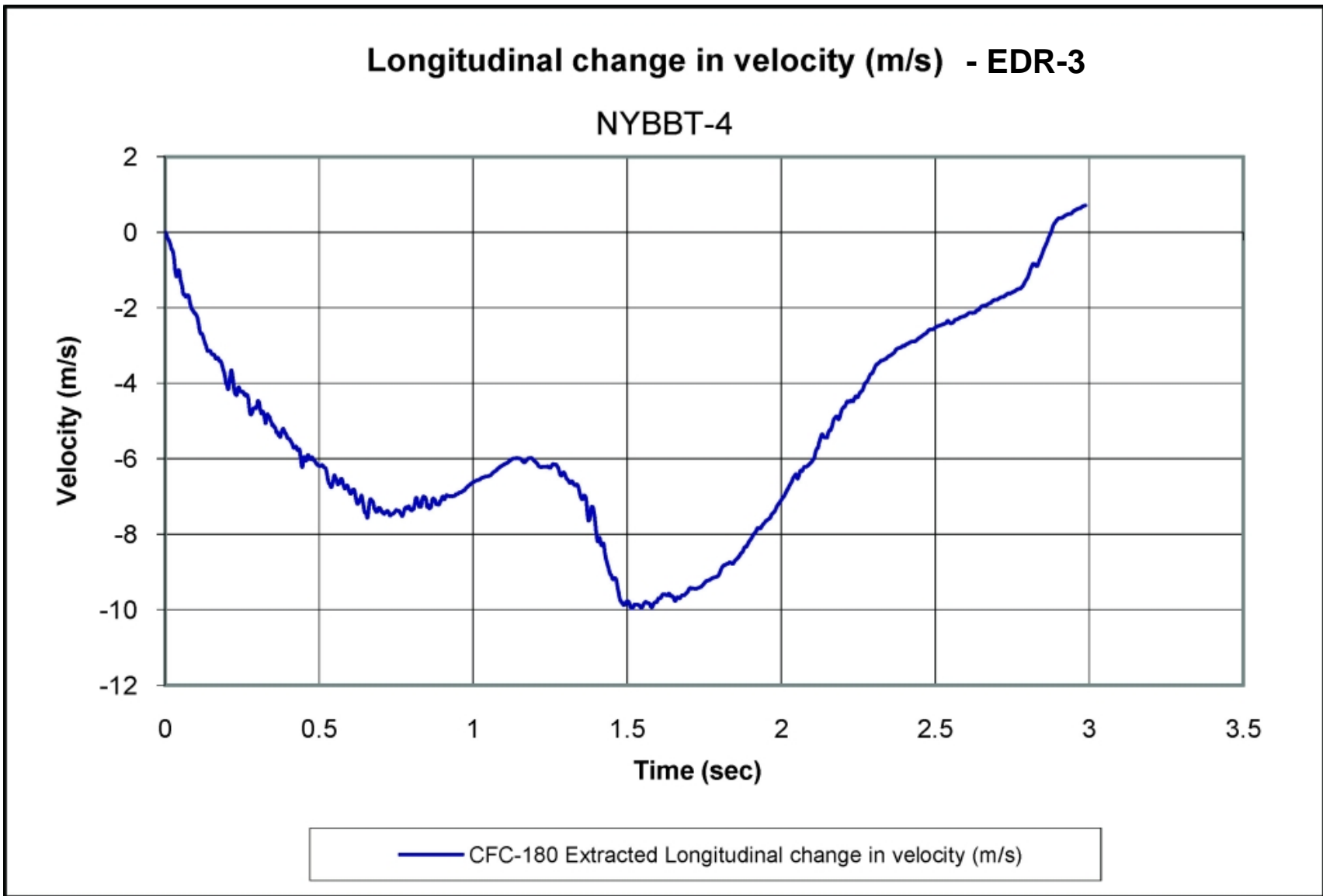


Figure L-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-4

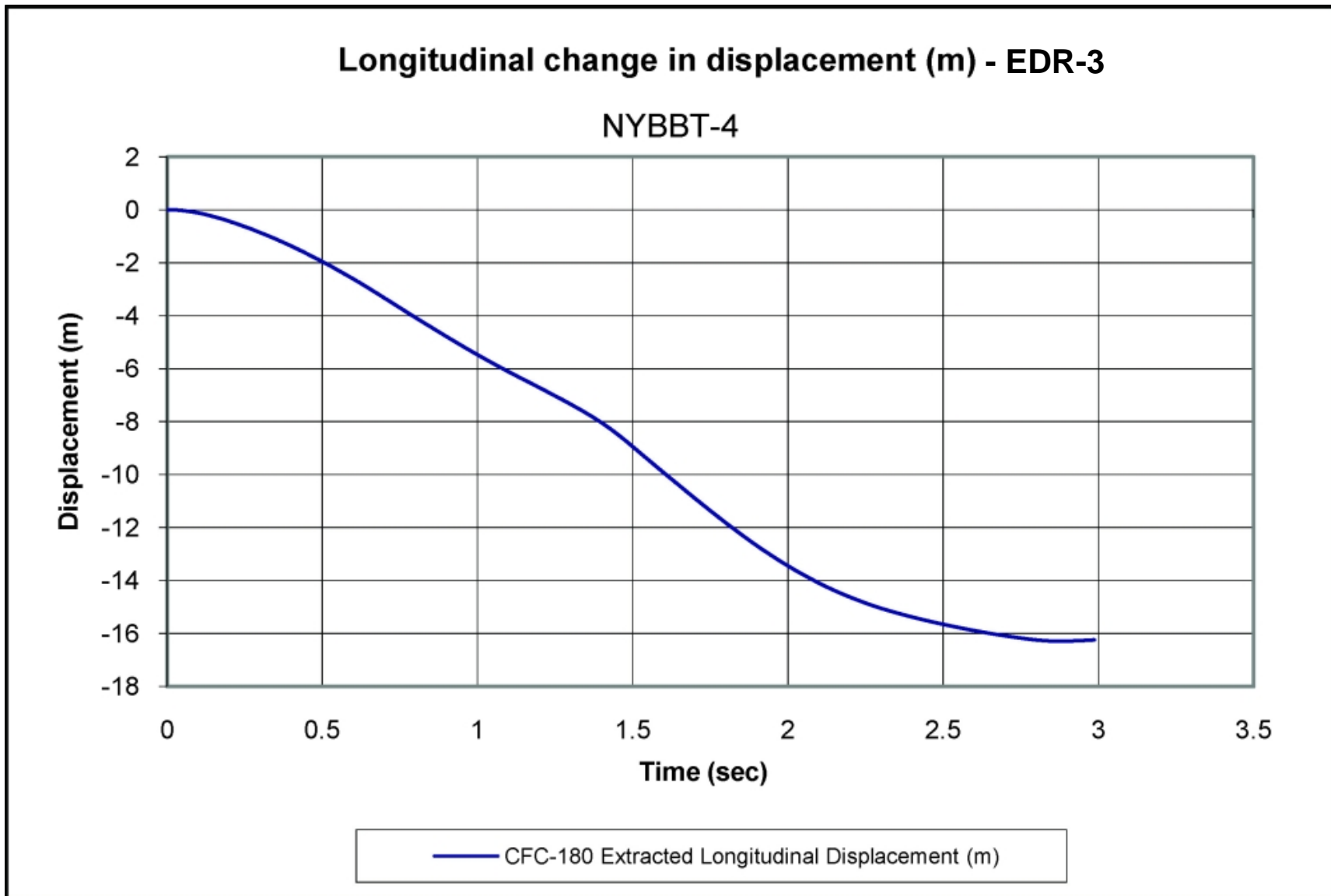


Figure L-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-4

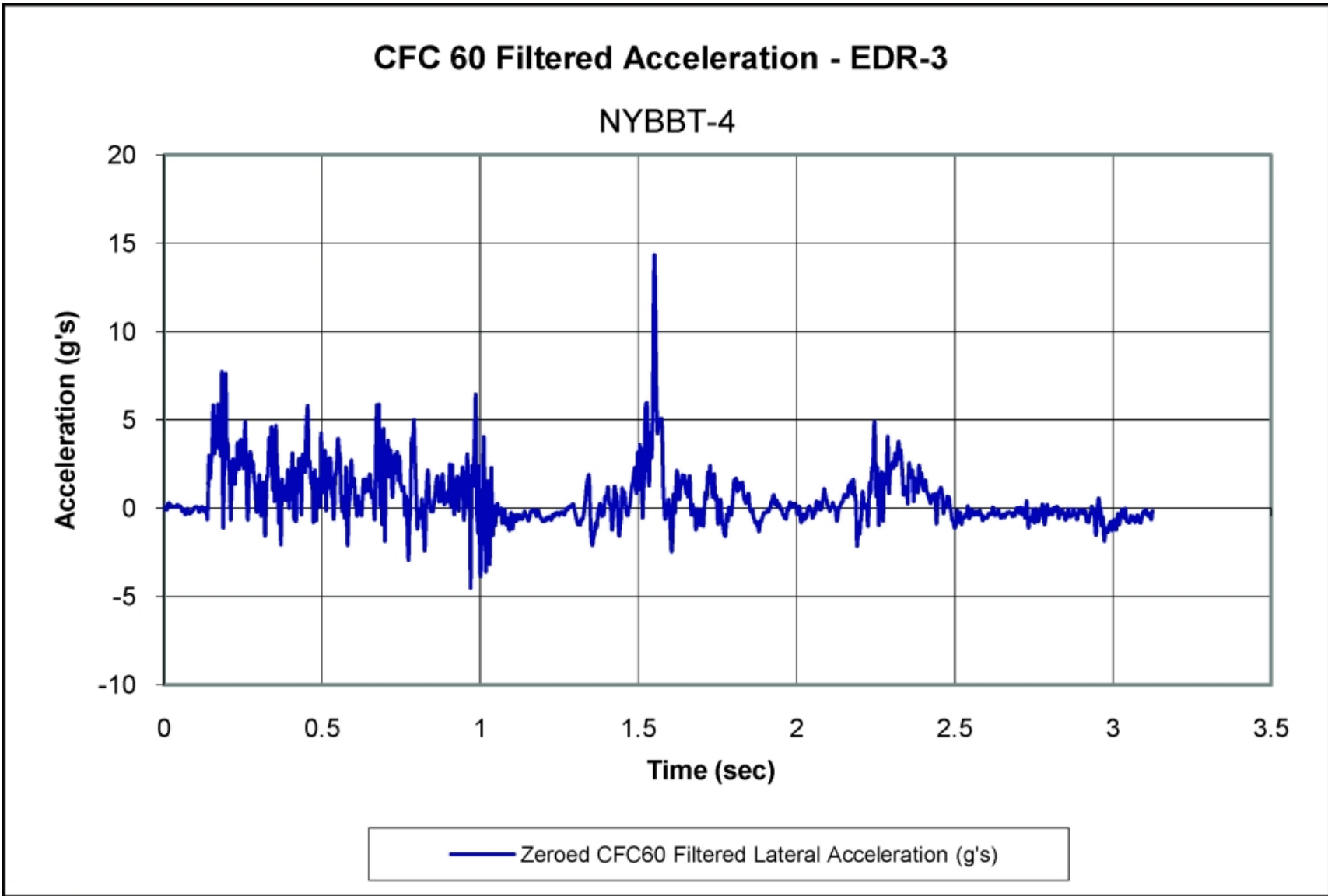


Figure L-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-4

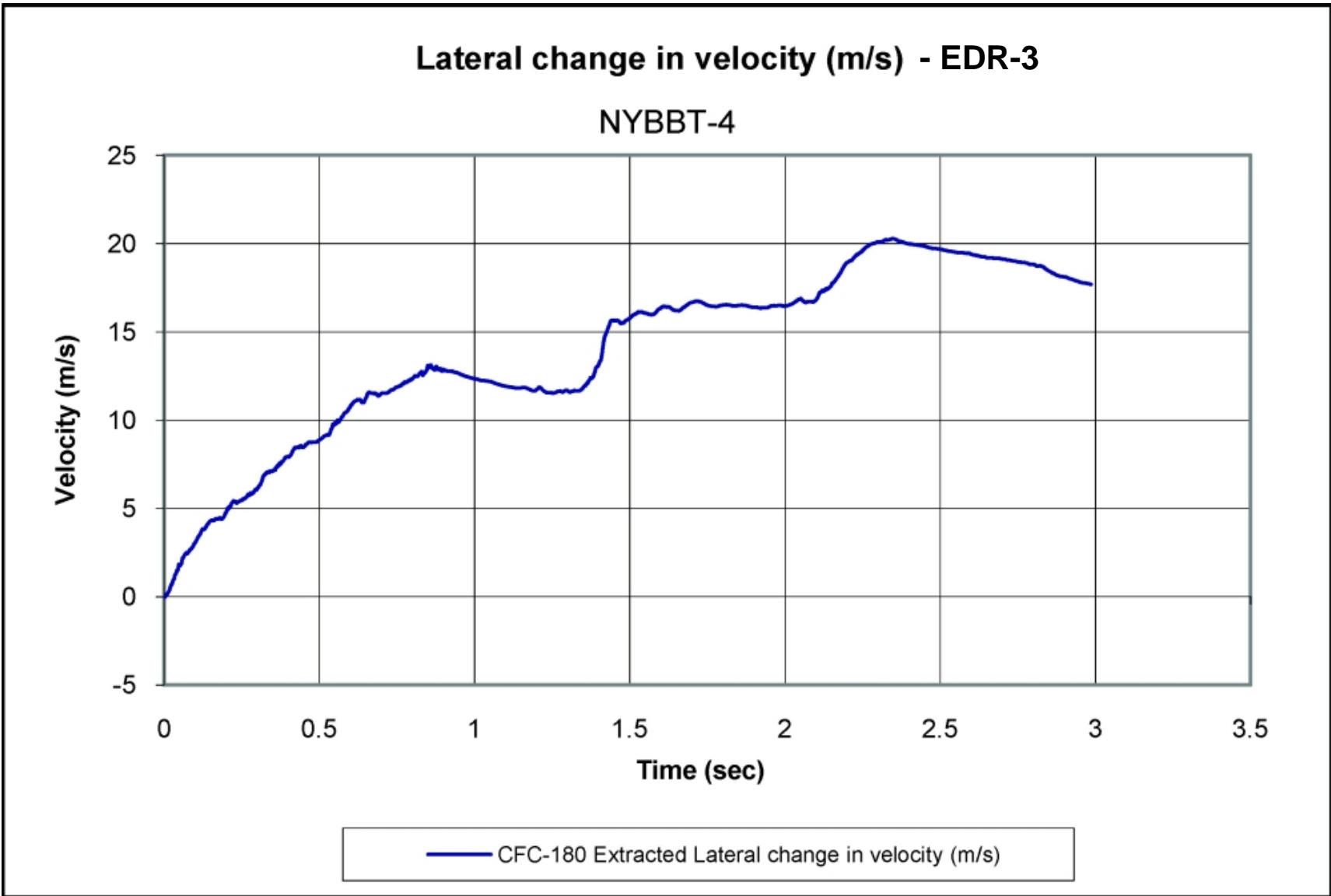


Figure L-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-4

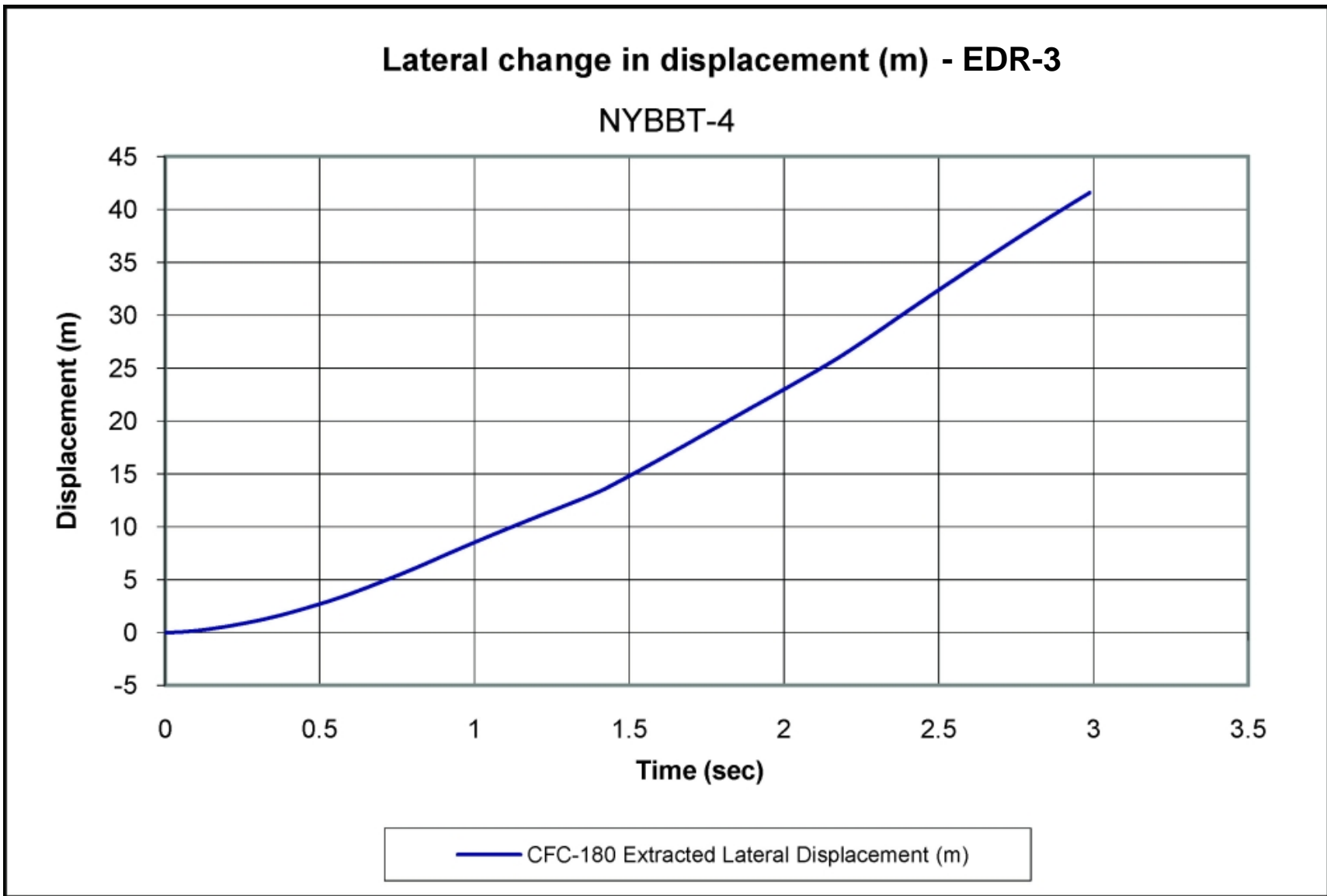


Figure L-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-4

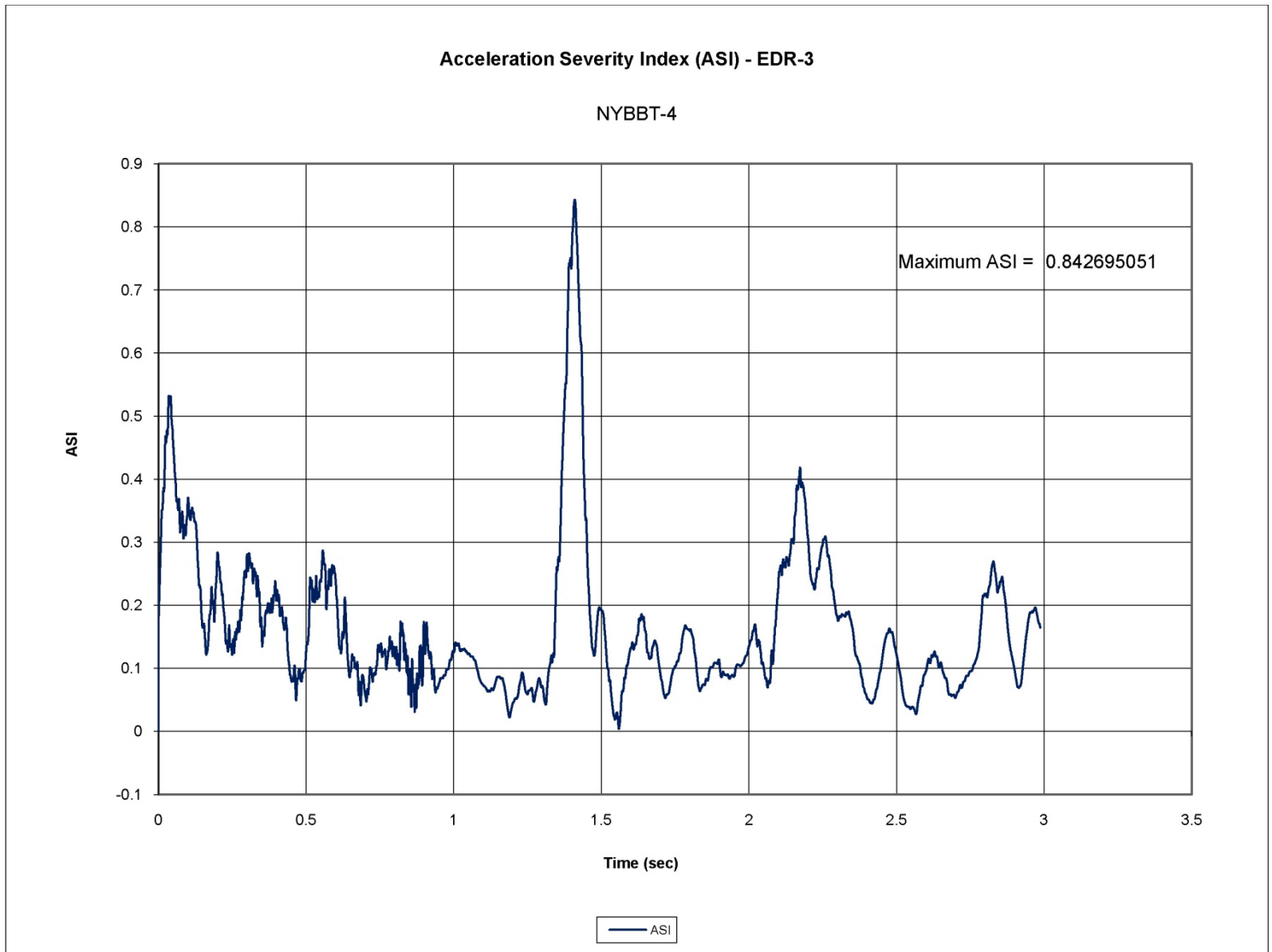


Figure L-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-4



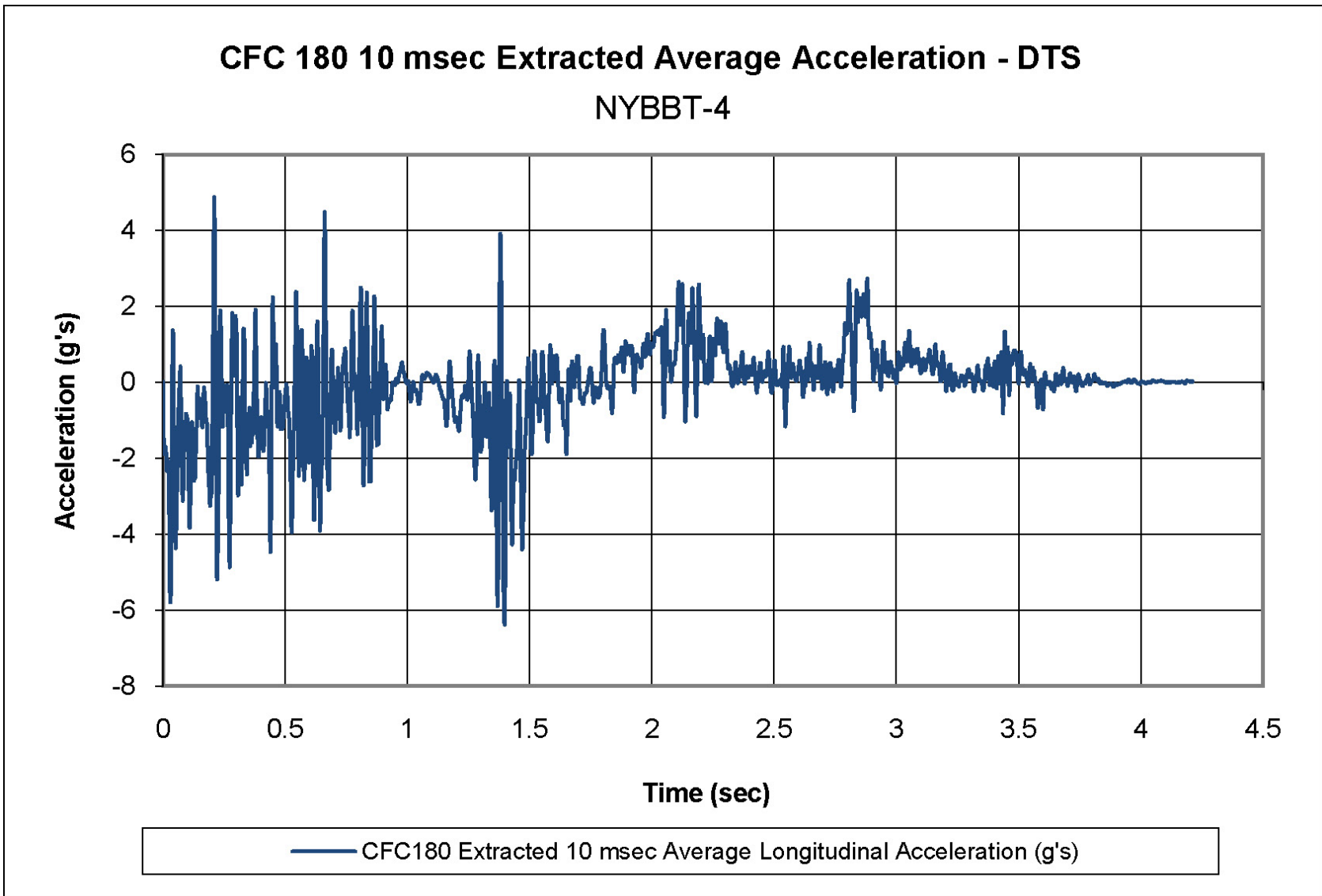


Figure L-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-4

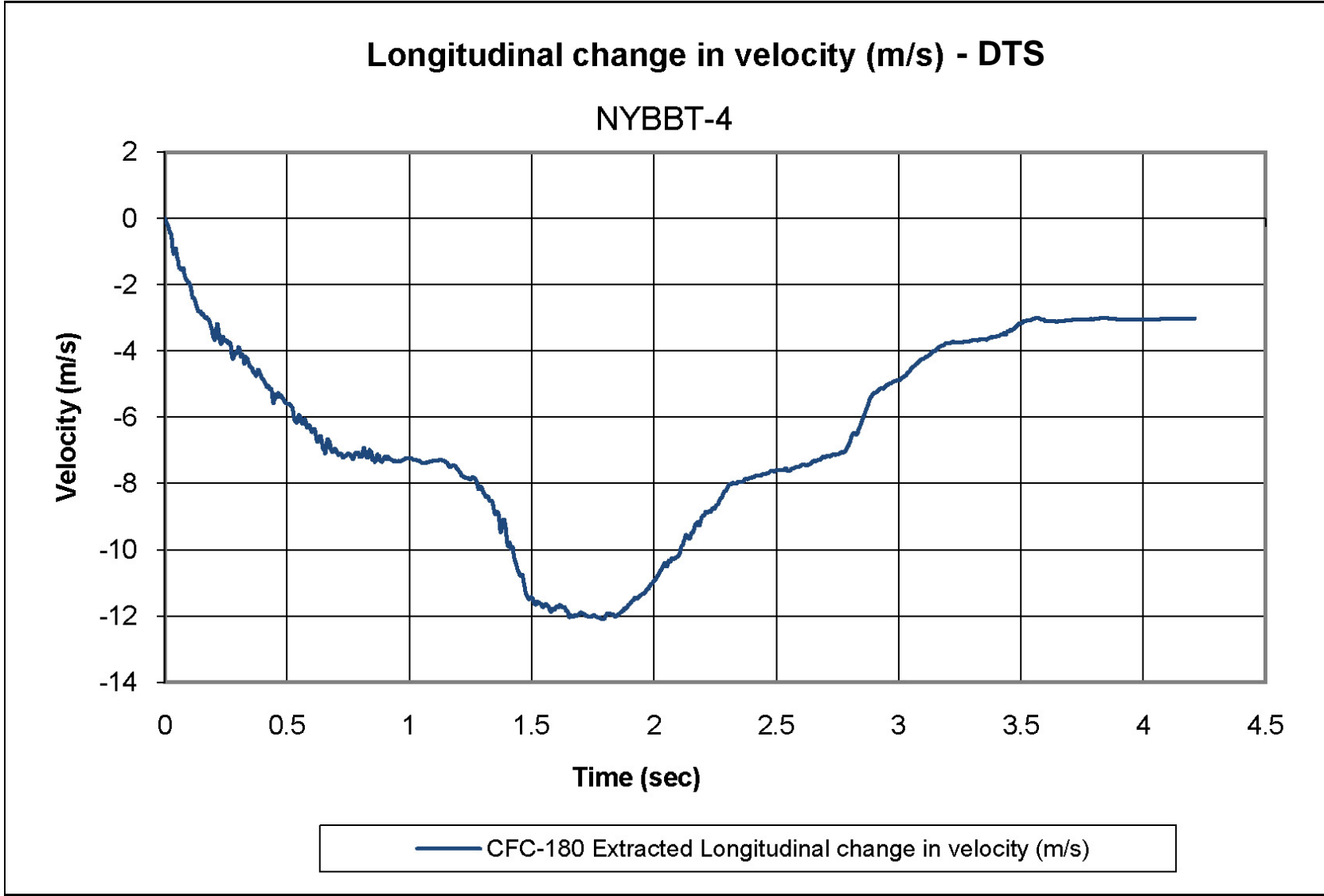


Figure L-9. Graph of Longitudinal Occupant Velocity (DTS), Test No. NYBBT-4

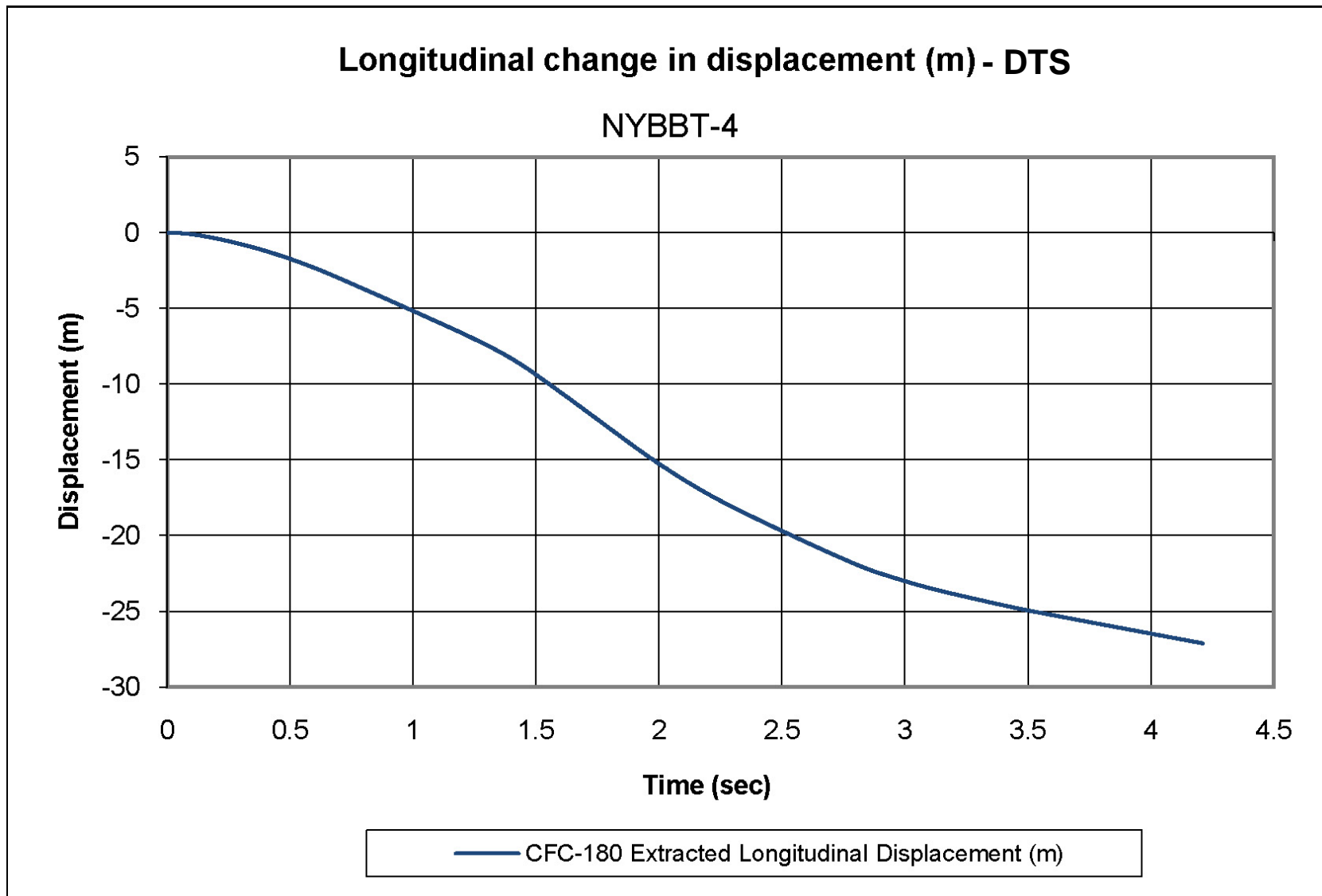


Figure L-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-4

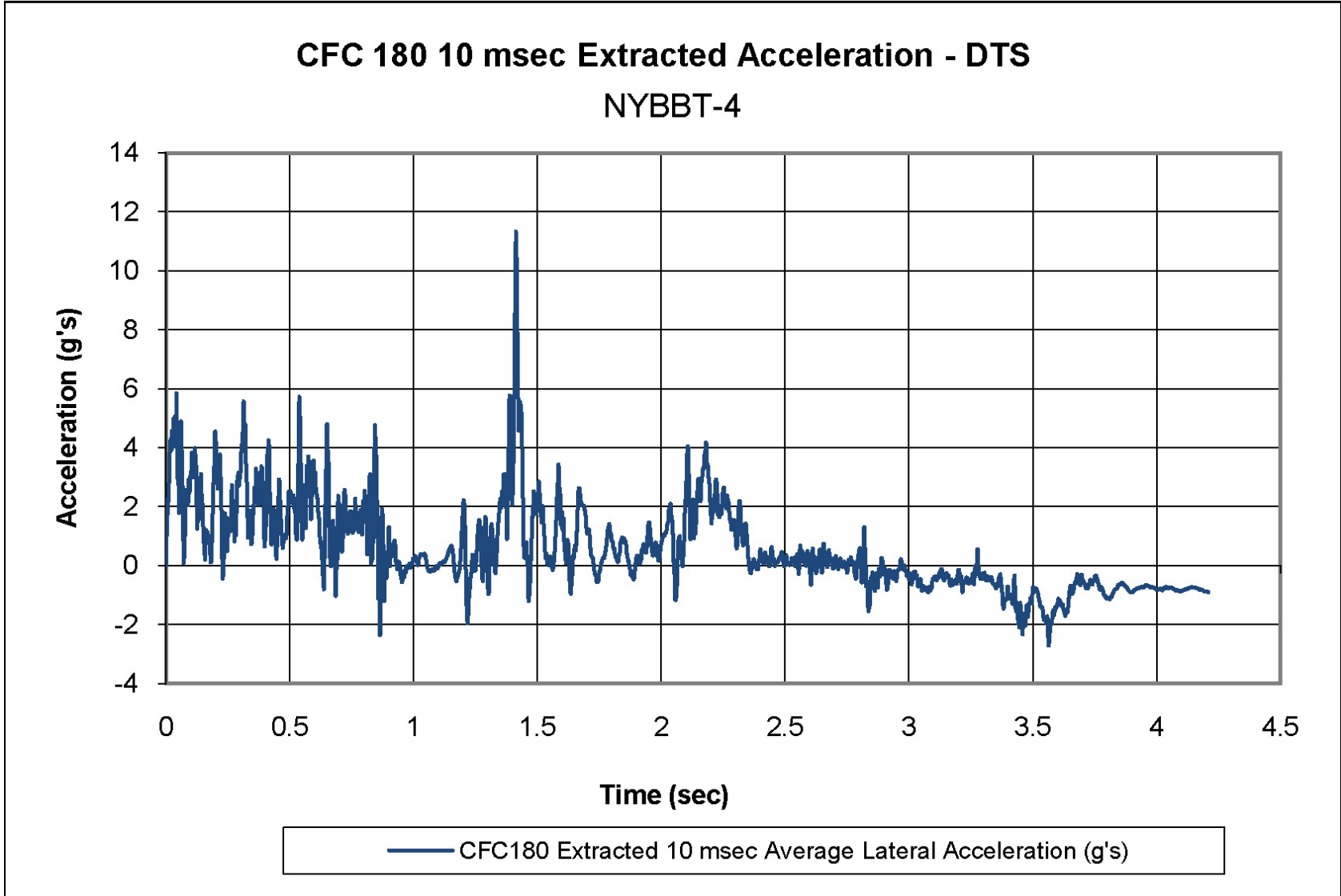


Figure L-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-4

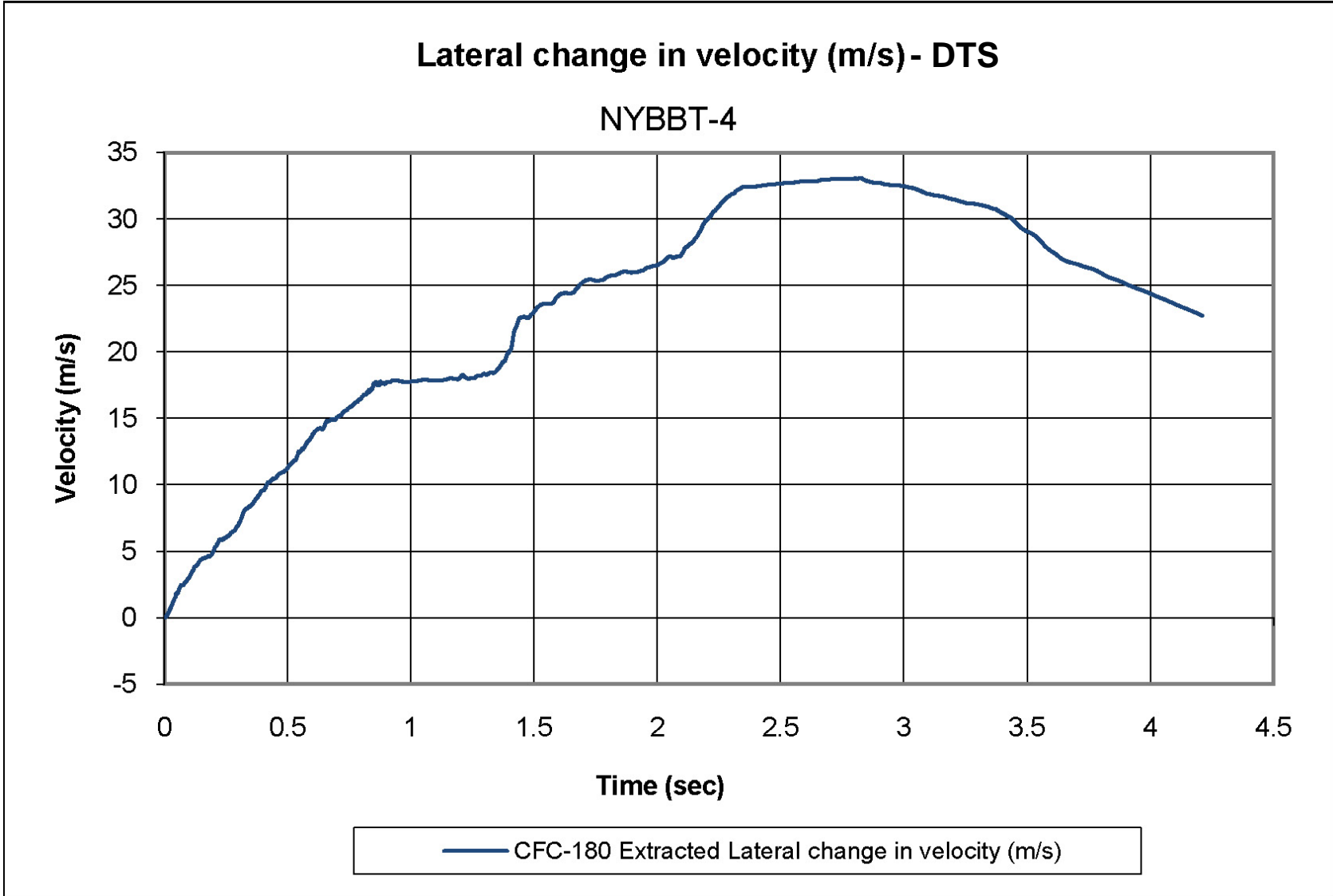


Figure L-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-4

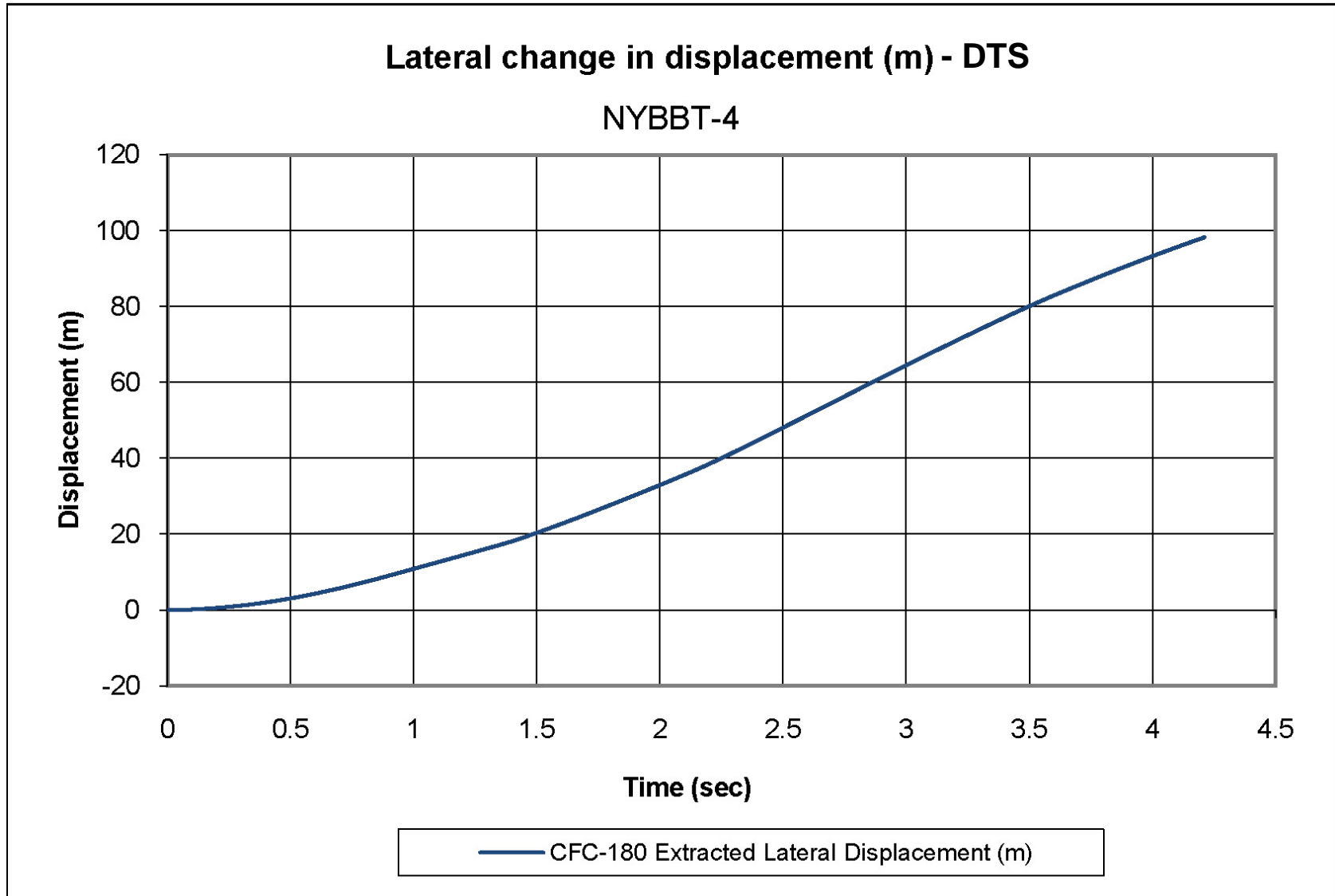


Figure L-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-4

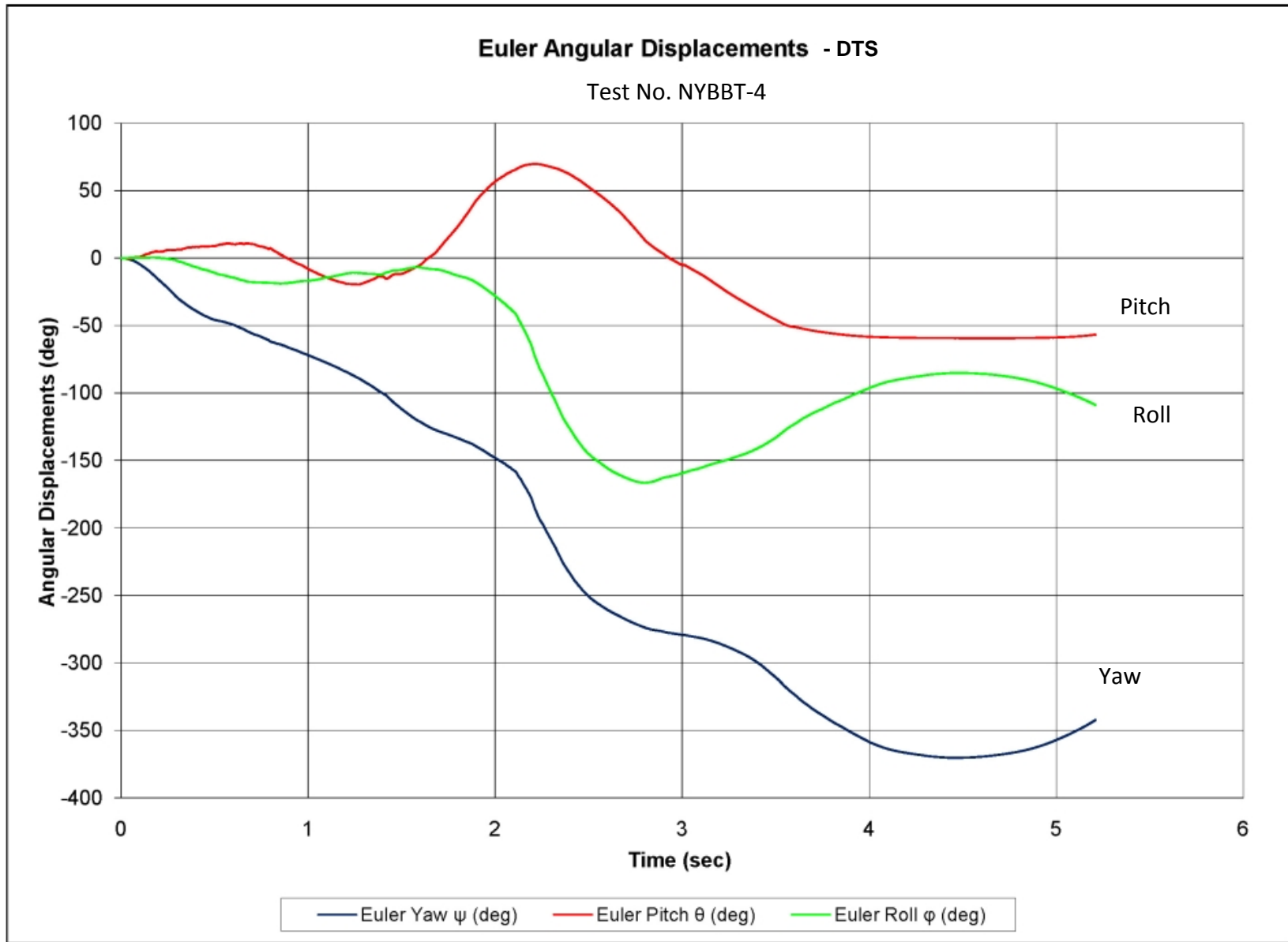


Figure L-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-4

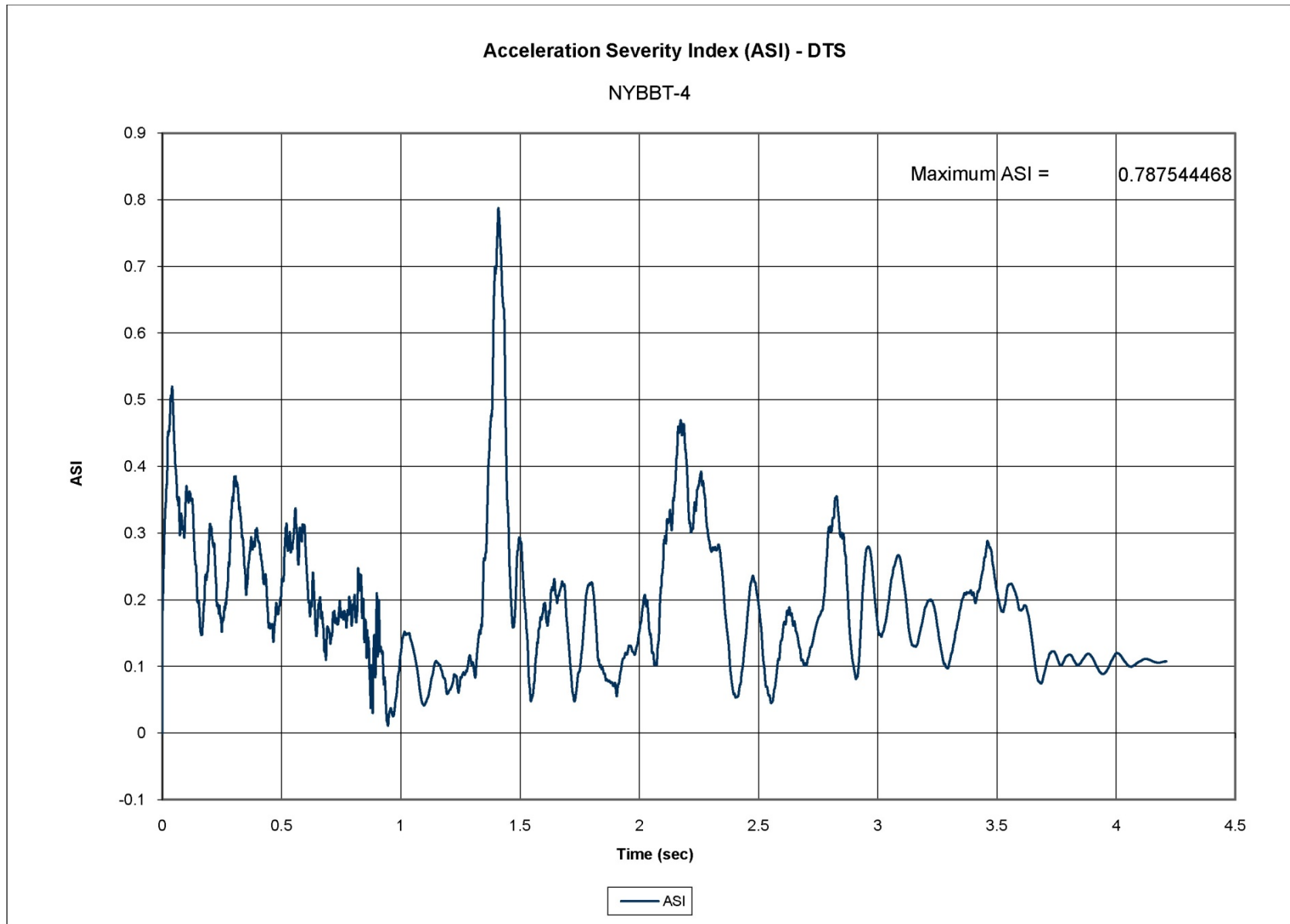


Figure L-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-4



**APPENDIX M Modified Type IIA Box Beam Terminal System Details - Metric and English Units, Test No. NYBBT-5**

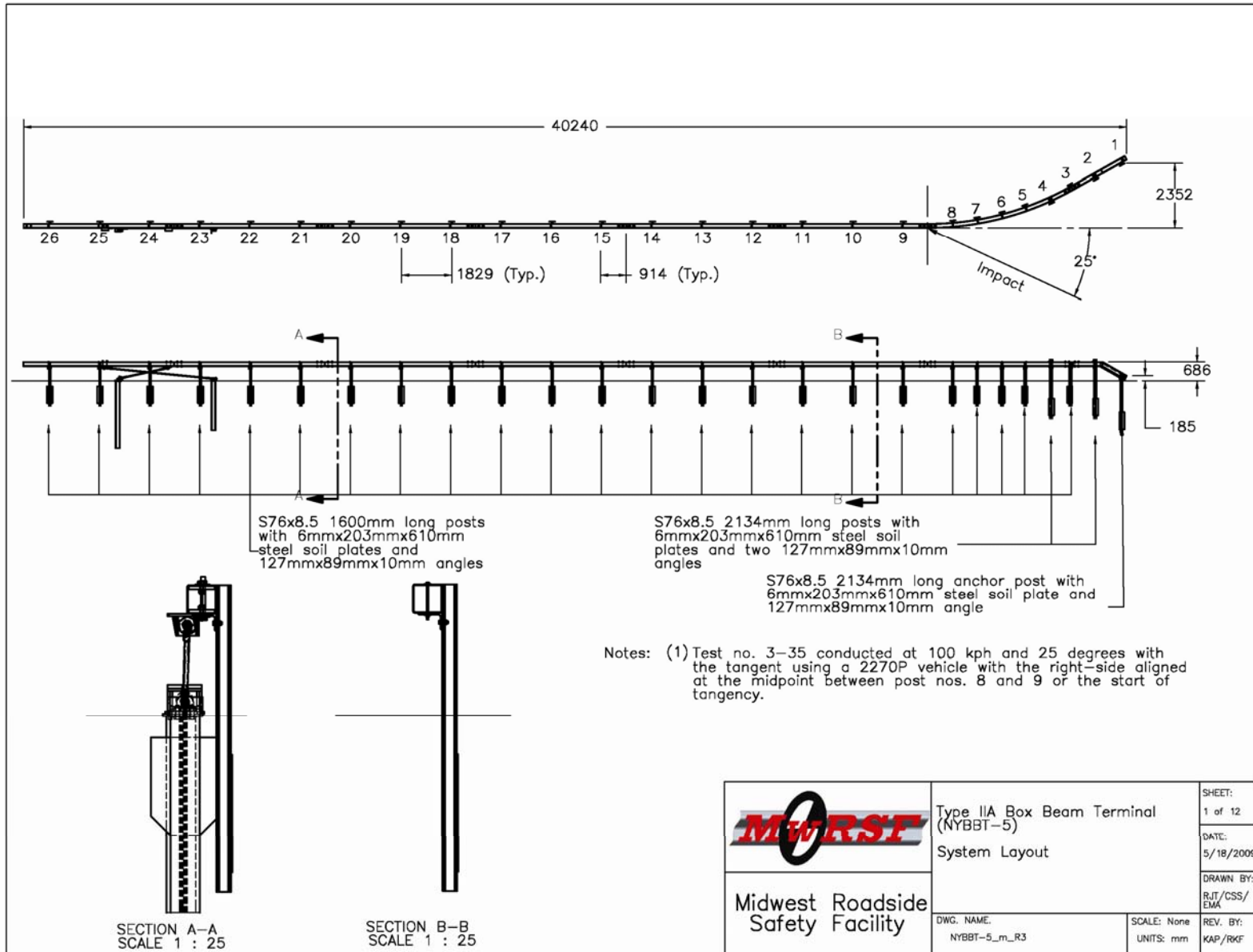


Figure M-1. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

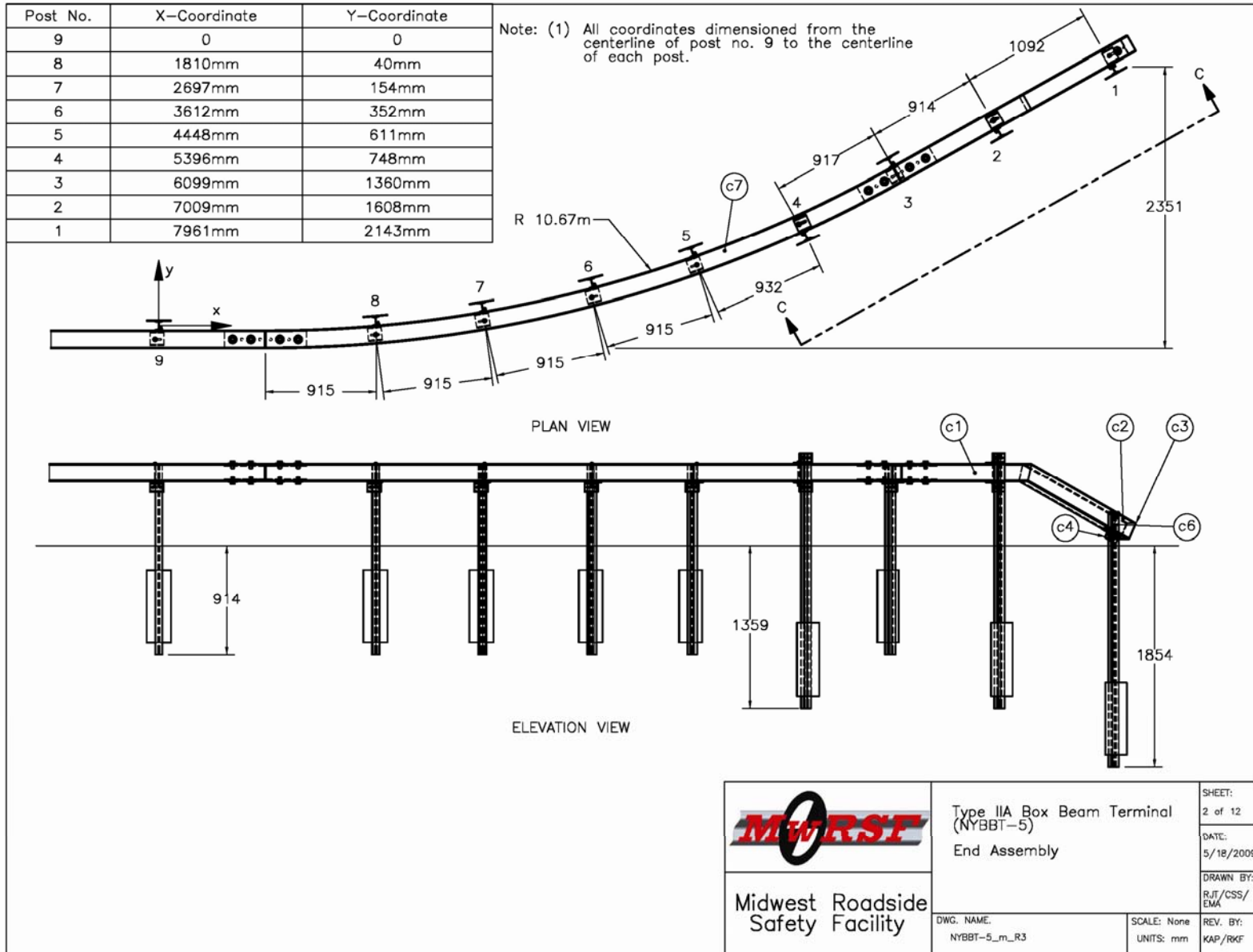


Figure M-2. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

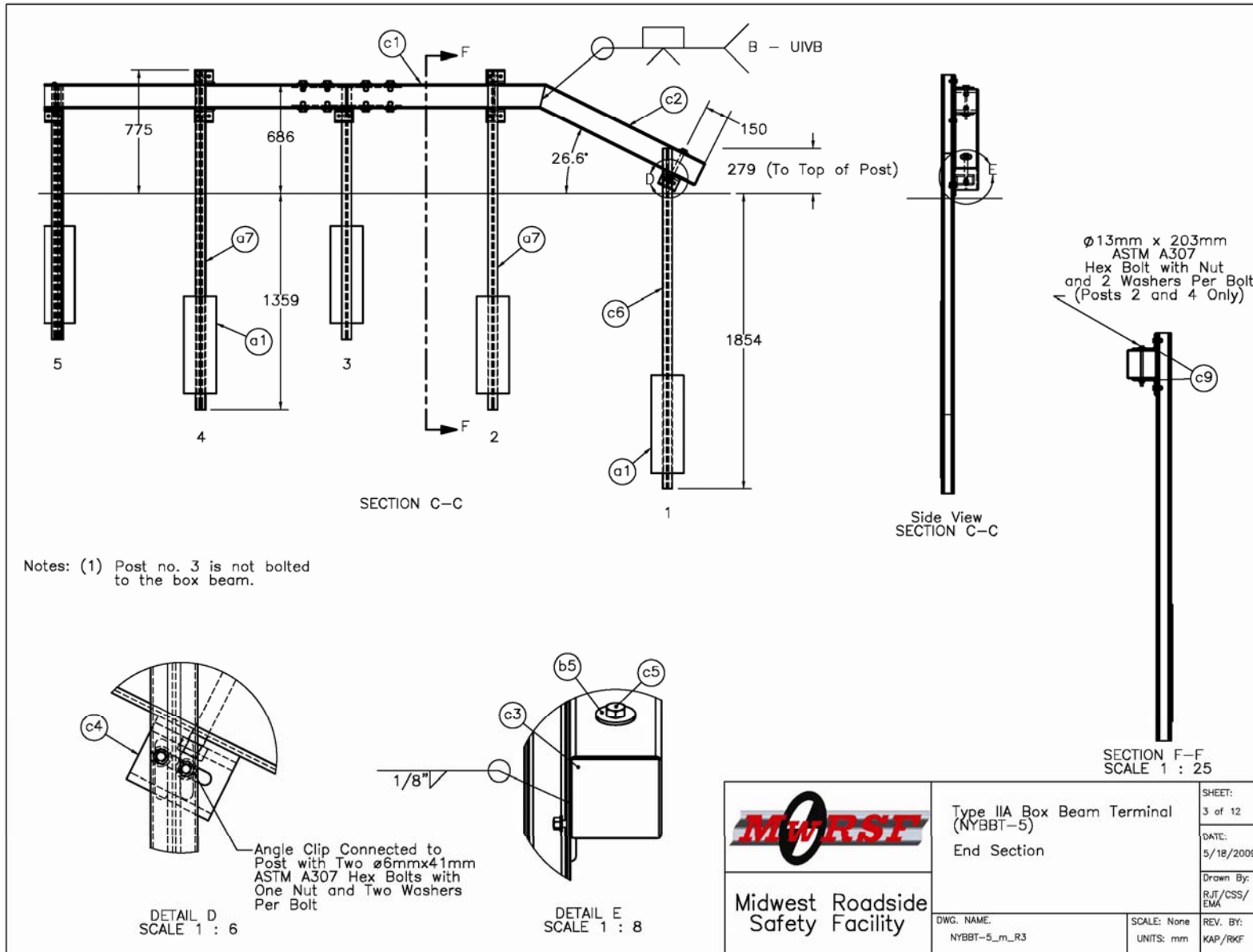


Figure M-3. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

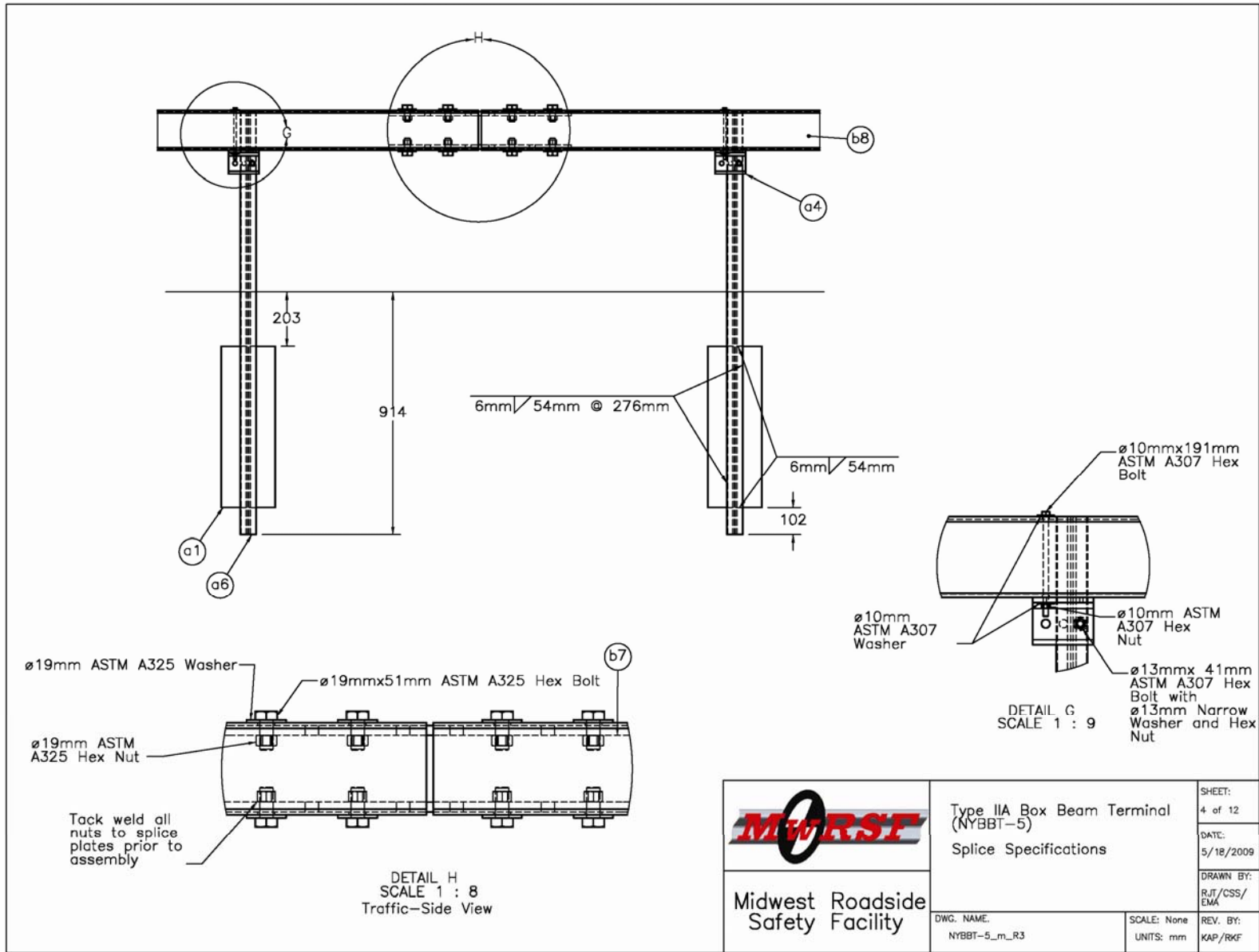


Figure M-4. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

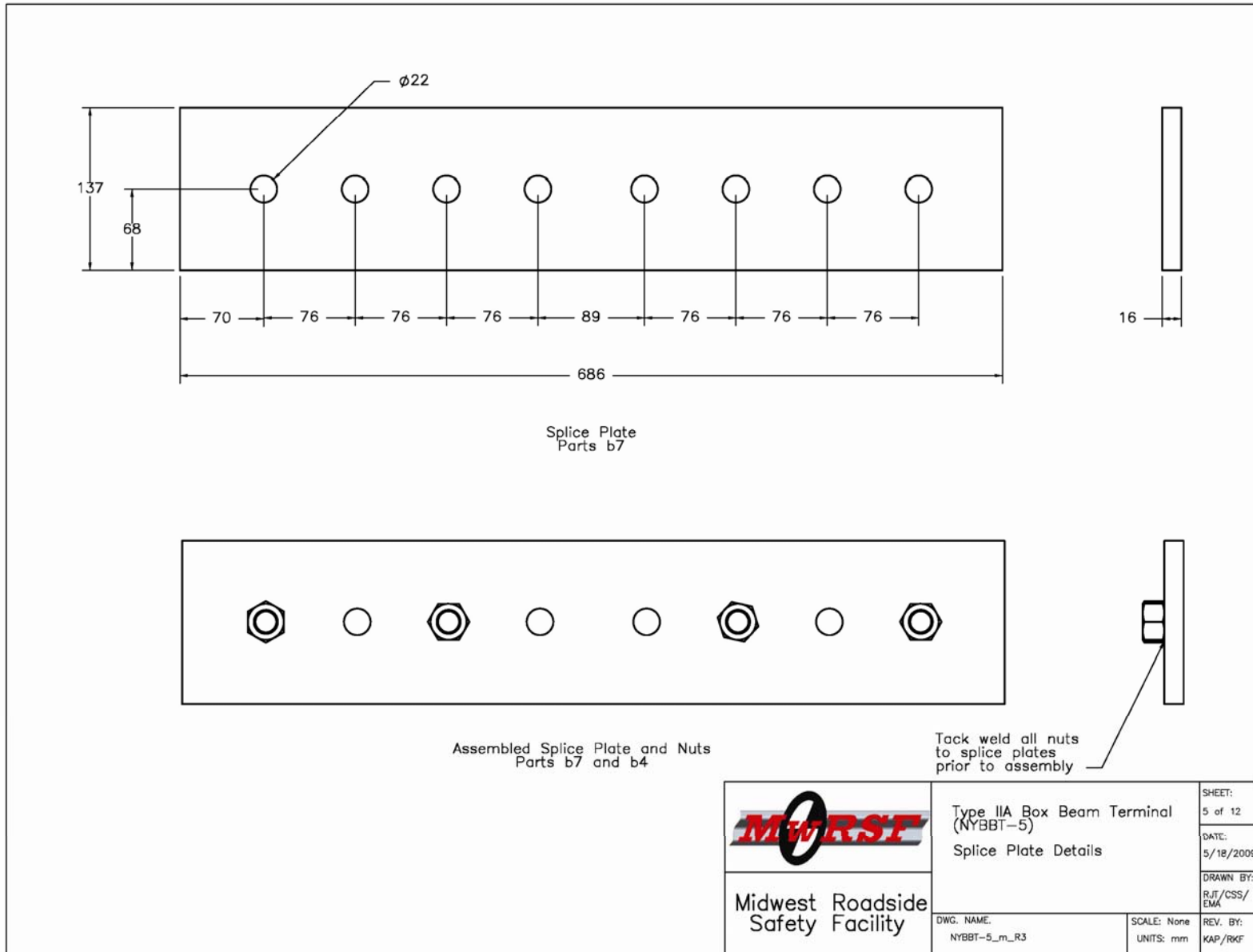


Figure M-5. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

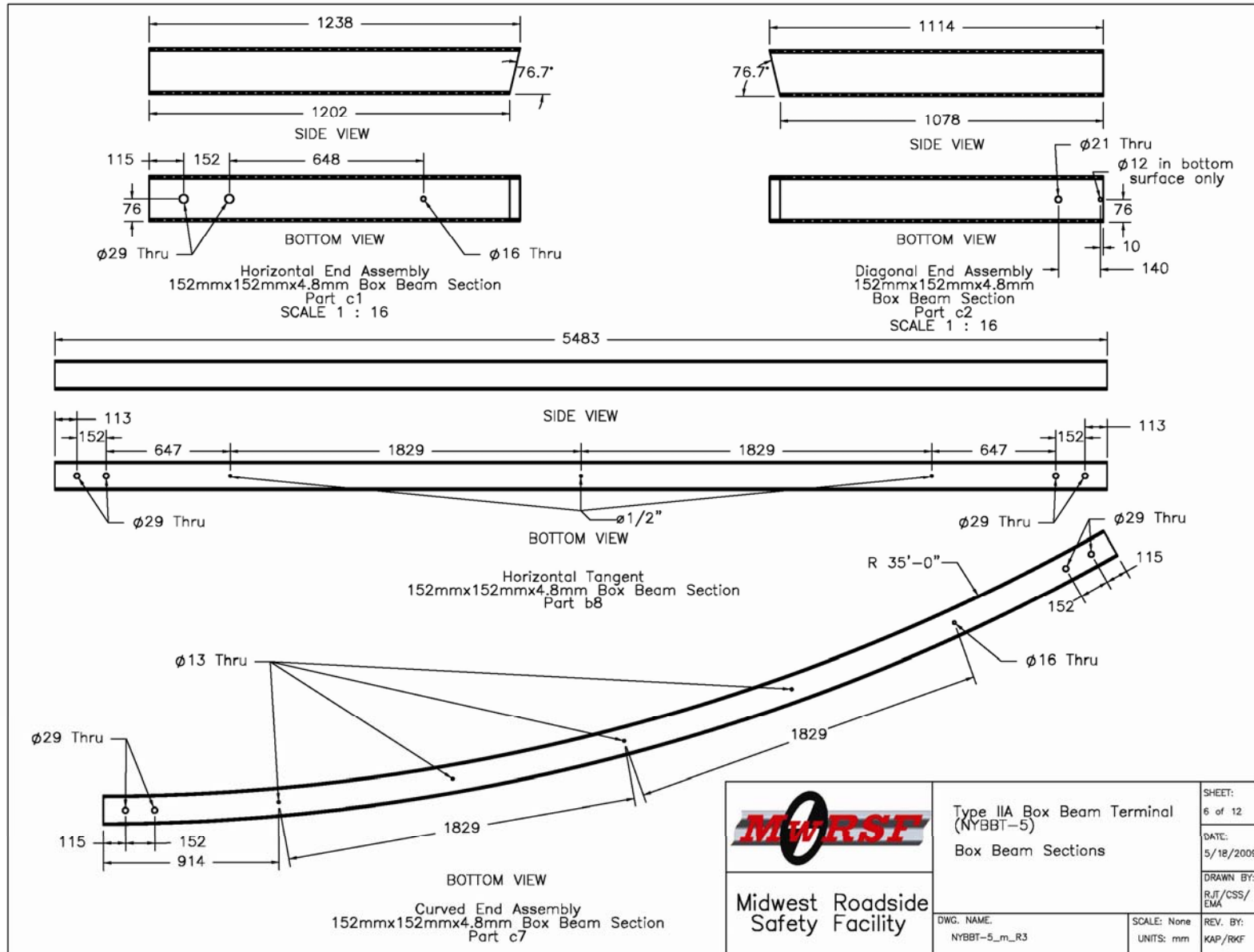


Figure M-6. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

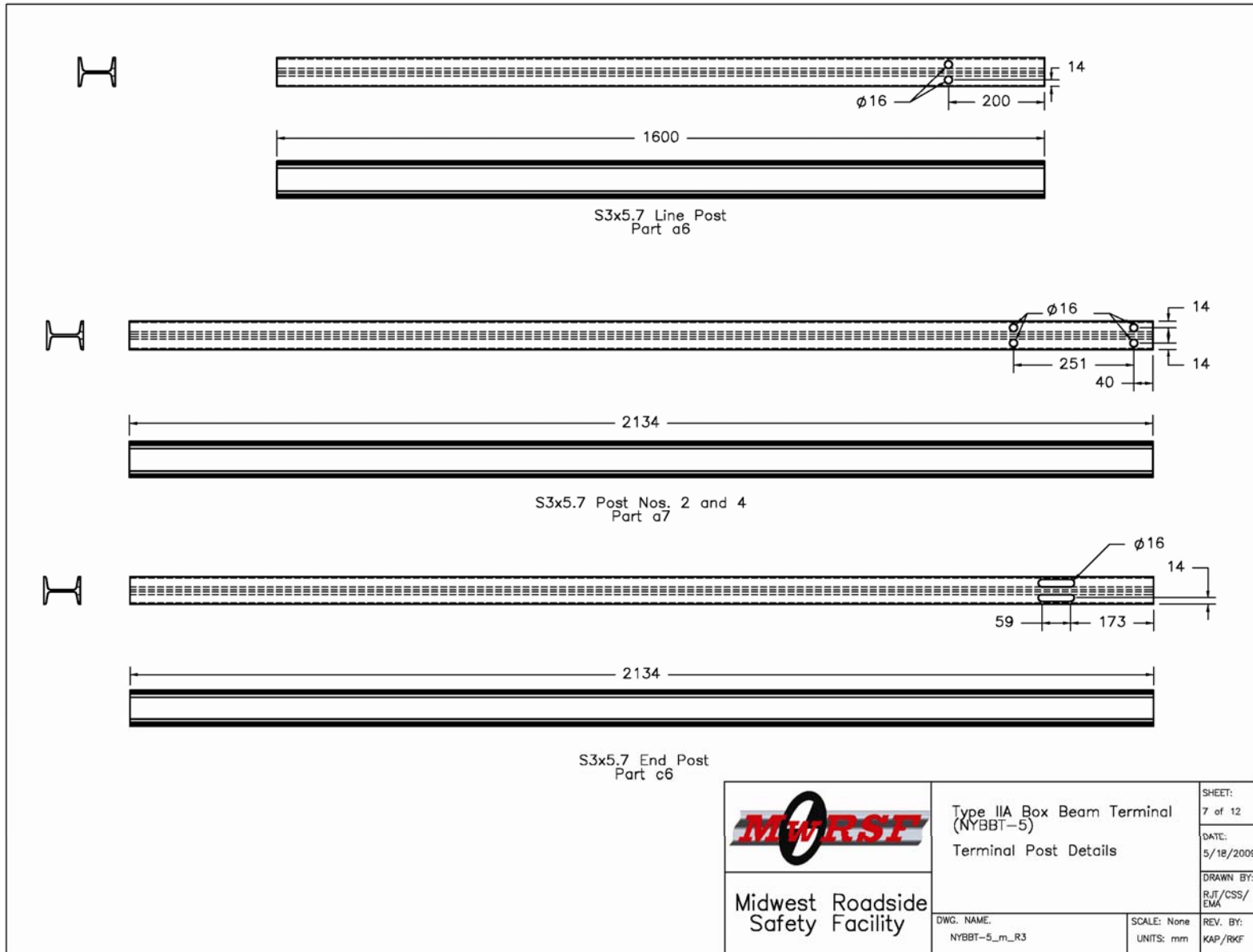


Figure M-7. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5



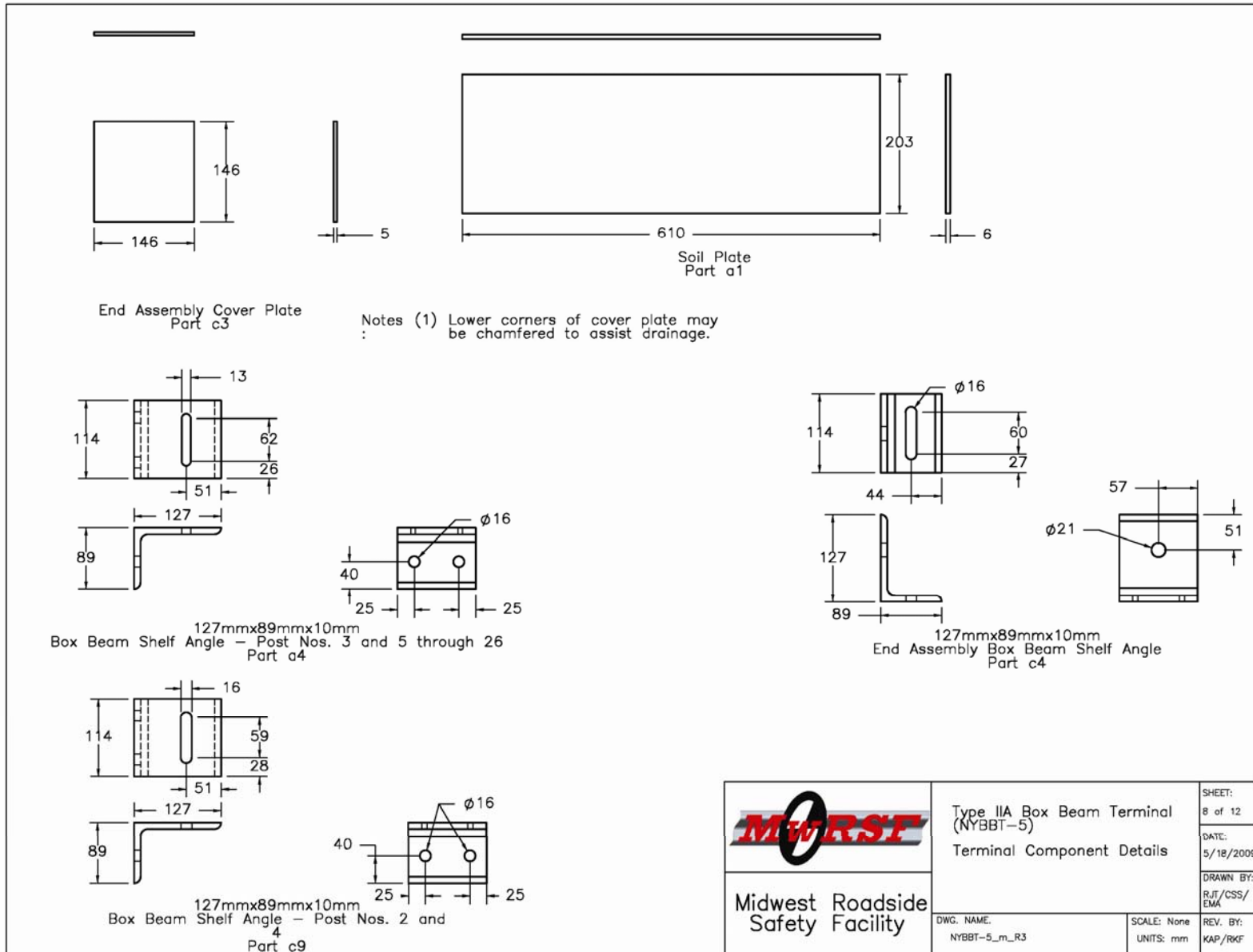


Figure M-8. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

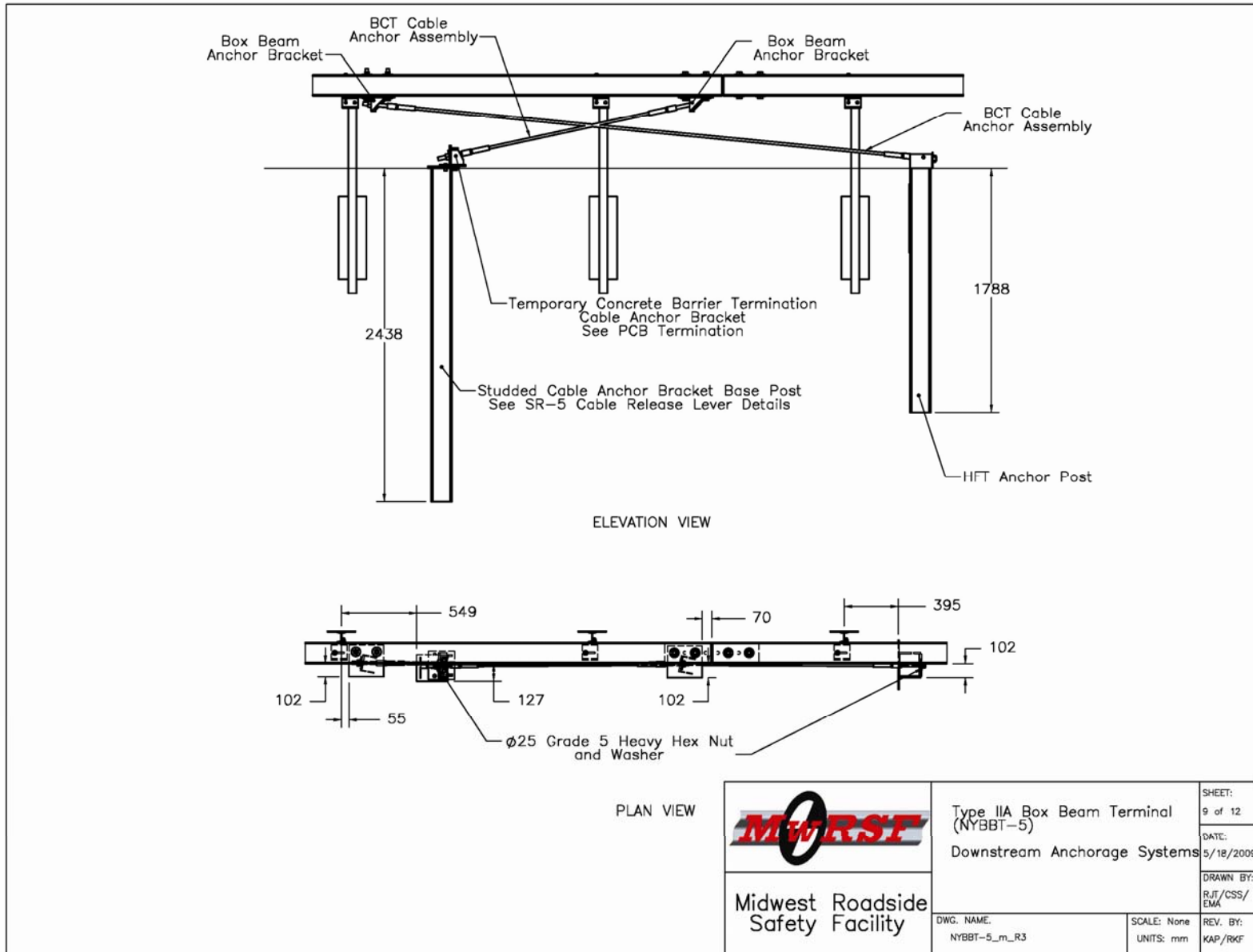


Figure M-9. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

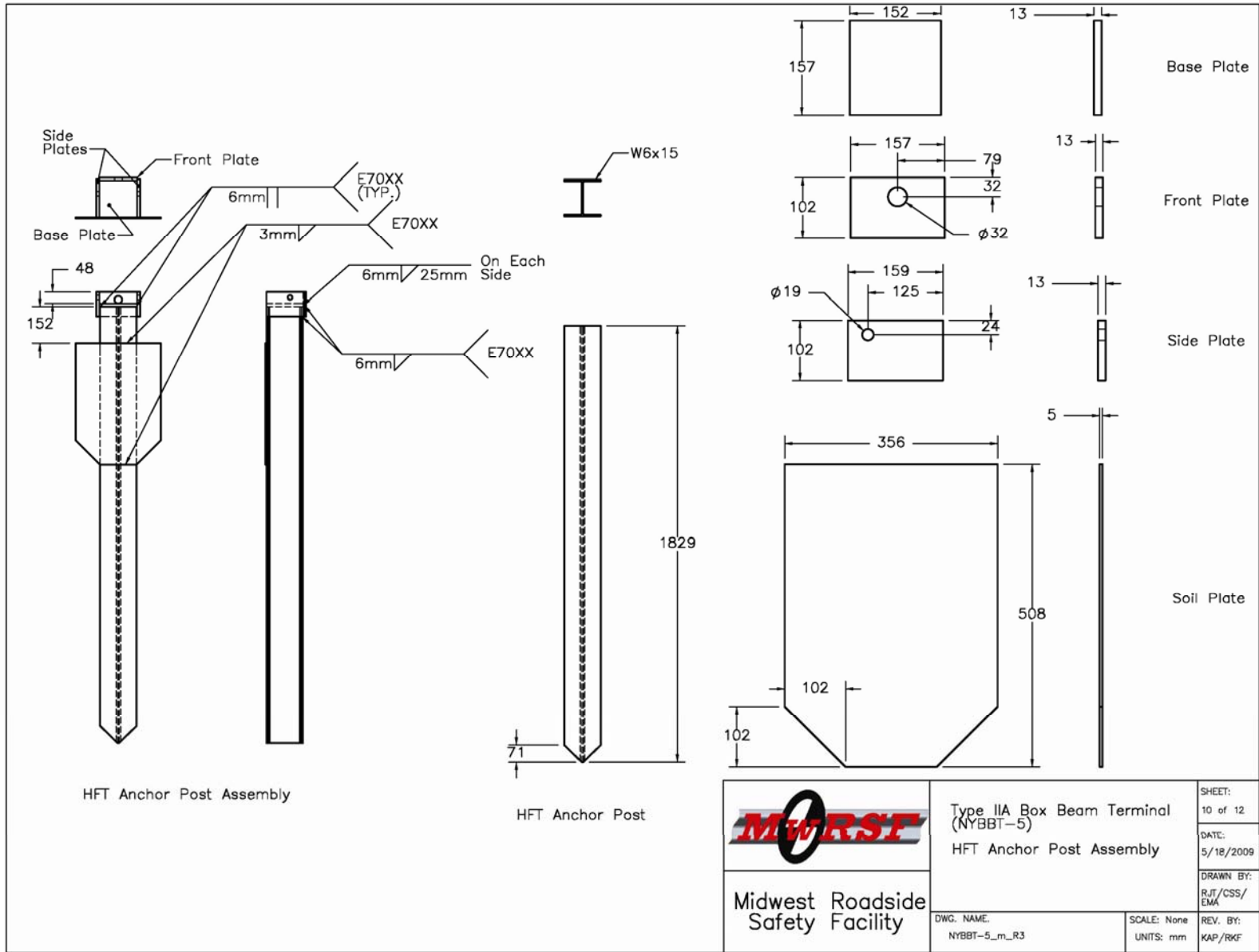


Figure M-10. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

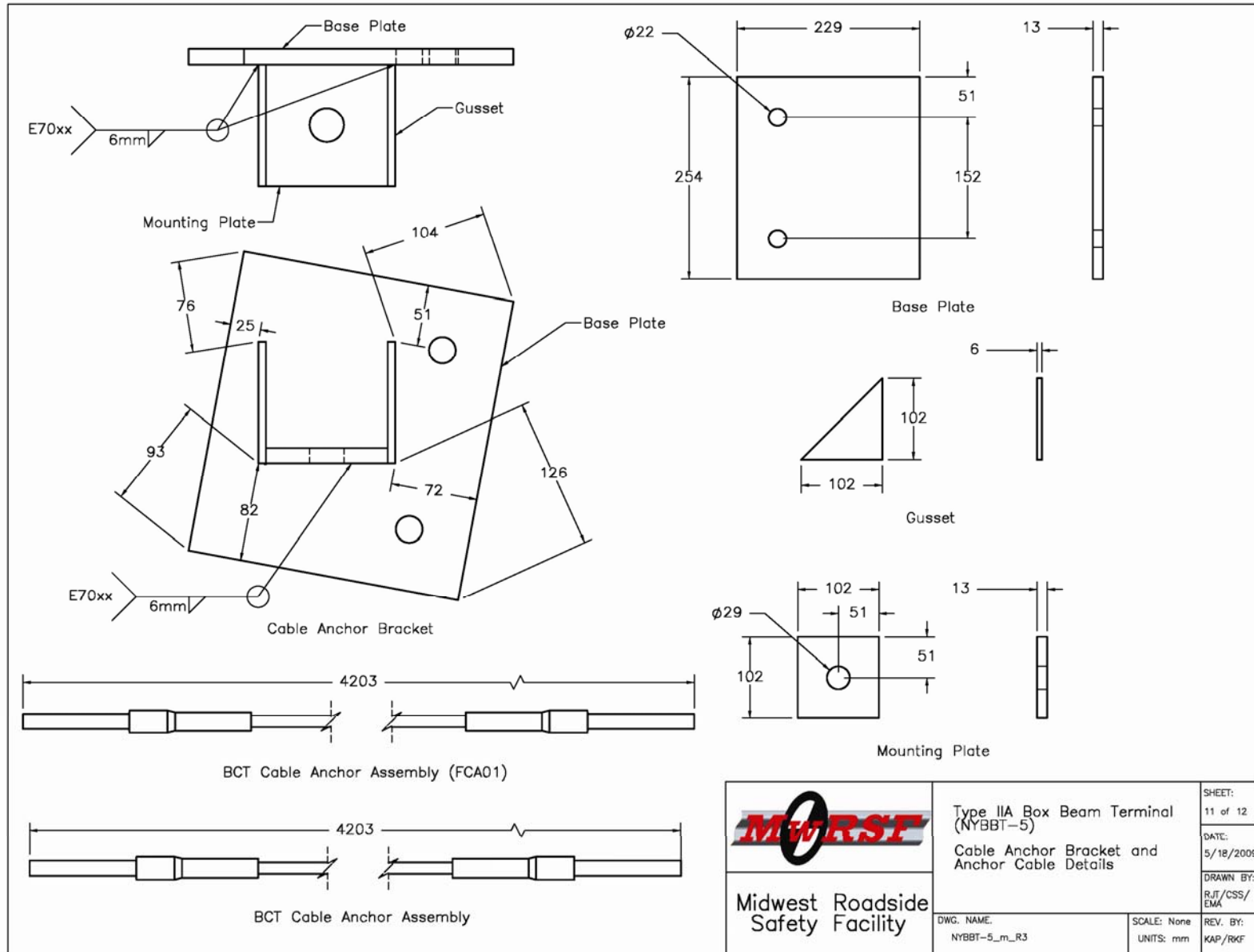


Figure M-11. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

NYBBT-5			
Item No.	QTY.	Description	Material Spec
a1	26	6mm x 203mm x 610mm steel soil plate	A36 Steel
a2	29	ø 13mm coarse thread 41mm long hex bolt	ASTM A307
a3	31	ø 13mm hex nut	ASTM A307
a4	23	127mm x 89mm x 10mm box beam shelf angle	A36 Steel
a5	31	ø 13mm narrow washer	ASTM A307
a6	23	S76 x 8.5 1600mm long post	A36 Steel
a7	2	S76 x 8.5 2134mm long post	A36 Steel
b1	22	ø 10mm coarse thread 191mm long hex bolt	ASTM A307
b2	22	ø 10mm hex nut	ASTM A307
b3	44	ø 10mm wide washer	ASTM A307
b4	59	ø 19mm hex nut	ASTM A325
b5	61	ø 19mm wide washer	ASTM A325
b6	56	ø 19mm coarse thread 51mm long hex bolt	ASTM A307
b7	14	686mm x 137mm x 16mm splice plate	A36 Steel
b8	6	152mm x 152mm x 4.8mm by 5483mm long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 152mm x 152mm x 4.8mm box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 152mm x 152mm x 4.8mm box beam	ASTM A500 Grade B
c3	1	End assembly 4.8mm thick cover plate	A36 Steel
c4	1	127mm x 89mm x 10mm box beam anchor post shelf angle	A36 Steel
c5	1	ø 19mm coarse thread 191mm long hex bolt	ASTM A307
c6	1	S76 x 8.5 2134mm long post anchor post	A36 Steel
c7	1	152mm x 152mm x 4.8mm R 10.62m Curved Box Beam	ASTM A500 Grade B
c8	2	ø 13mm coarse thread 203mm long hex bolt	ASTM A307
c9	4	127mm x 89mm x 10mm box beam shelf angle with ø16mm slot	A36 Steel
c10	4	ø 13mm wide washer	ASTM A307

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-5) Bill of Materials		SHEET: 12 of 12
			DATE: 5/18/2009
		DWG. NAME: NYBBT-5_m_R3	DRAWN BY: RJT/CSS/ EMA
		SCALE: None UNITS: mm	REV. BY: KAP/RKF

Figure M-12. Modified Type IIA Box Beam Terminal Details (Metric), Test No. NYBBT-5

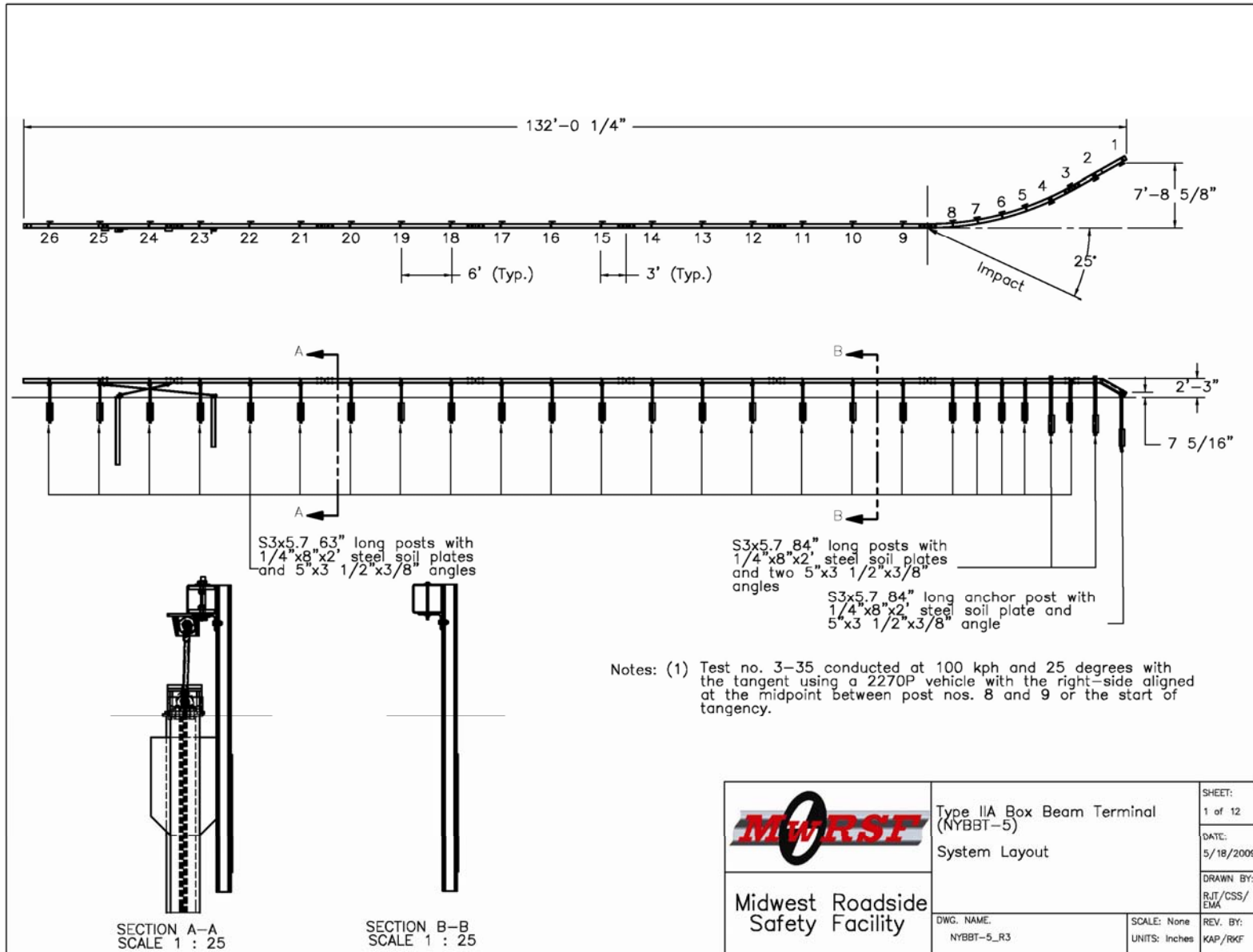


Figure M-13. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

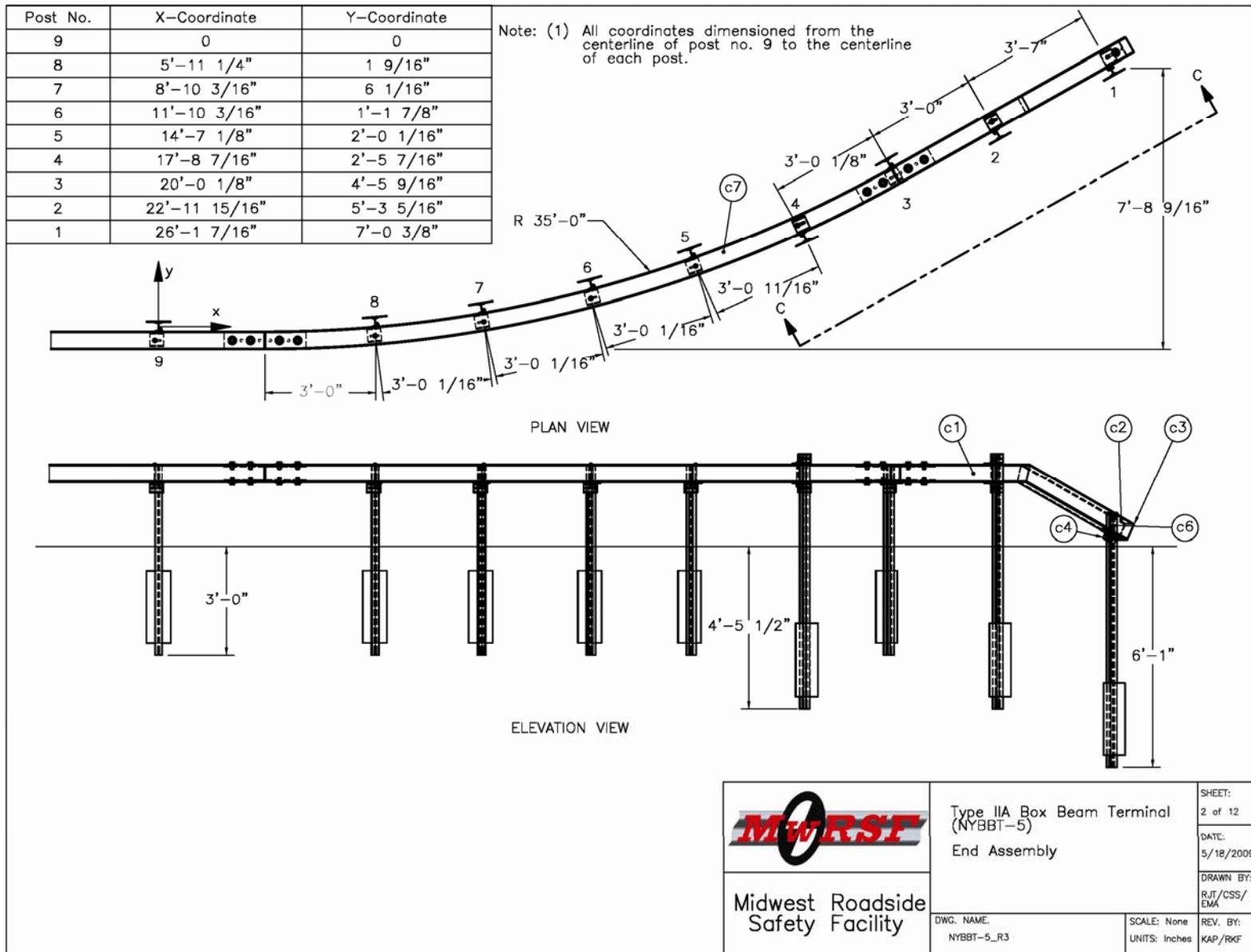


Figure M-14. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

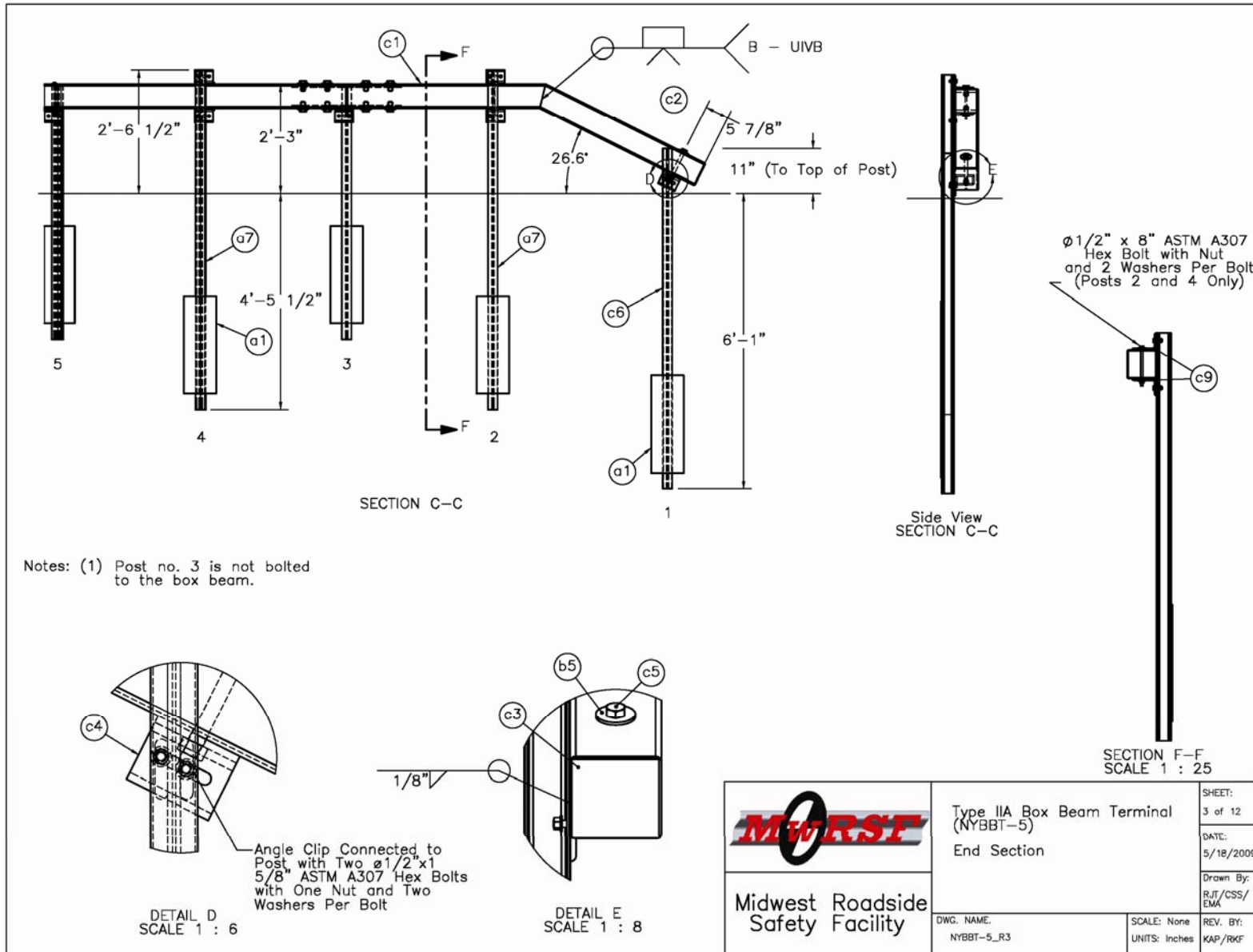


Figure M-15. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5



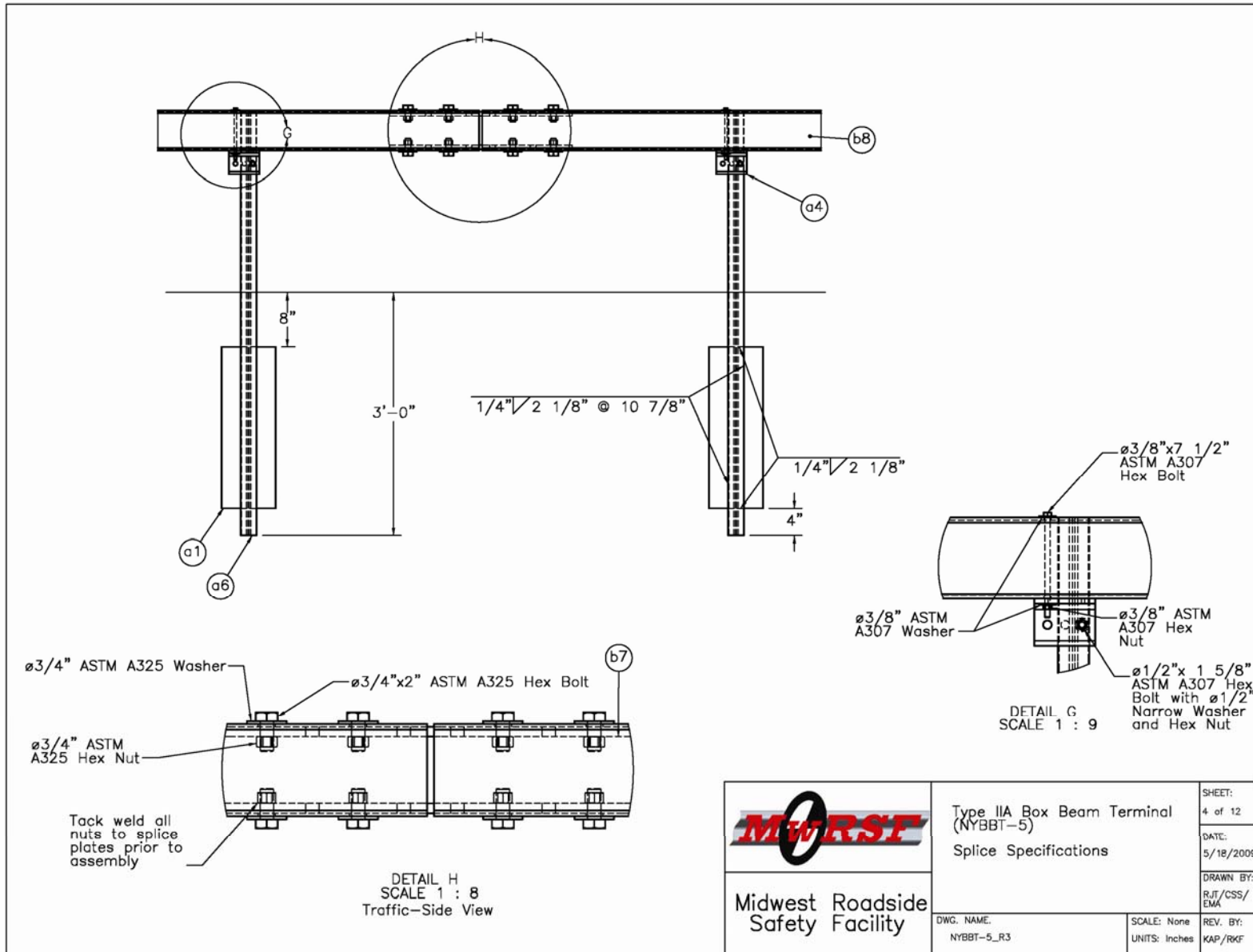


Figure M-16. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

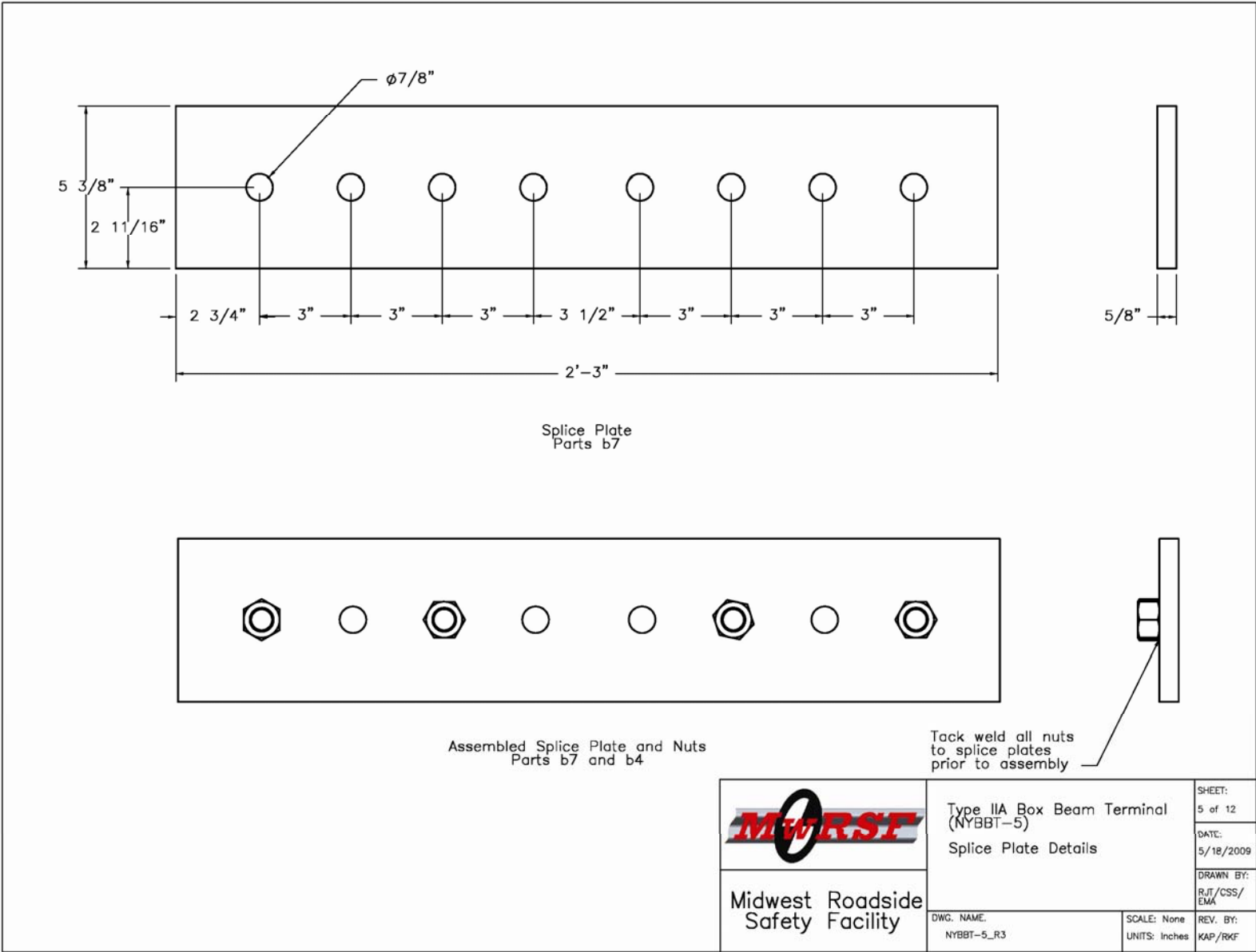


Figure M-17. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

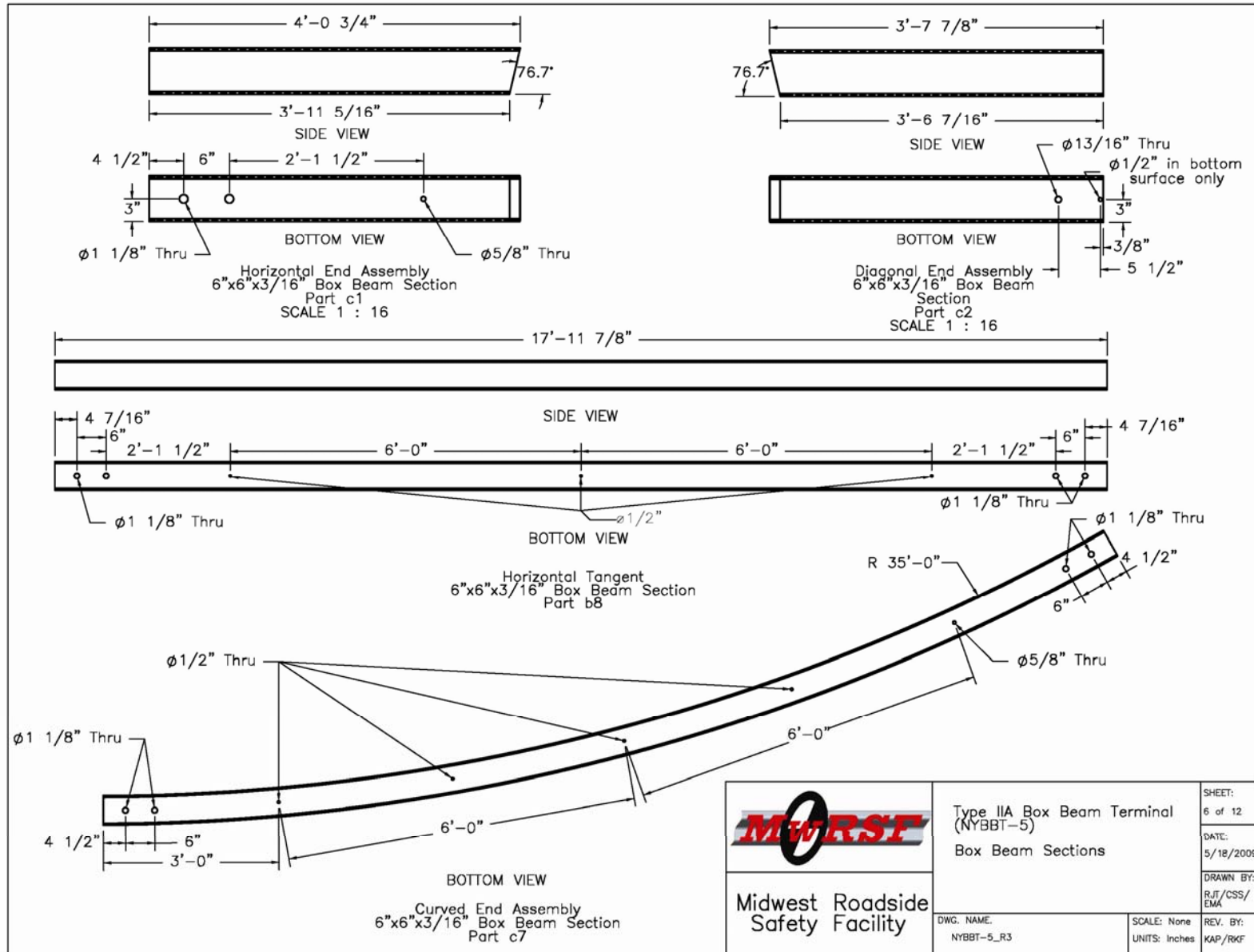


Figure M-18. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

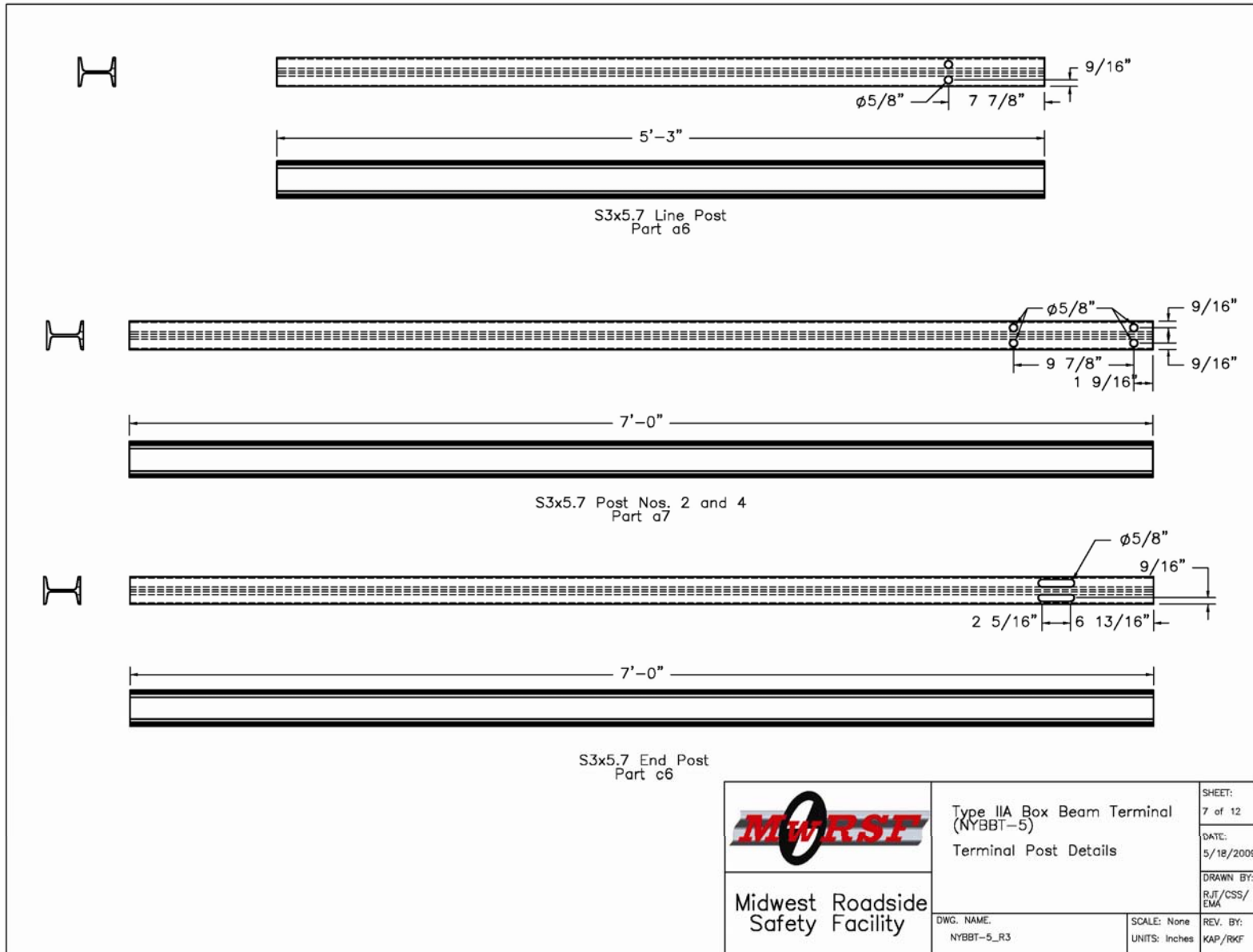


Figure M-19. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5



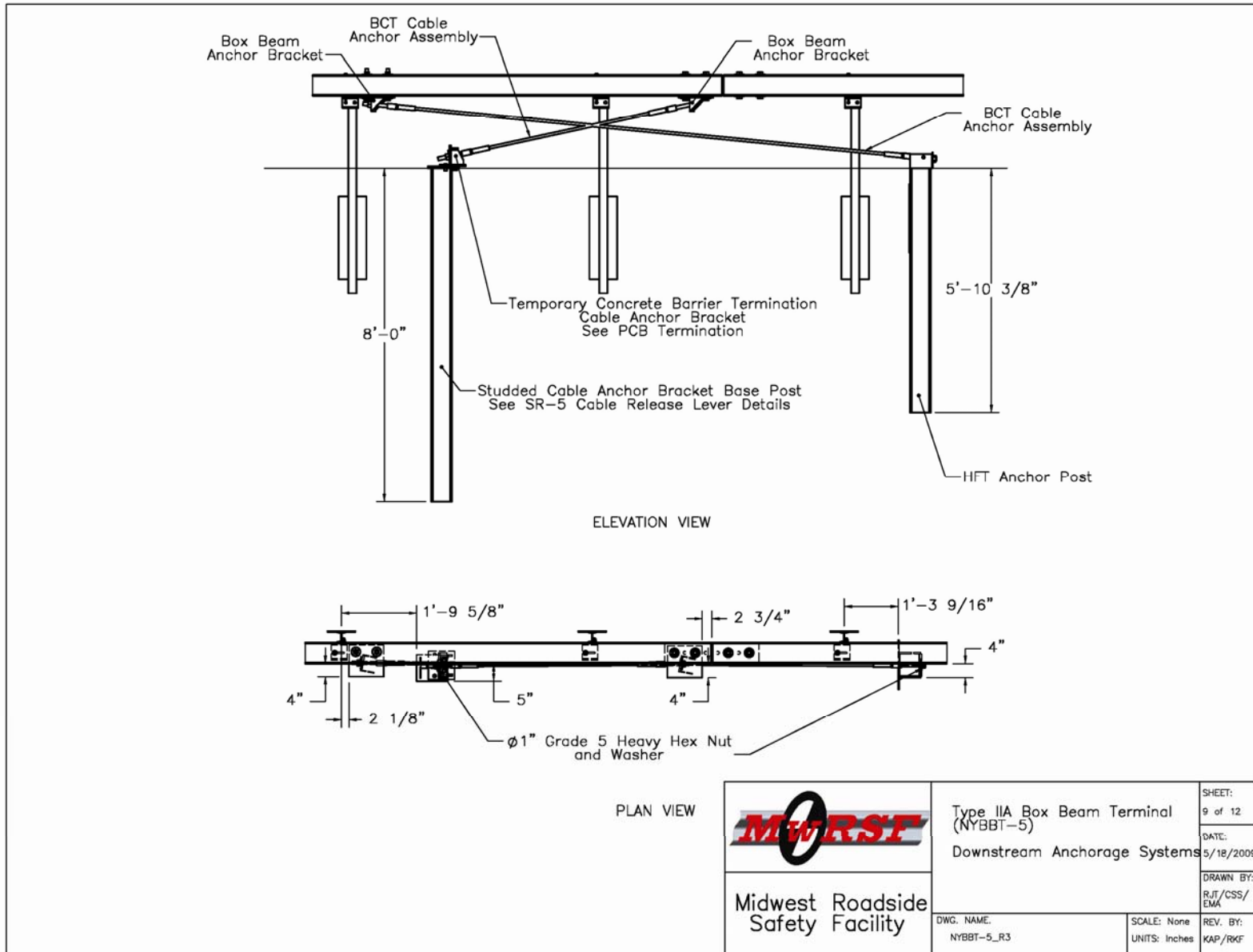


Figure M-21. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

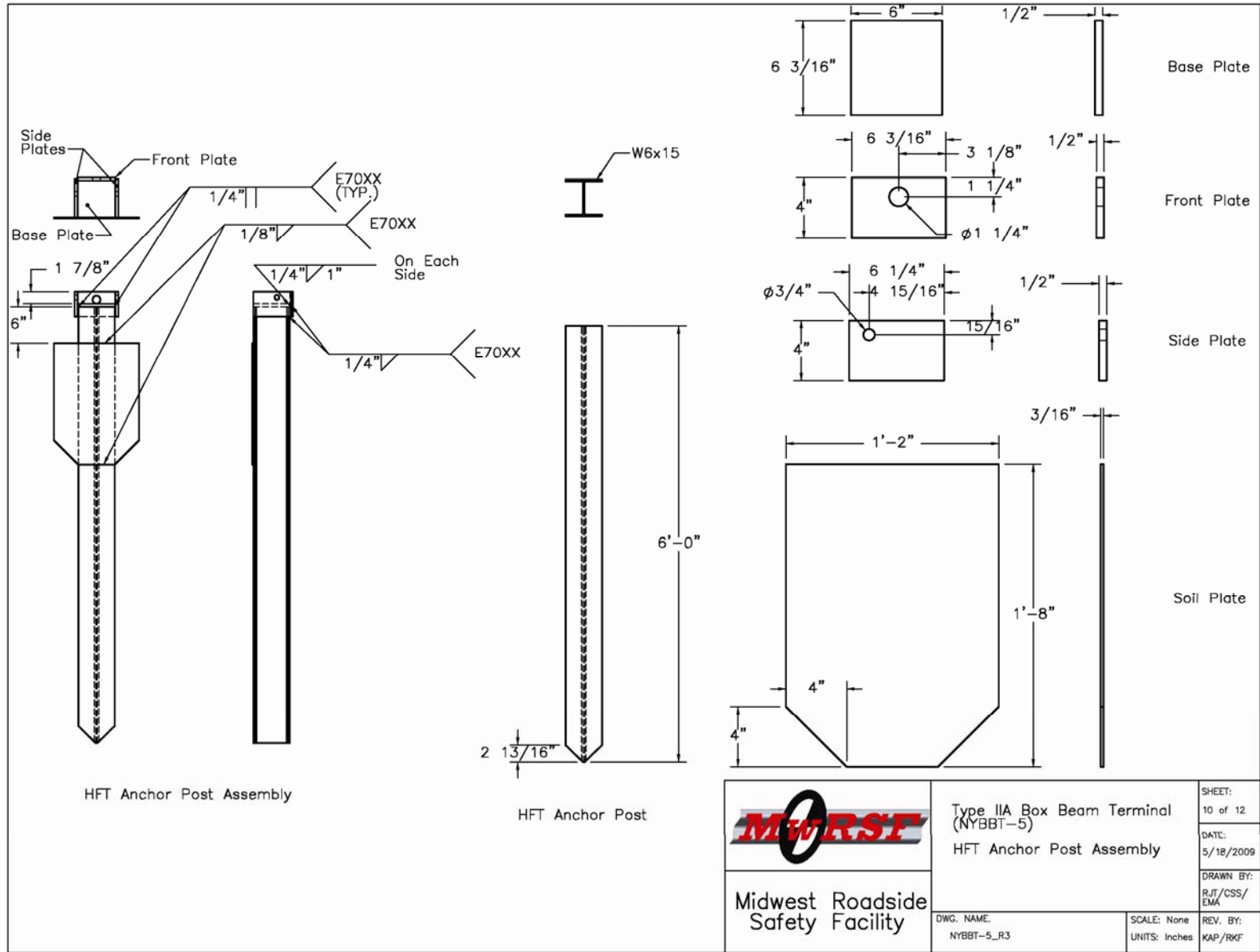


Figure M-22. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

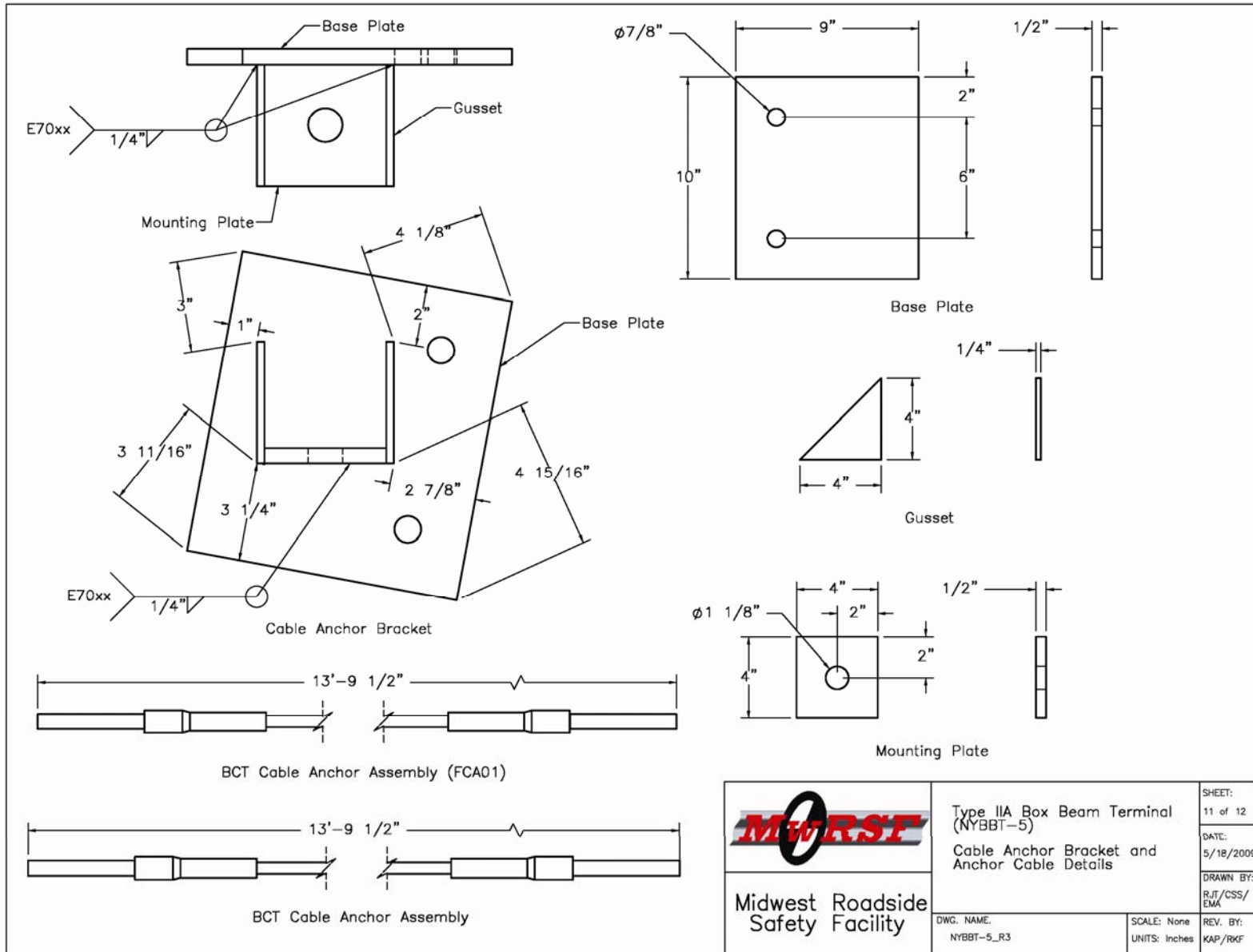


Figure M-23. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5



NYBBT-5			
Item No.	QTY.	Description	Material Spec
a1	26	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	29	ø 1/2" coarse thread 1 5/8" long hex bolt	ASTM A307
a3	31	ø 1/2" hex nut	ASTM A307
a4	23	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	31	ø 1/2" narrow washer	ASTM A307
a6	23	S3 x 5.7 63" long post	A36 Steel
a7	2	S3 x 5.7 84" long post	A36 Steel
b1	22	ø 3/8" coarse thread 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	59	ø 3/4" hex nut	ASTM A325
b5	61	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread 2" long hex bolt	ASTM A307
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" by 17'-11 7/8" long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam anchor post shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread 7 3/4" long hex bolt	ASTM A307
c6	1	S3 x 5.7 84" long post anchor post	A36 Steel
c7	1	6"x6"x3/16" R 35' Curved Box Beam	ASTM A500 Grade B
c8	2	ø 1/2" coarse thread 8" long hex bolt	ASTM A307
c9	4	5" x 3 1/2" x 3/8" box beam shelf angle with ø5/8" slot	A36 Steel
c10	4	ø 1/2" wide washer	ASTM A307

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-5) Bill of Materials		SHEET: 12 of 12
			DATE: 5/18/2009
		DWG. NAME: NYBBT-5_R3	DRAWN BY: RJT/CSS/ EMA
		SCALE: None UNITS: Inches	REV. BY: KAP/RKF

Figure M-24. Modified Type IIA Box Beam Terminal Details (English), Test No. NYBBT-5

**APPENDIX N Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-5**

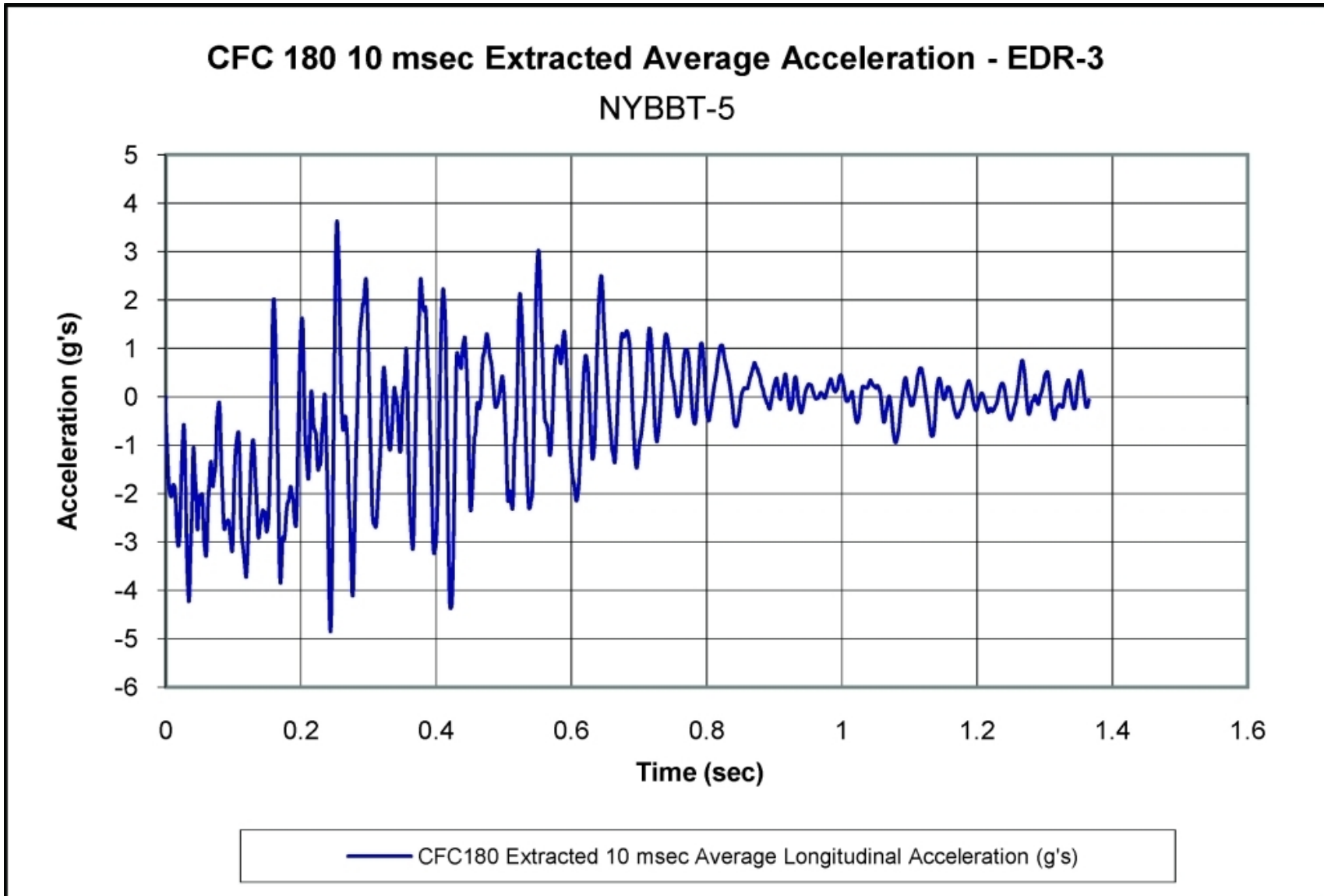


Figure N-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-5

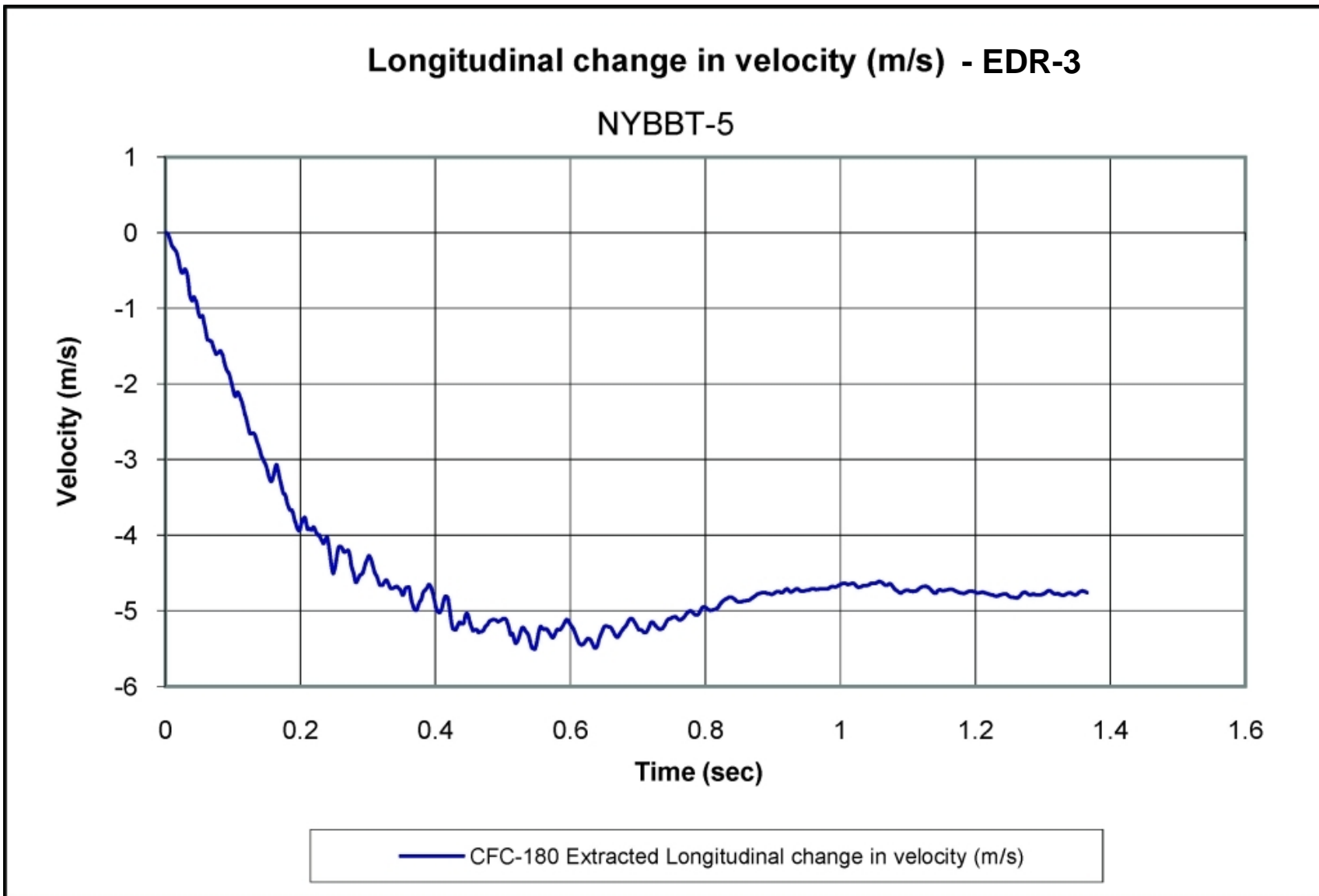


Figure N-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-5

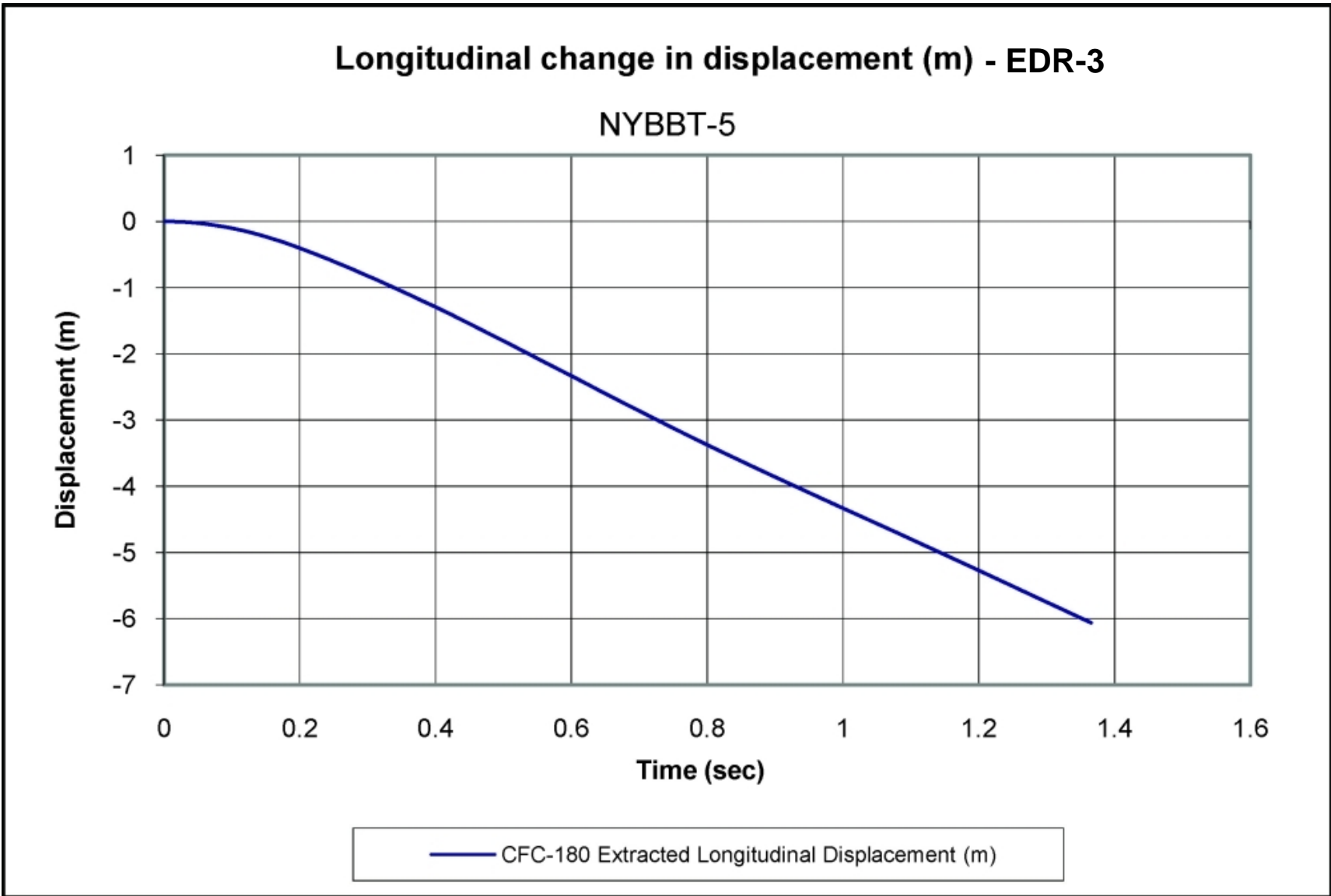


Figure N-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-5

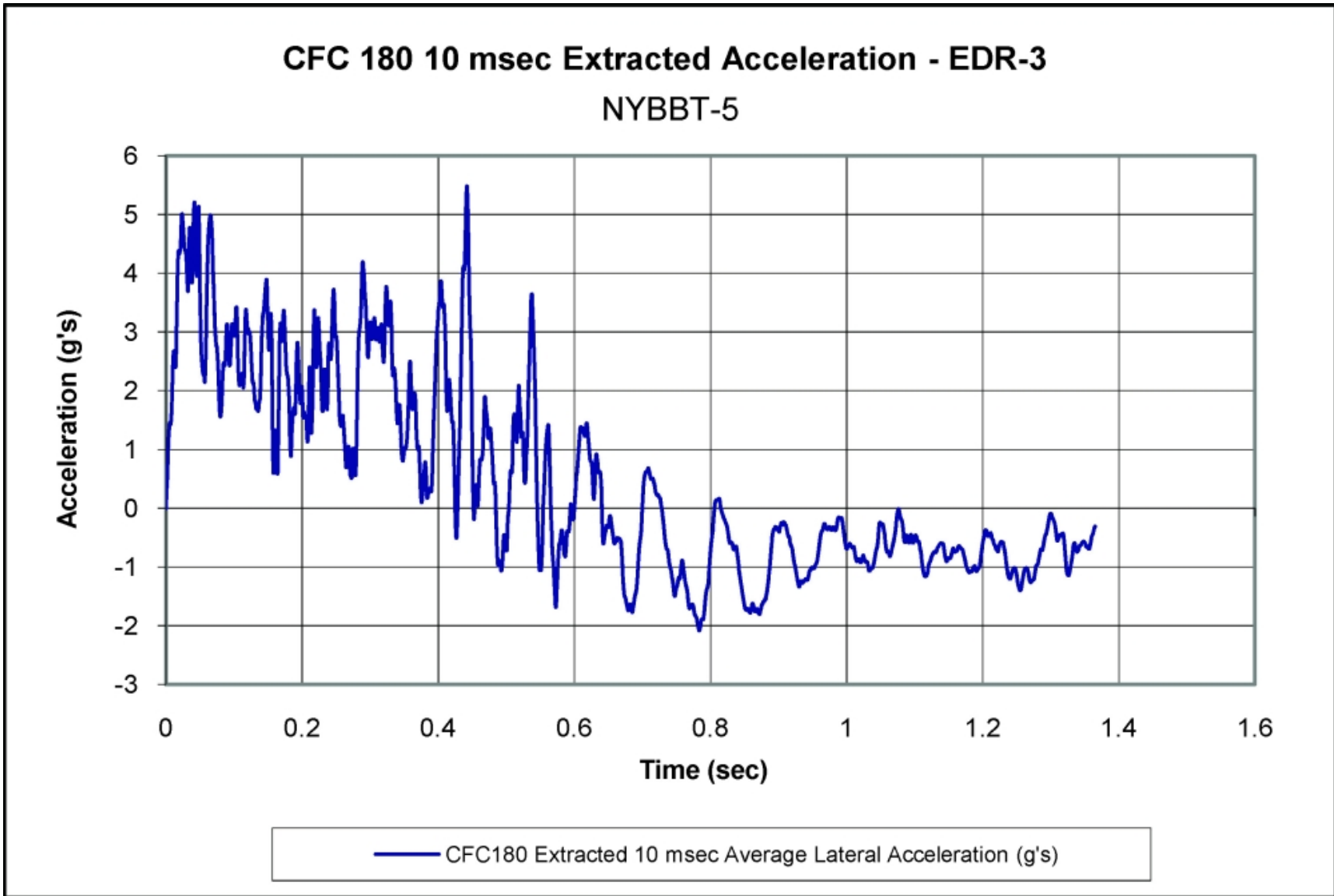


Figure N-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-5

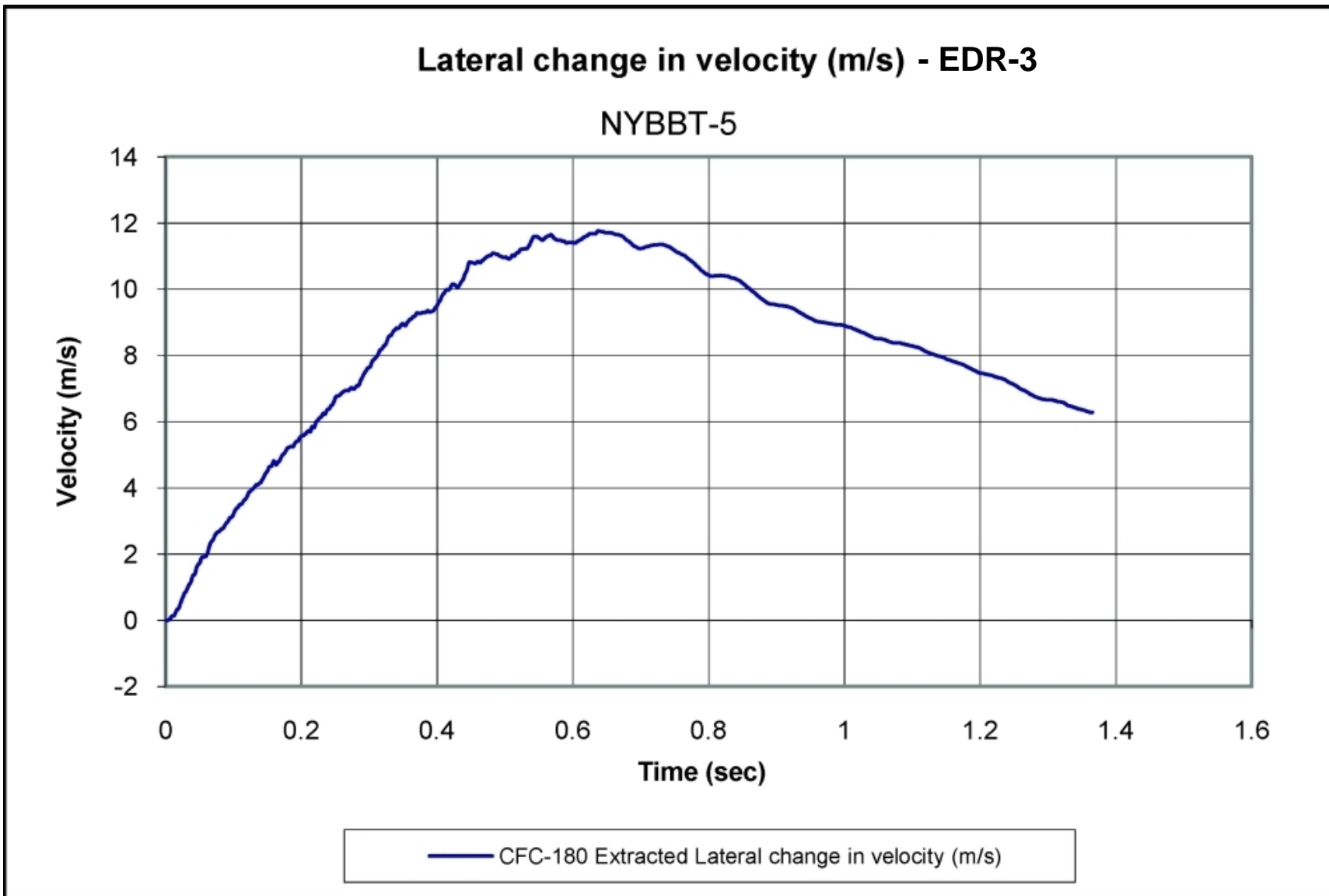


Figure N-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-5

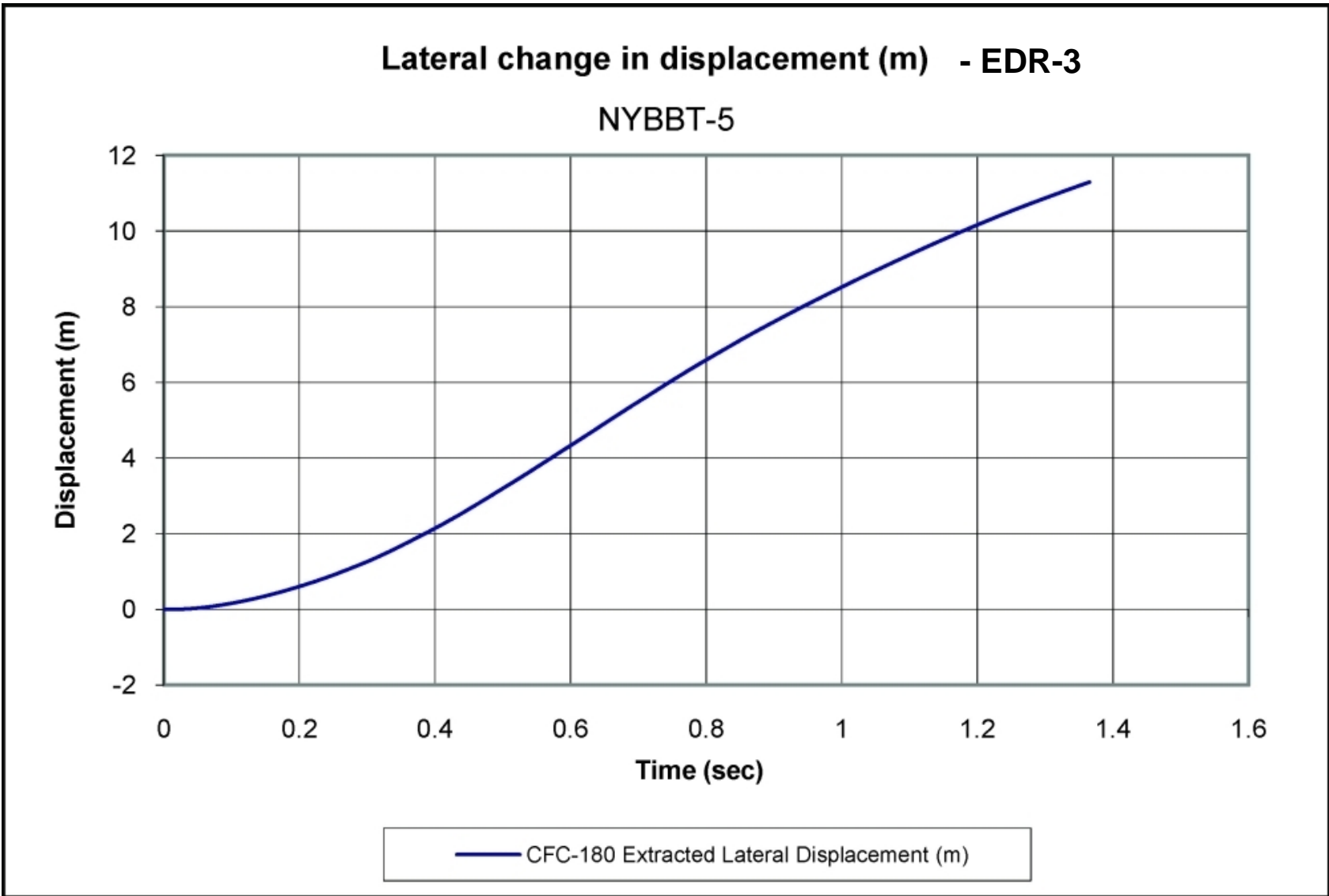


Figure N-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-5



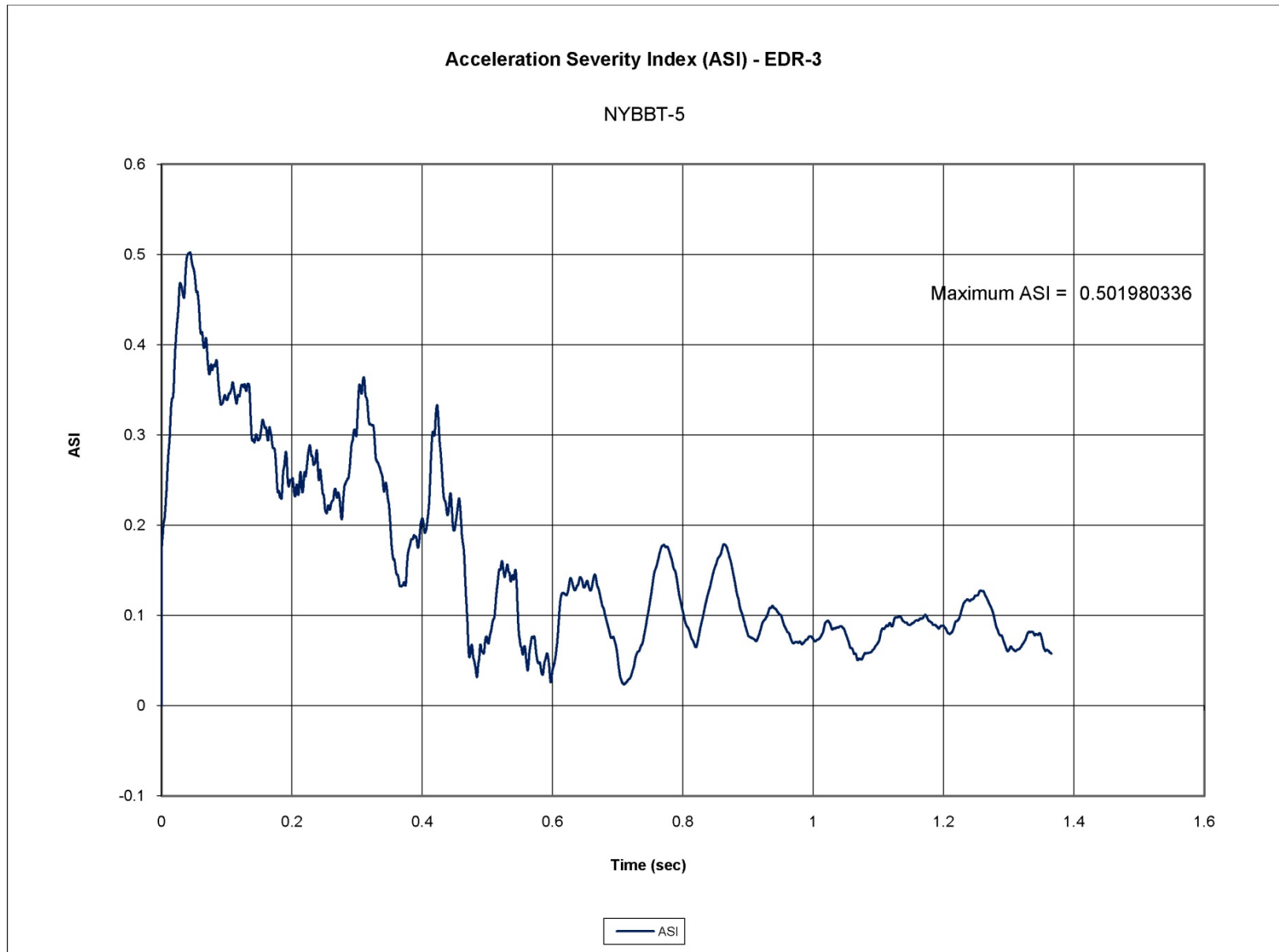


Figure N-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-5

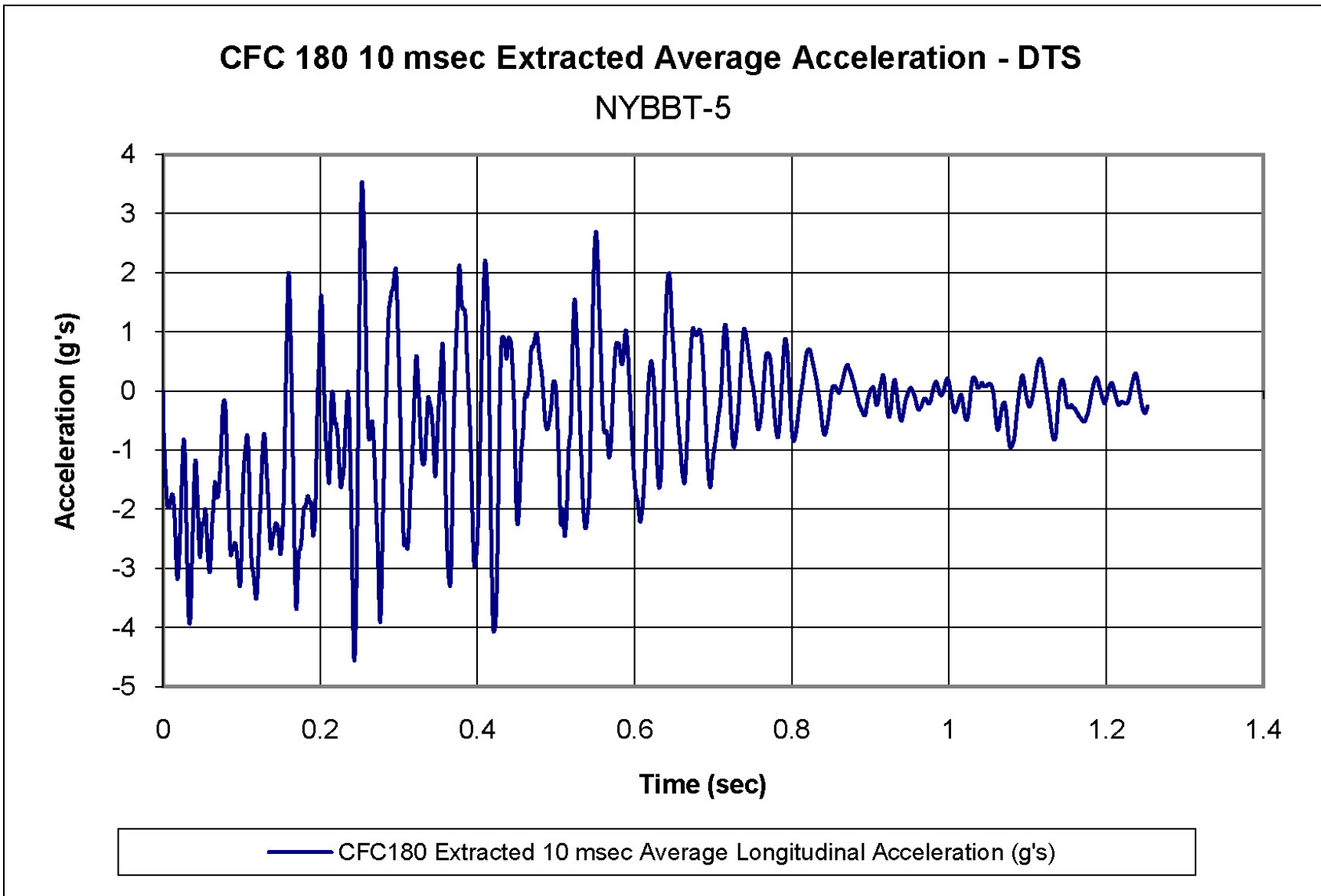


Figure N-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-5

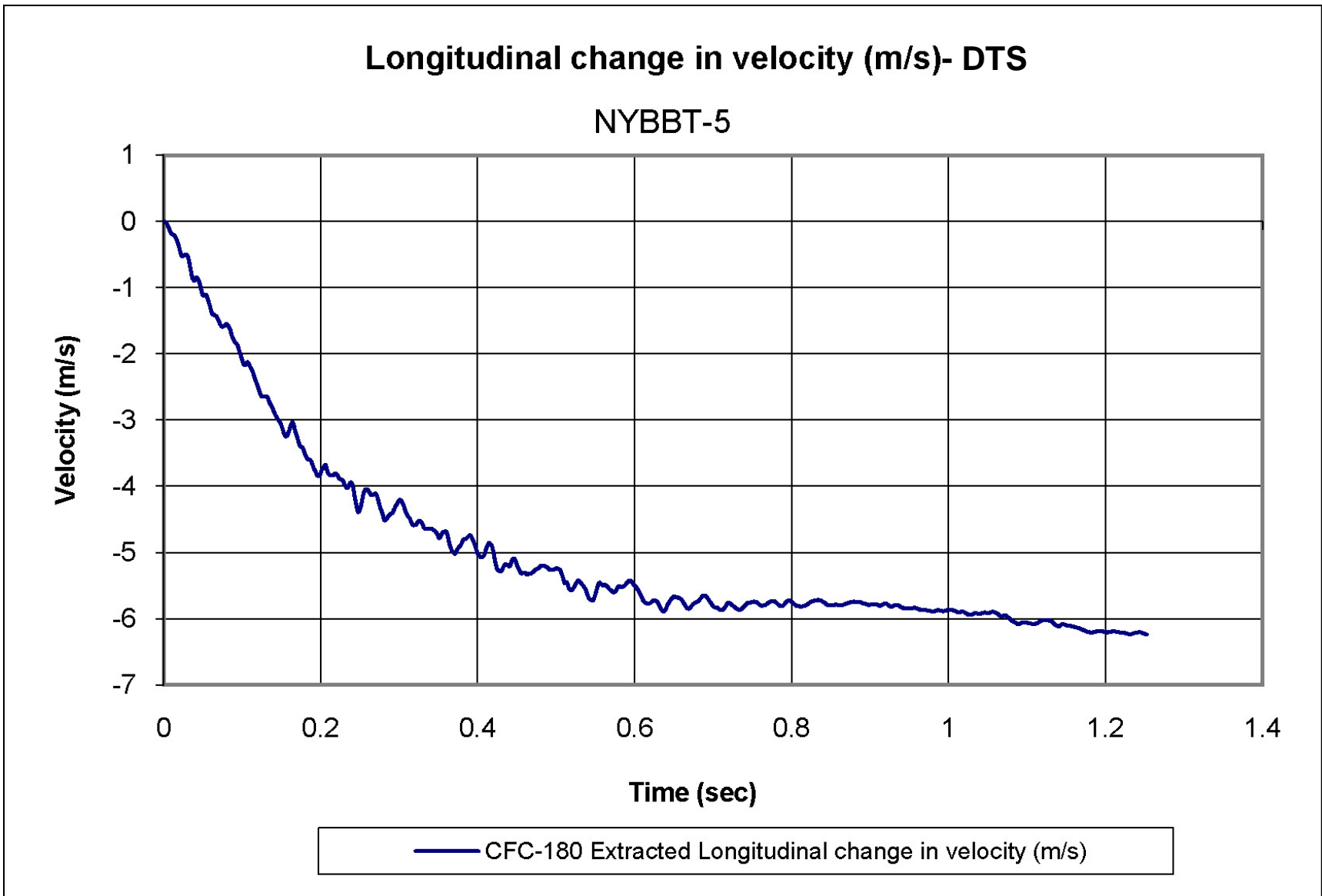


Figure N-9. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-5

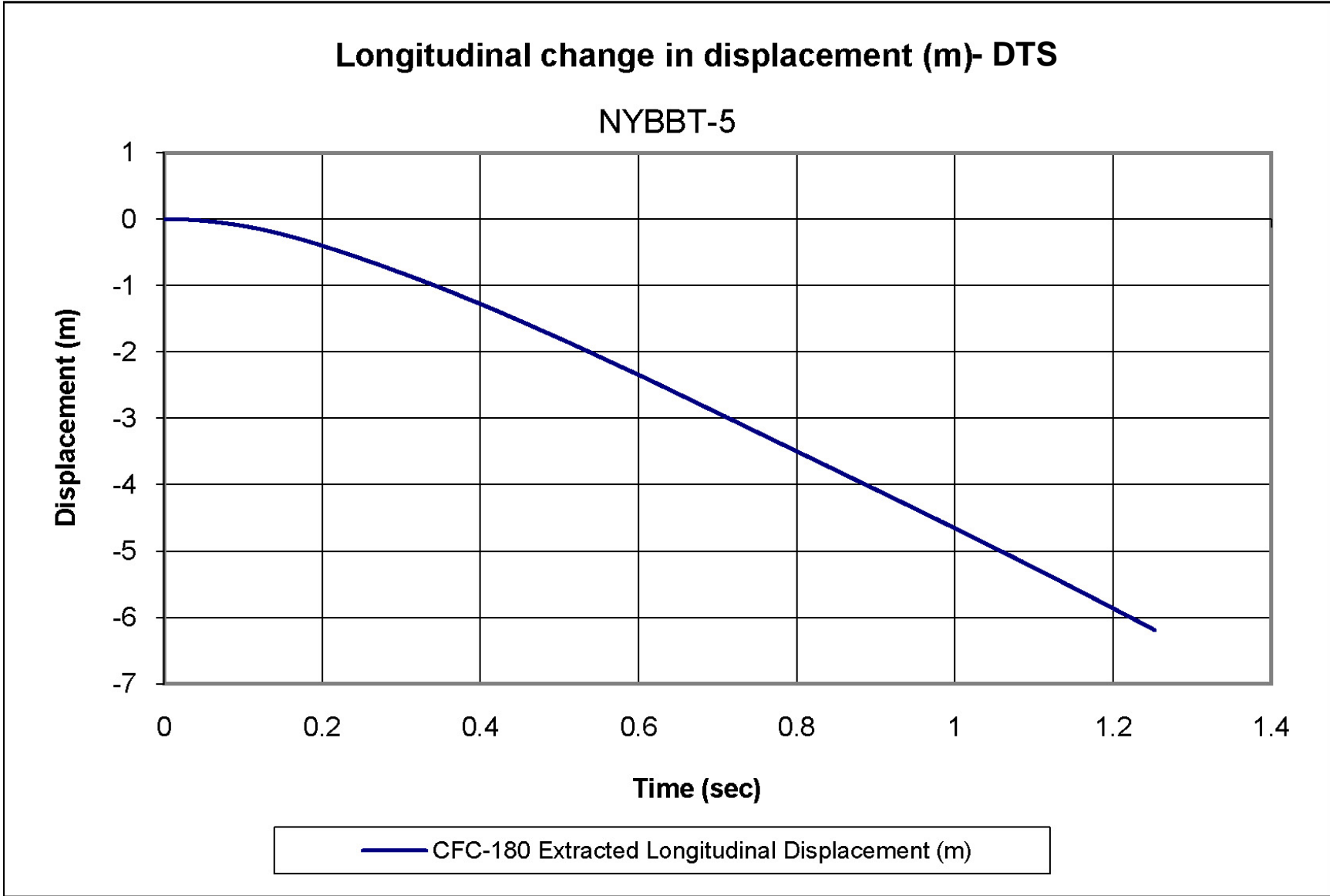


Figure N-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-5

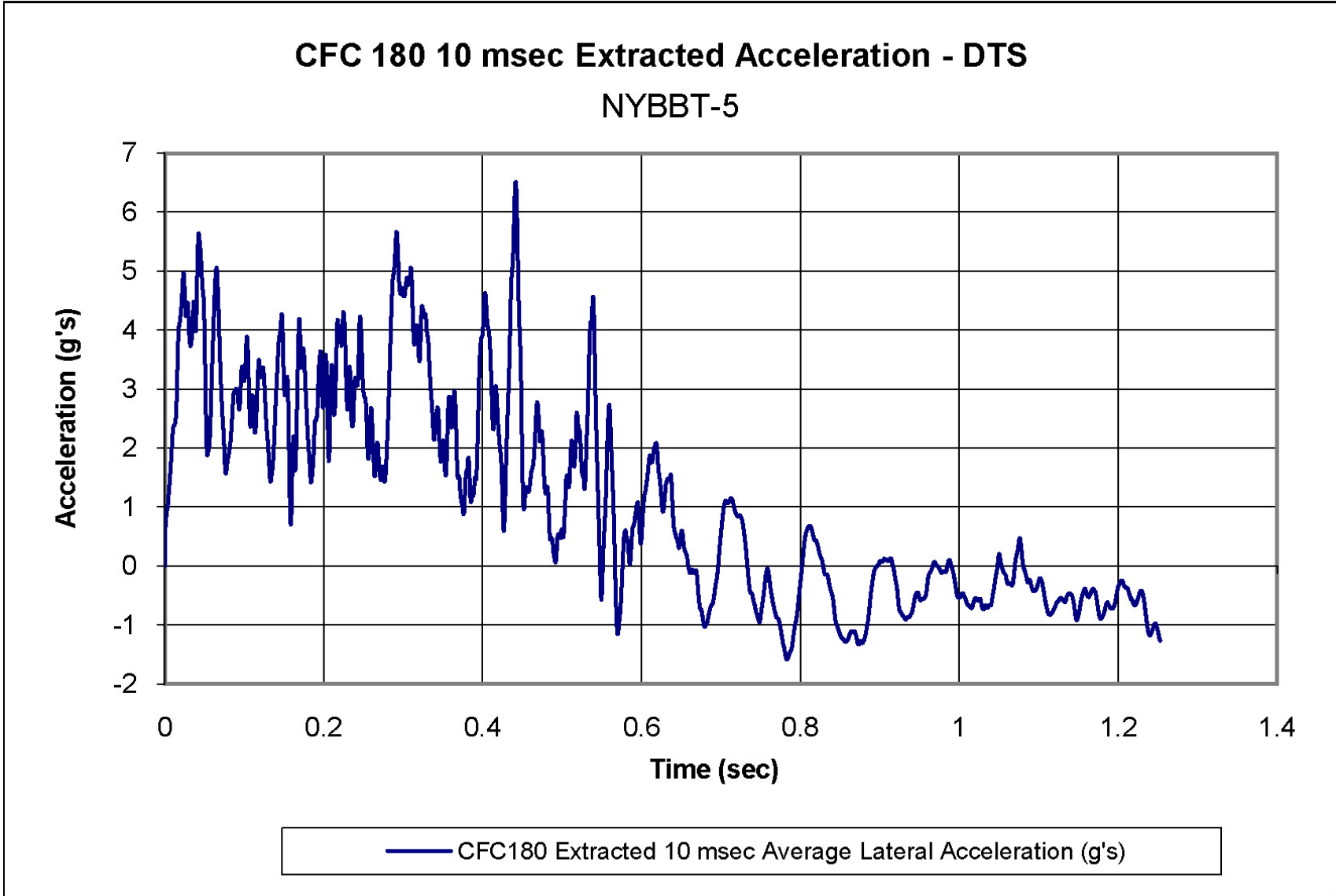


Figure N-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-5

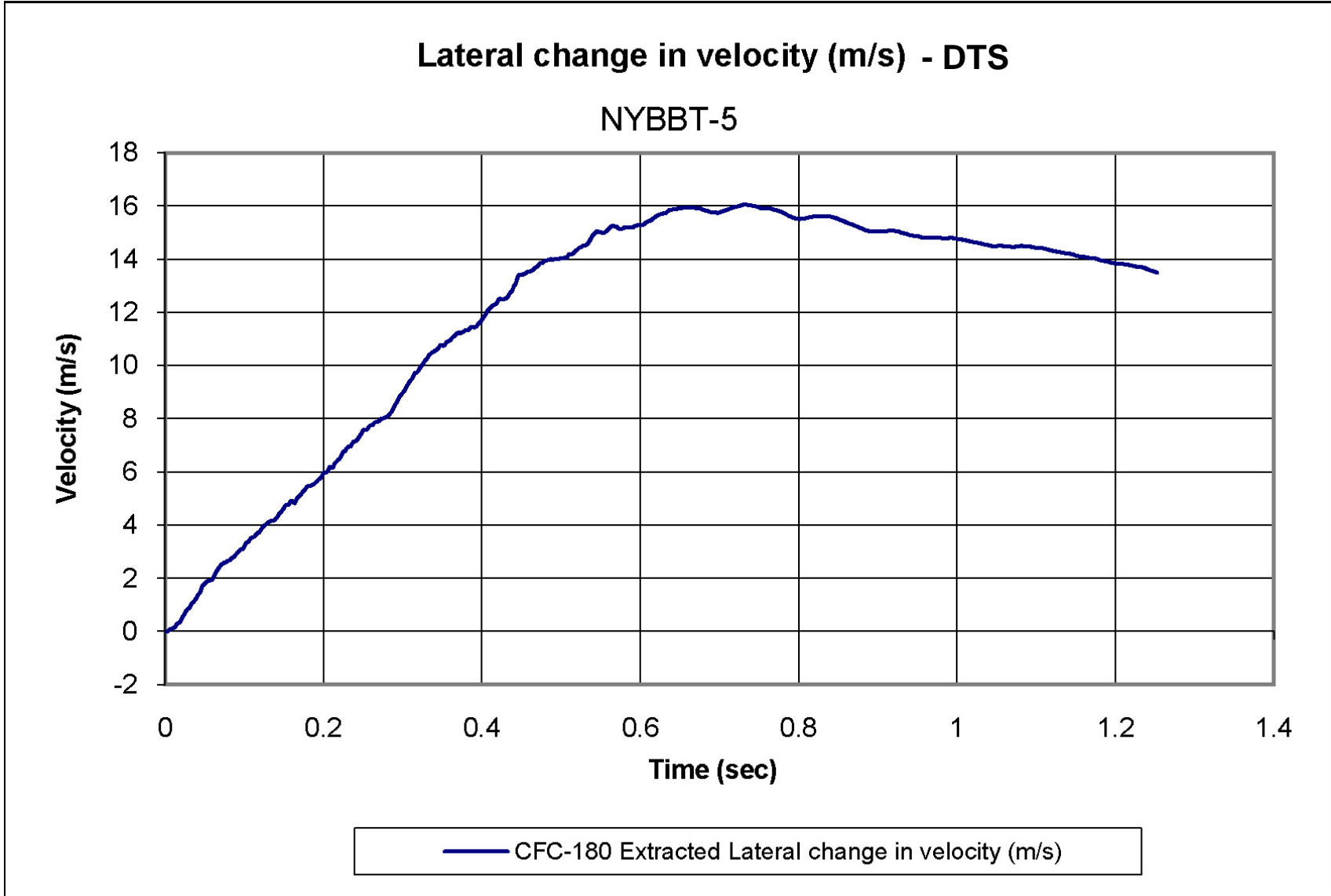


Figure N-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-5

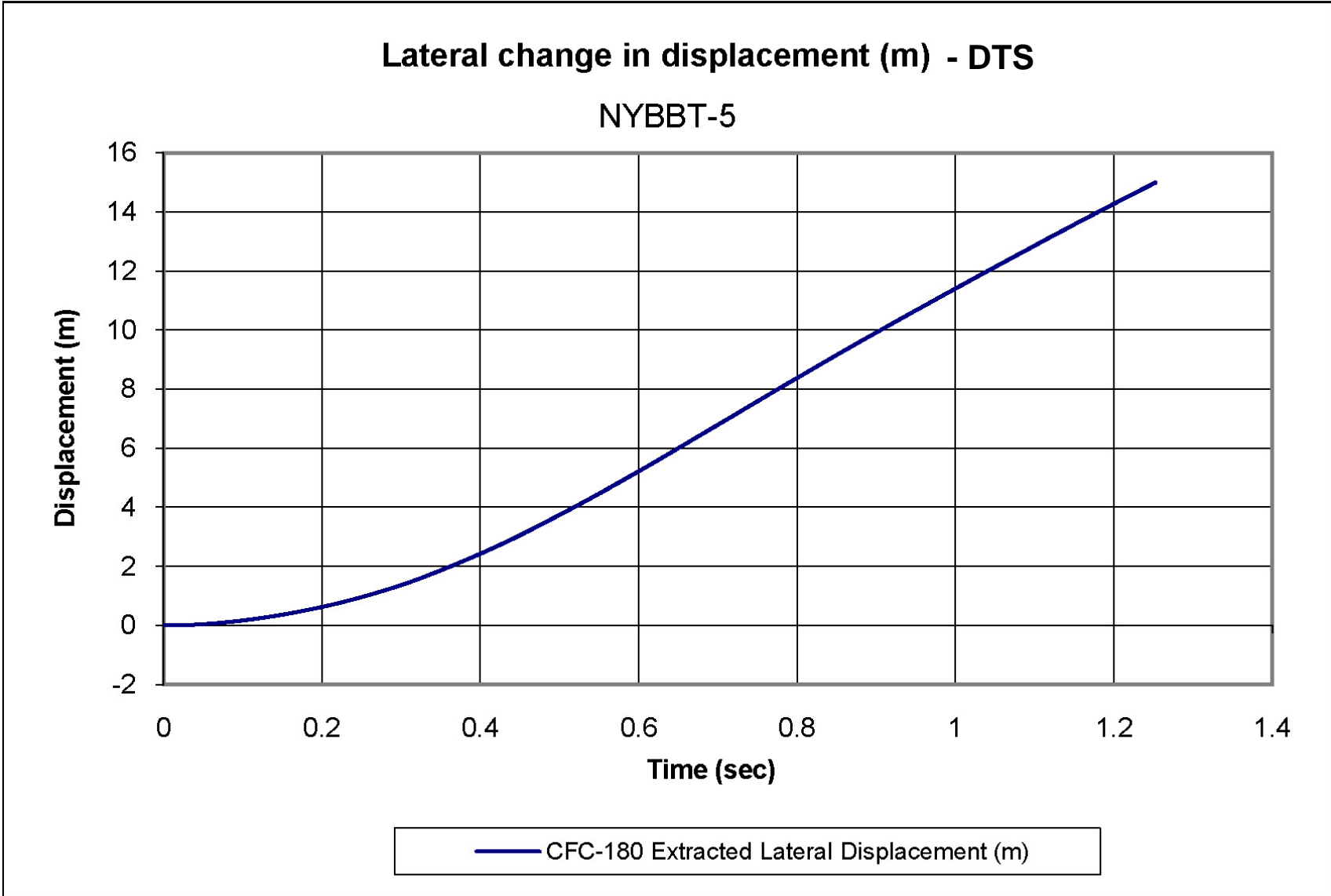


Figure N-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-5

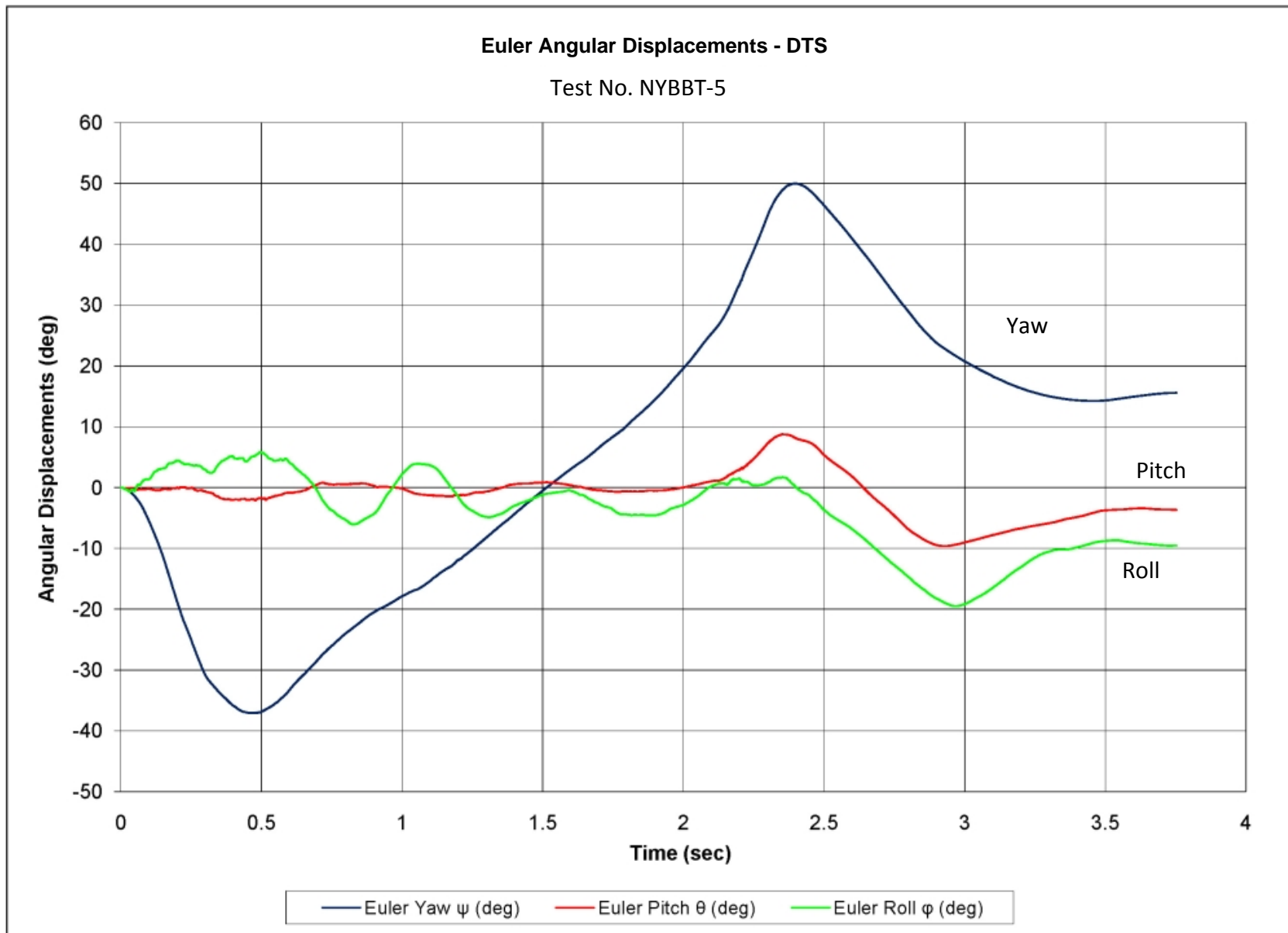


Figure N-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-5



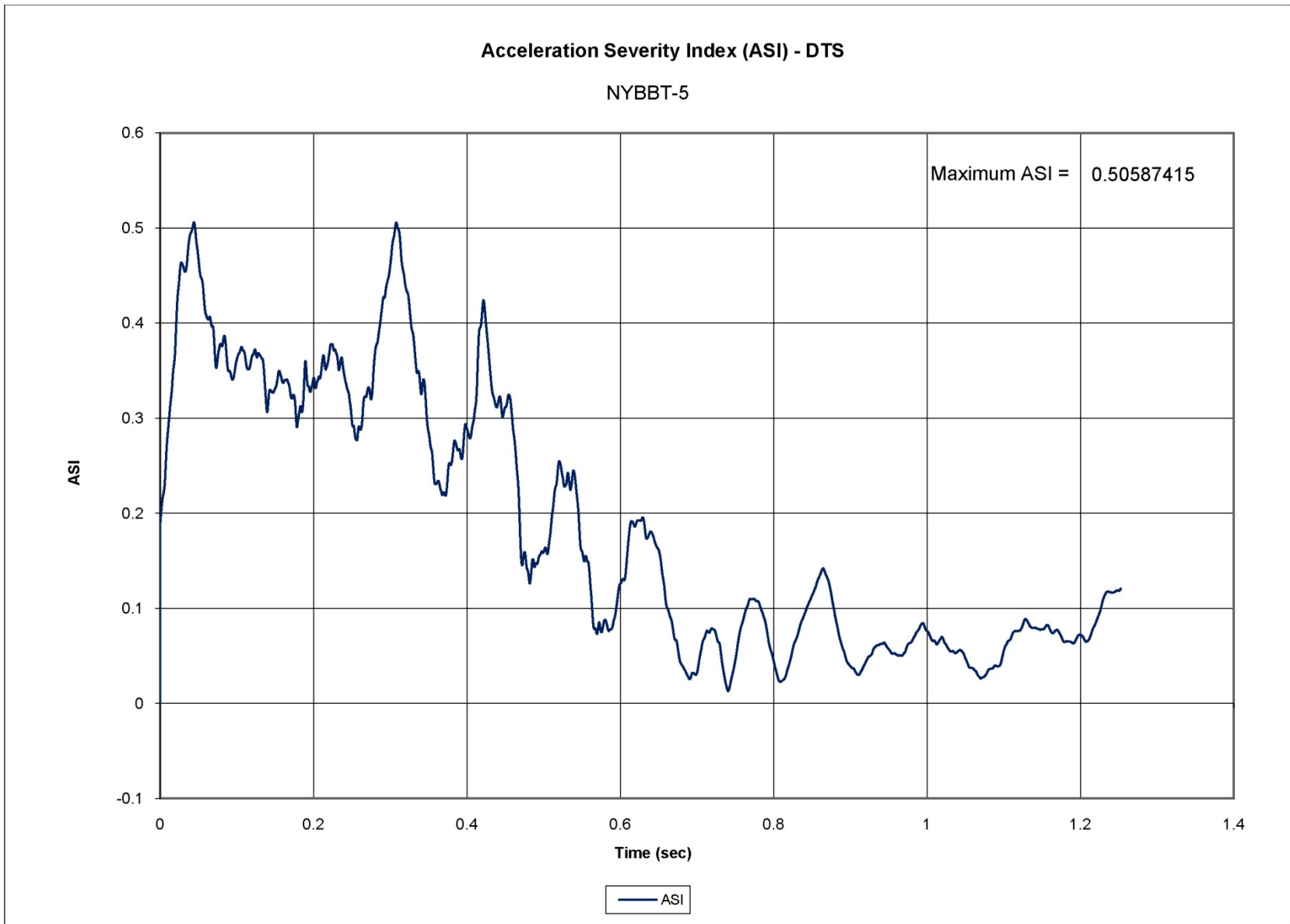


Figure N-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-5

**APPENDIX O Modified Type IIA Box Beam Terminal in Ditch System Details - English  
Units, Test No. NYBBT-6**

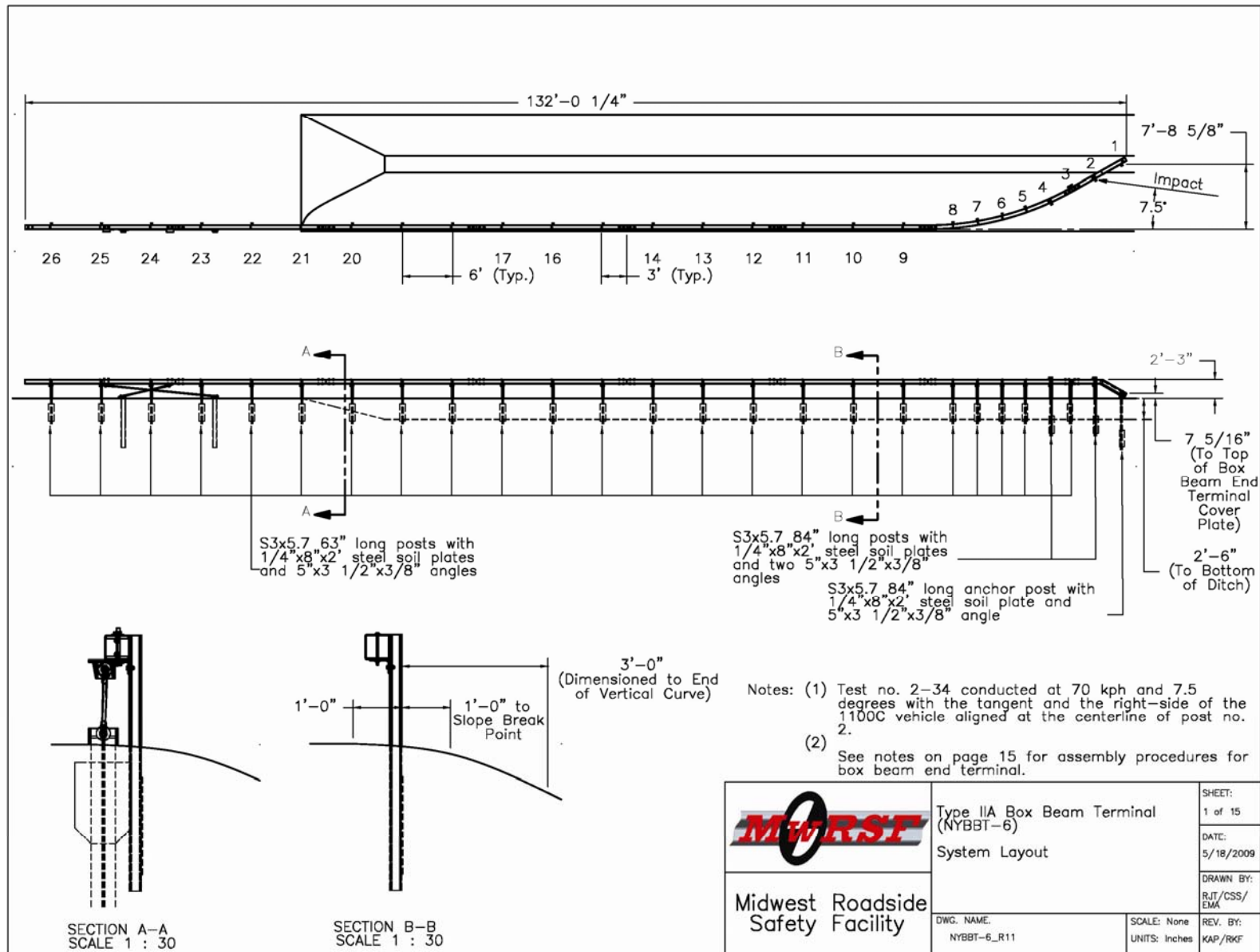


Figure O-1. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

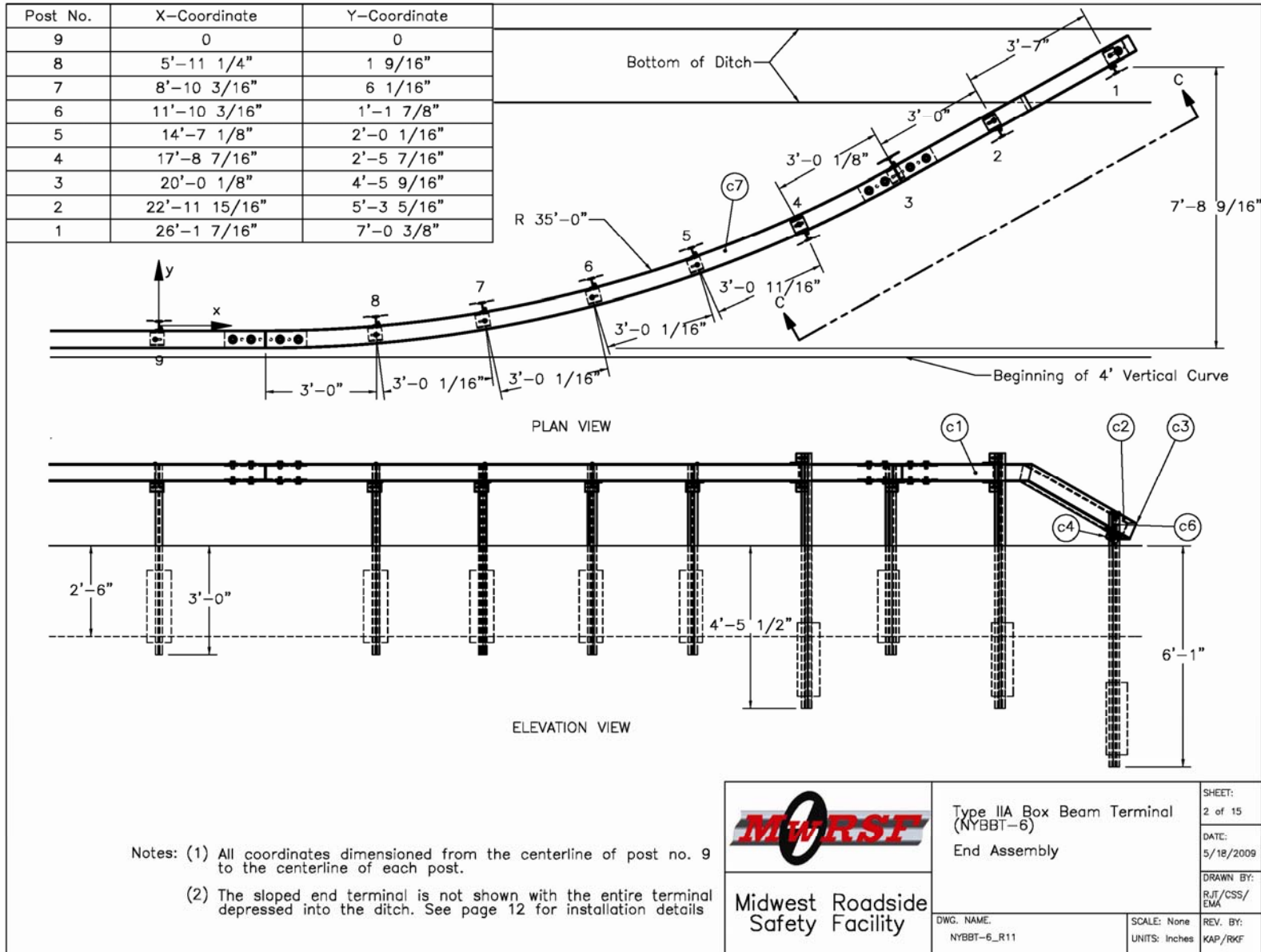


Figure O-2. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

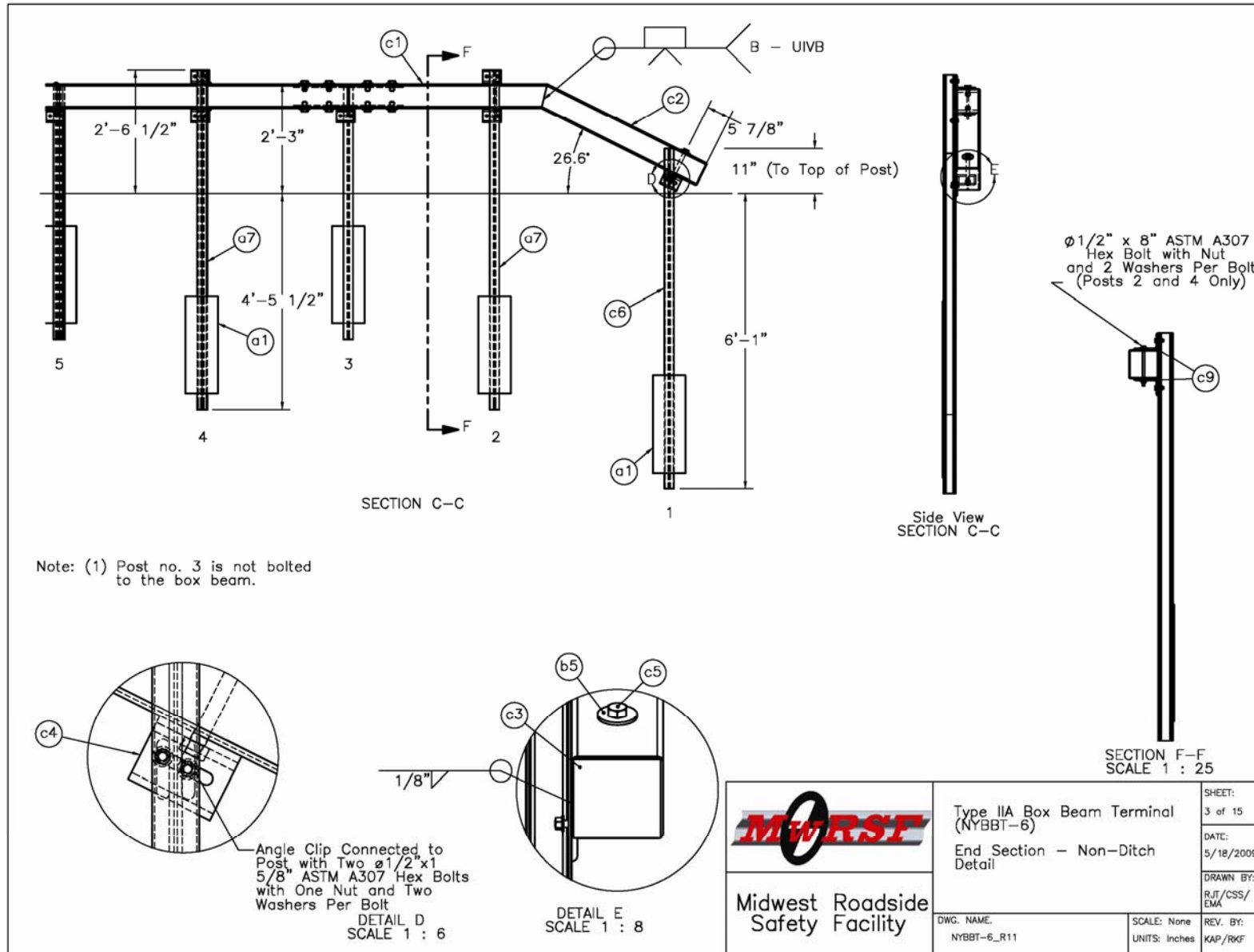


Figure O-3. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

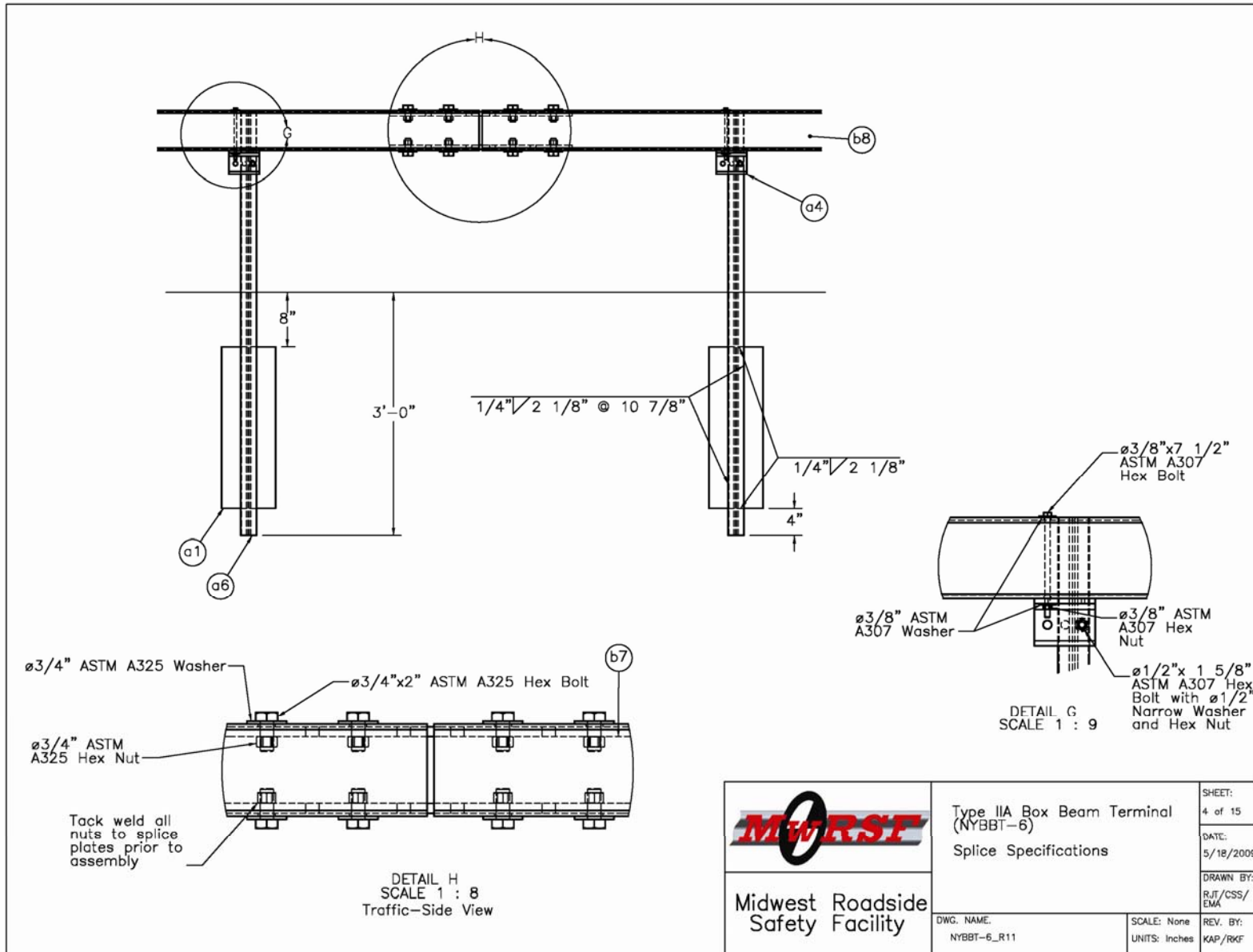


Figure O-4. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

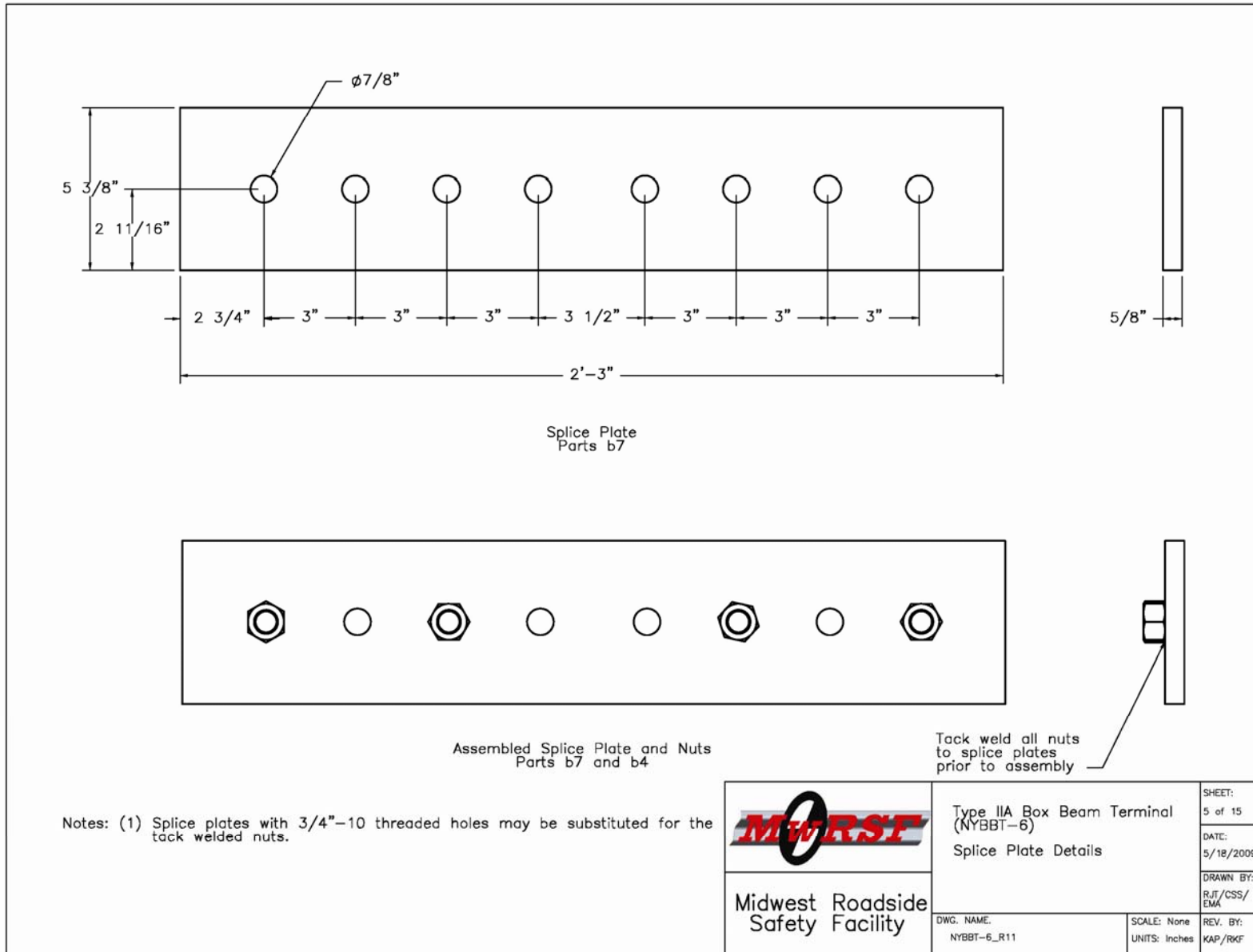


Figure O-5. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

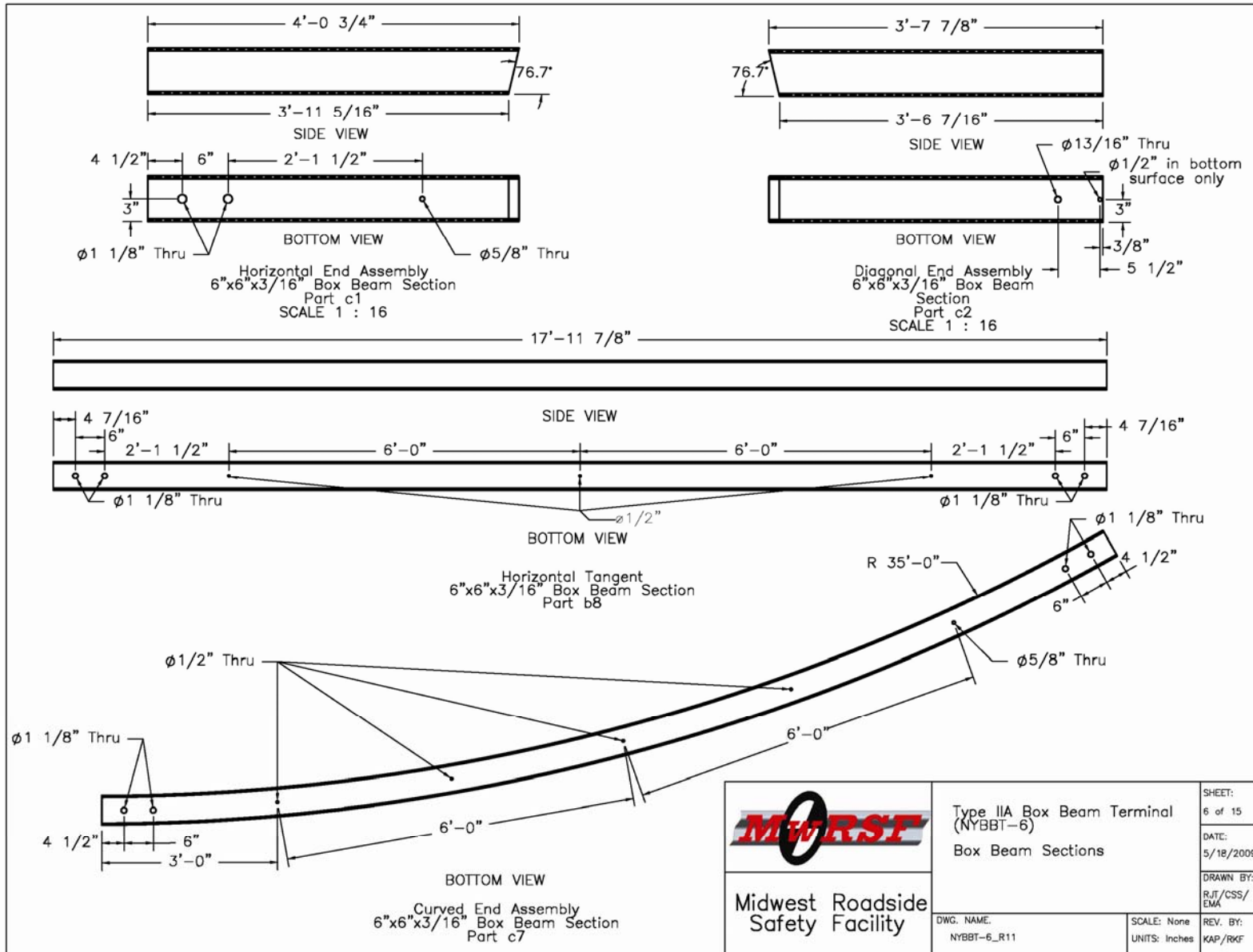


Figure O-6. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6



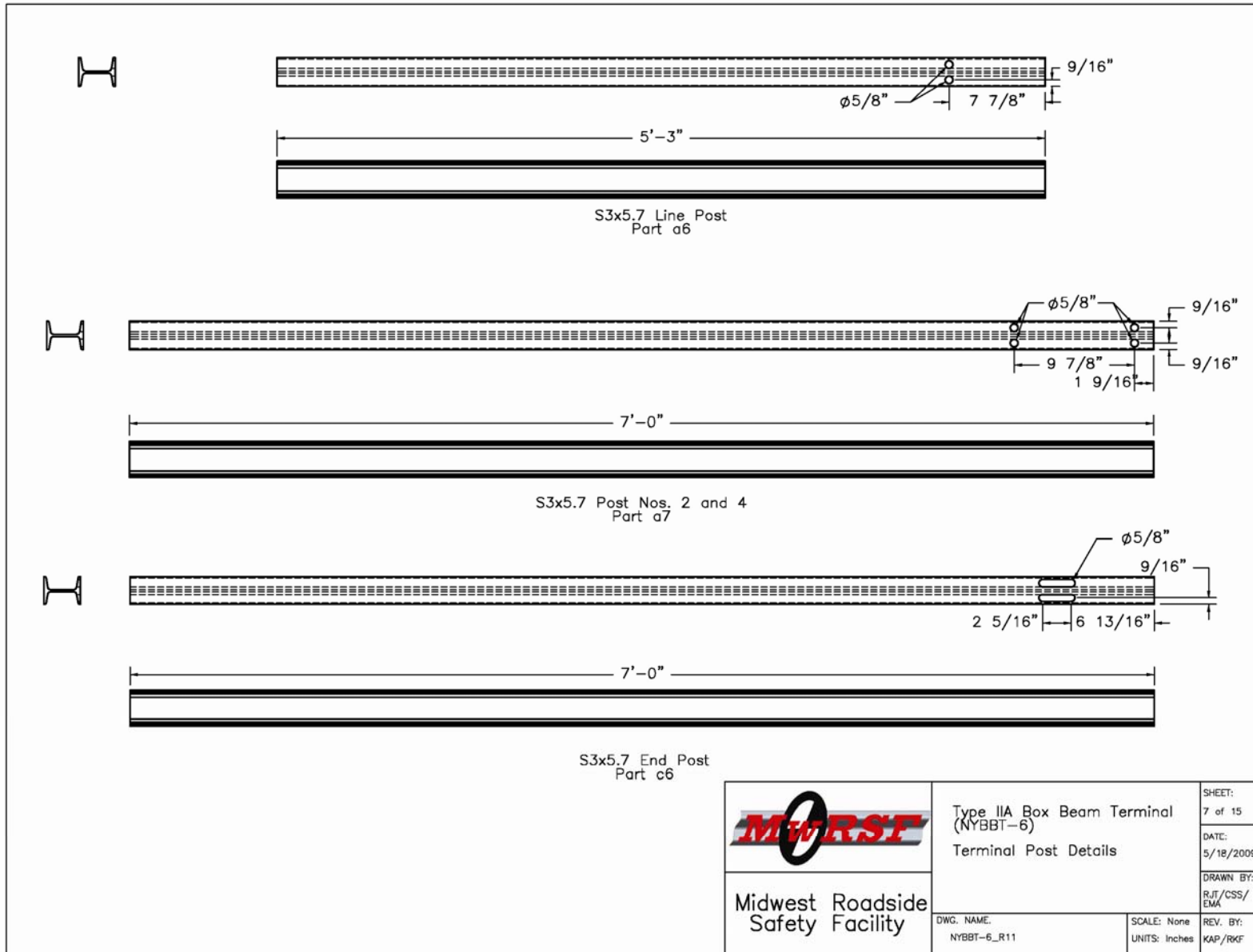


Figure O-7. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

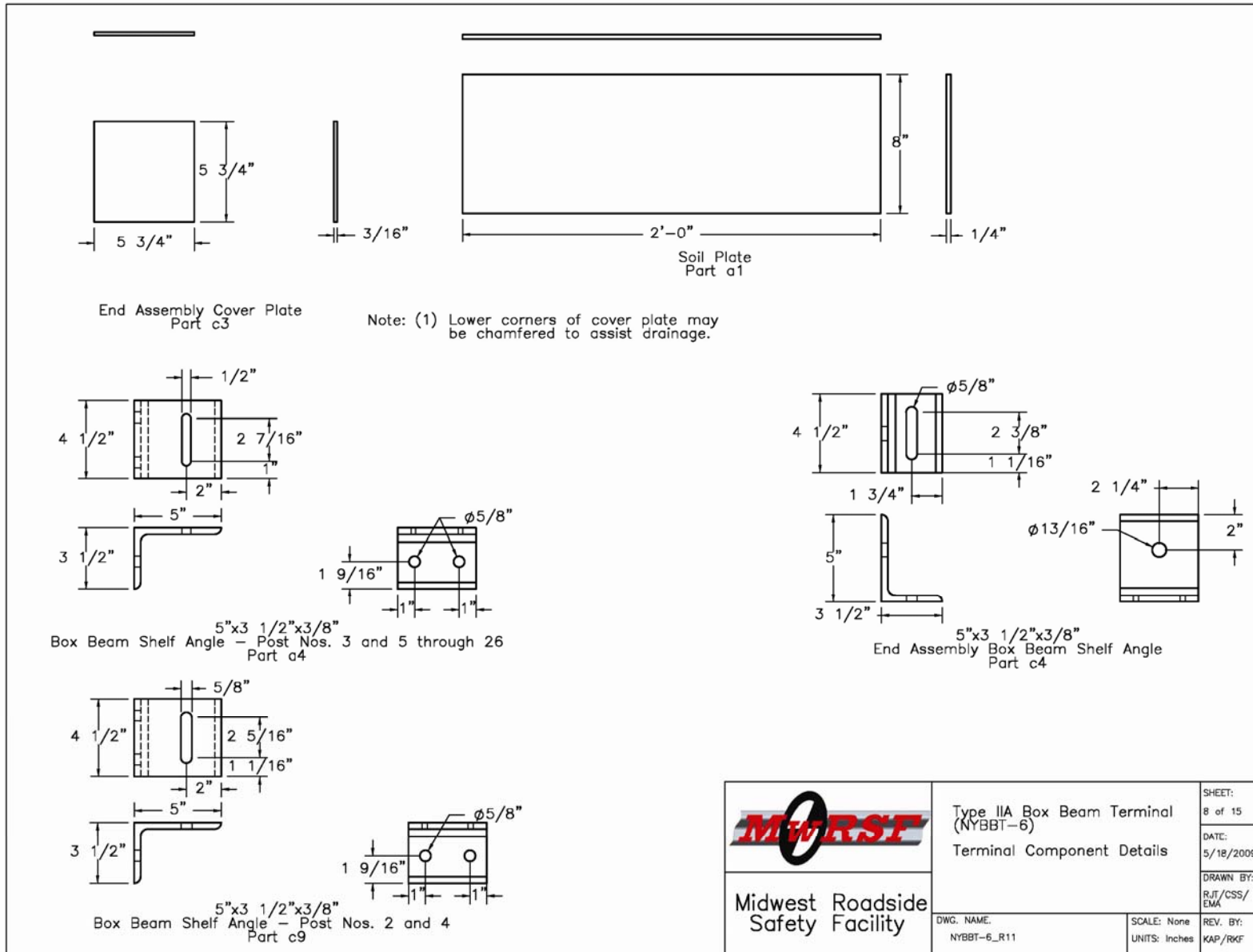


Figure O-8. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

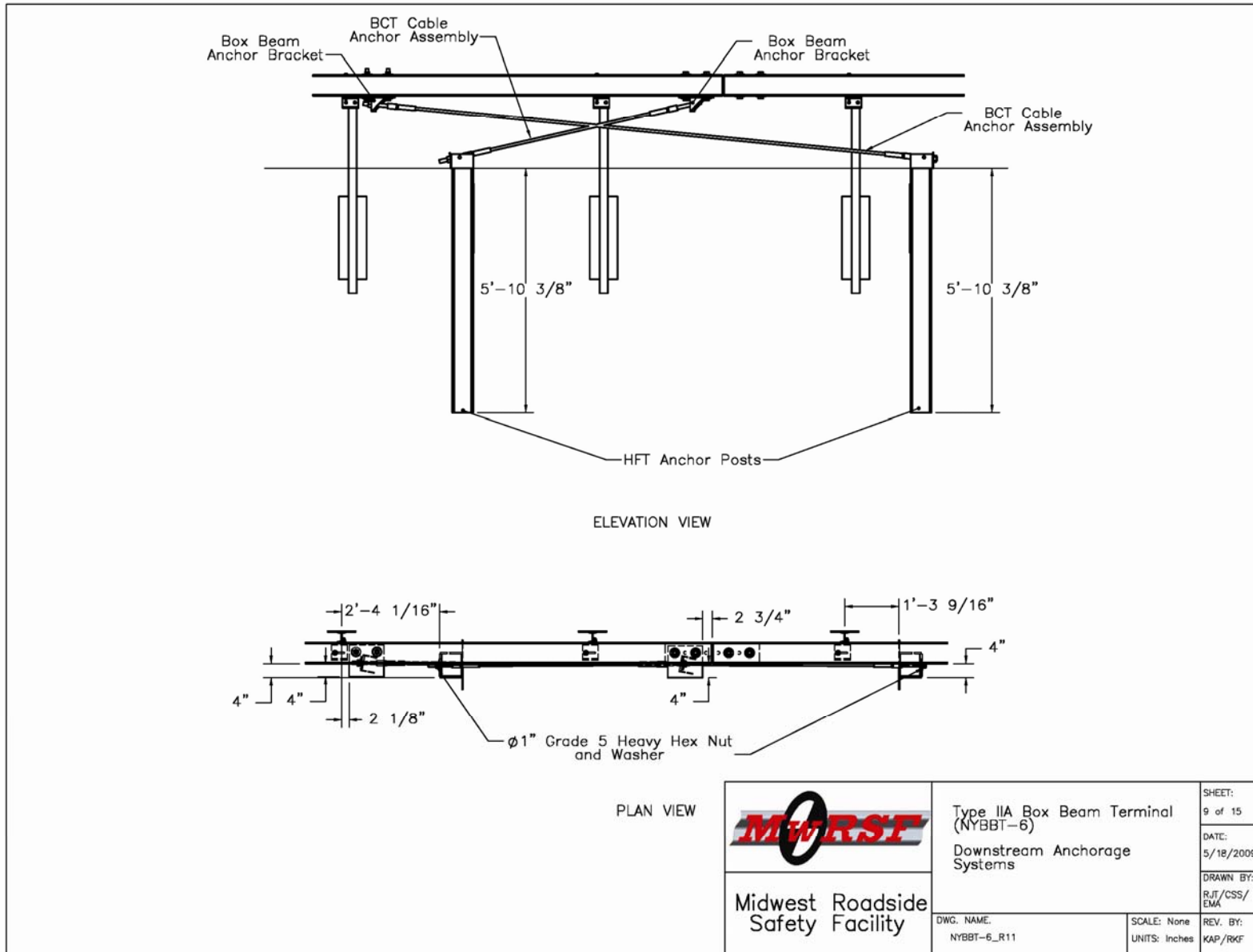


Figure O-9. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

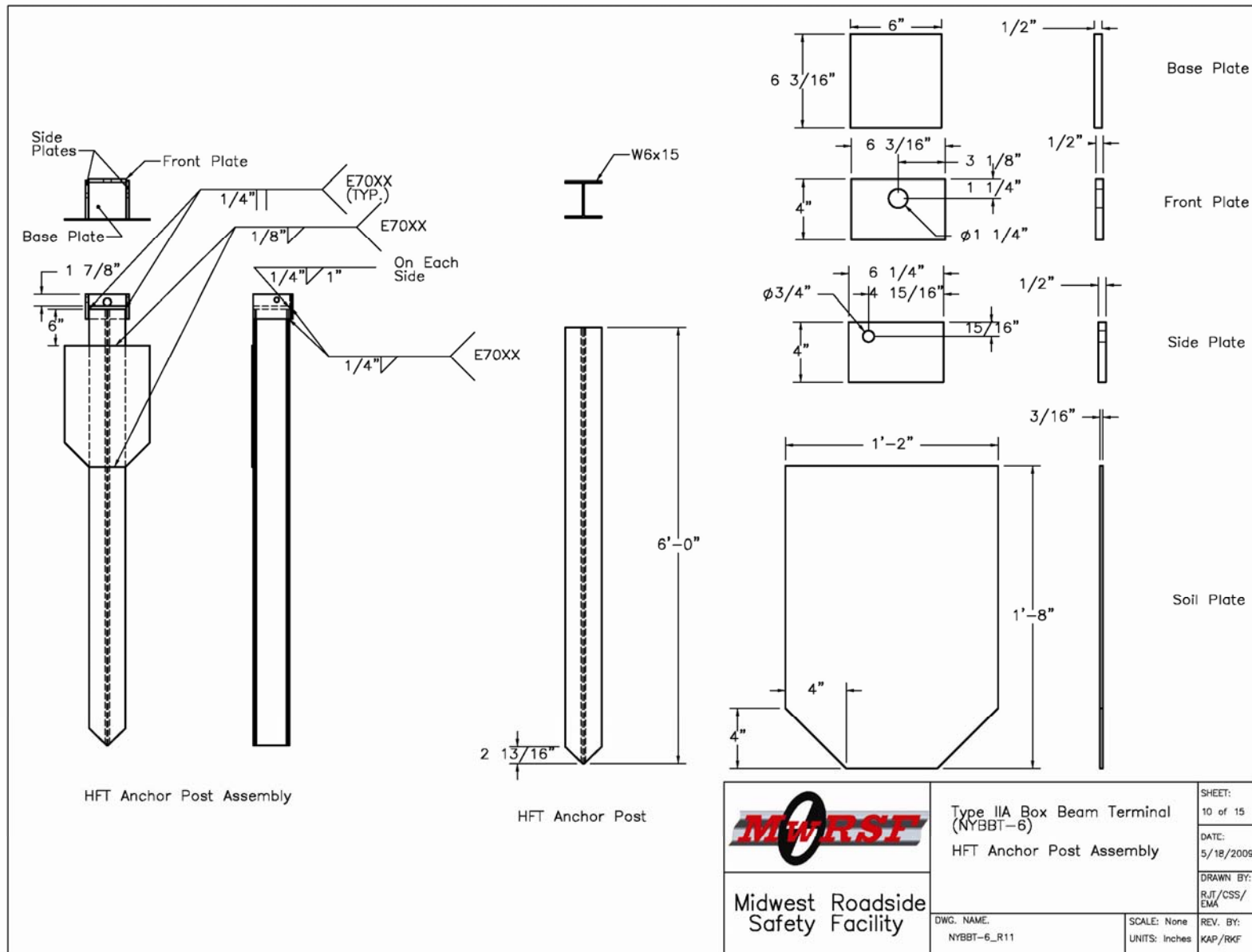


Figure O-10. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

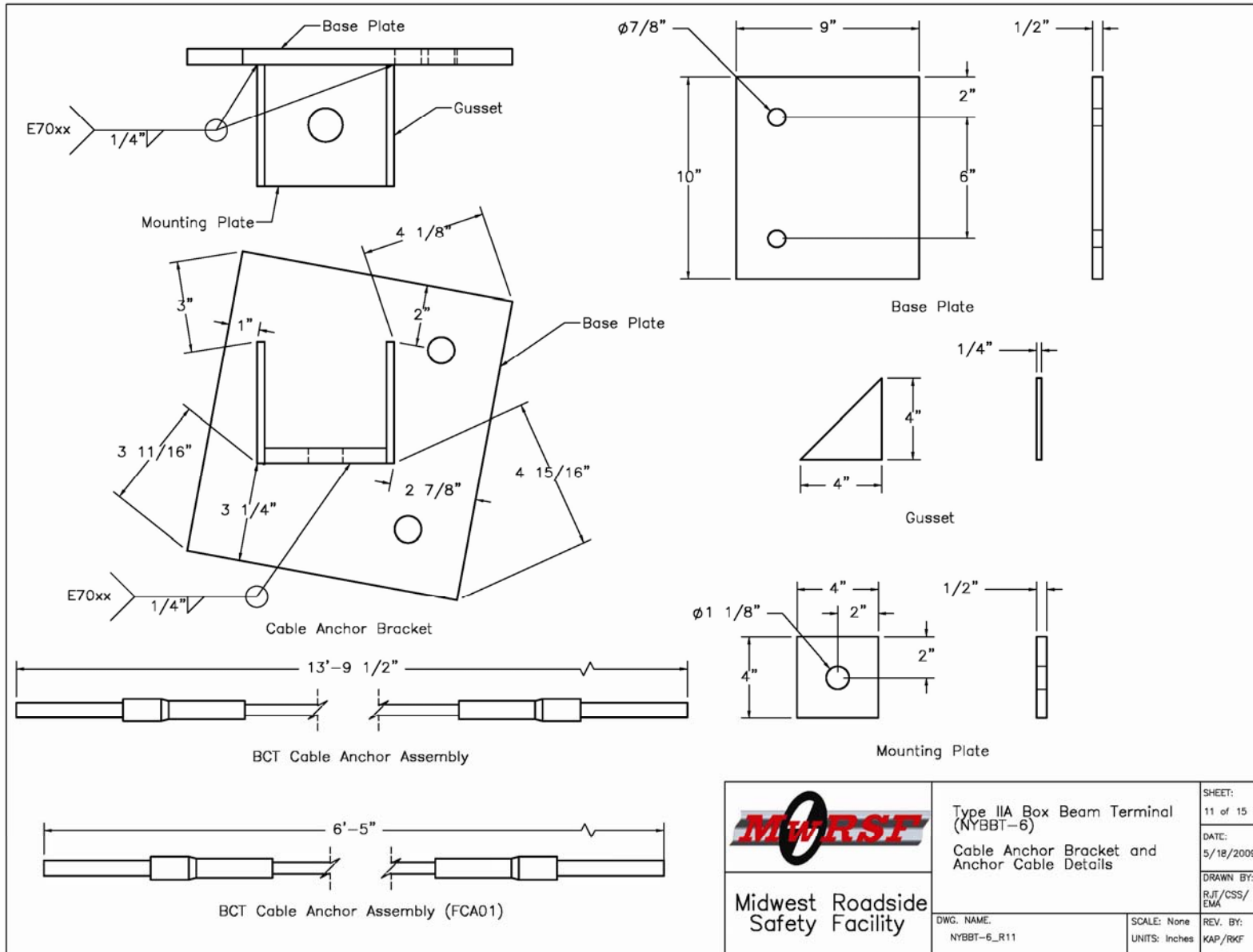


Figure O-11. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

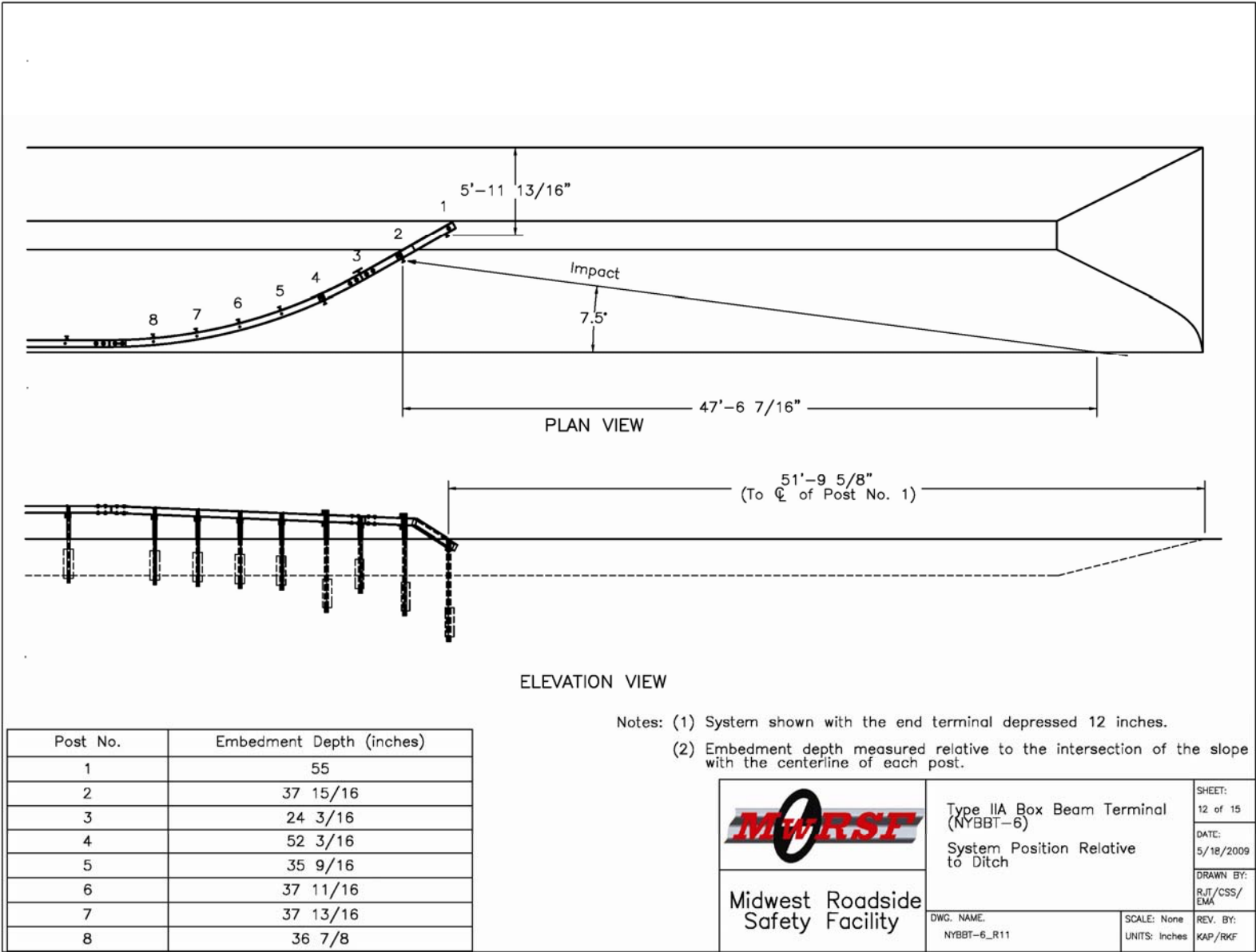


Figure O-12. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

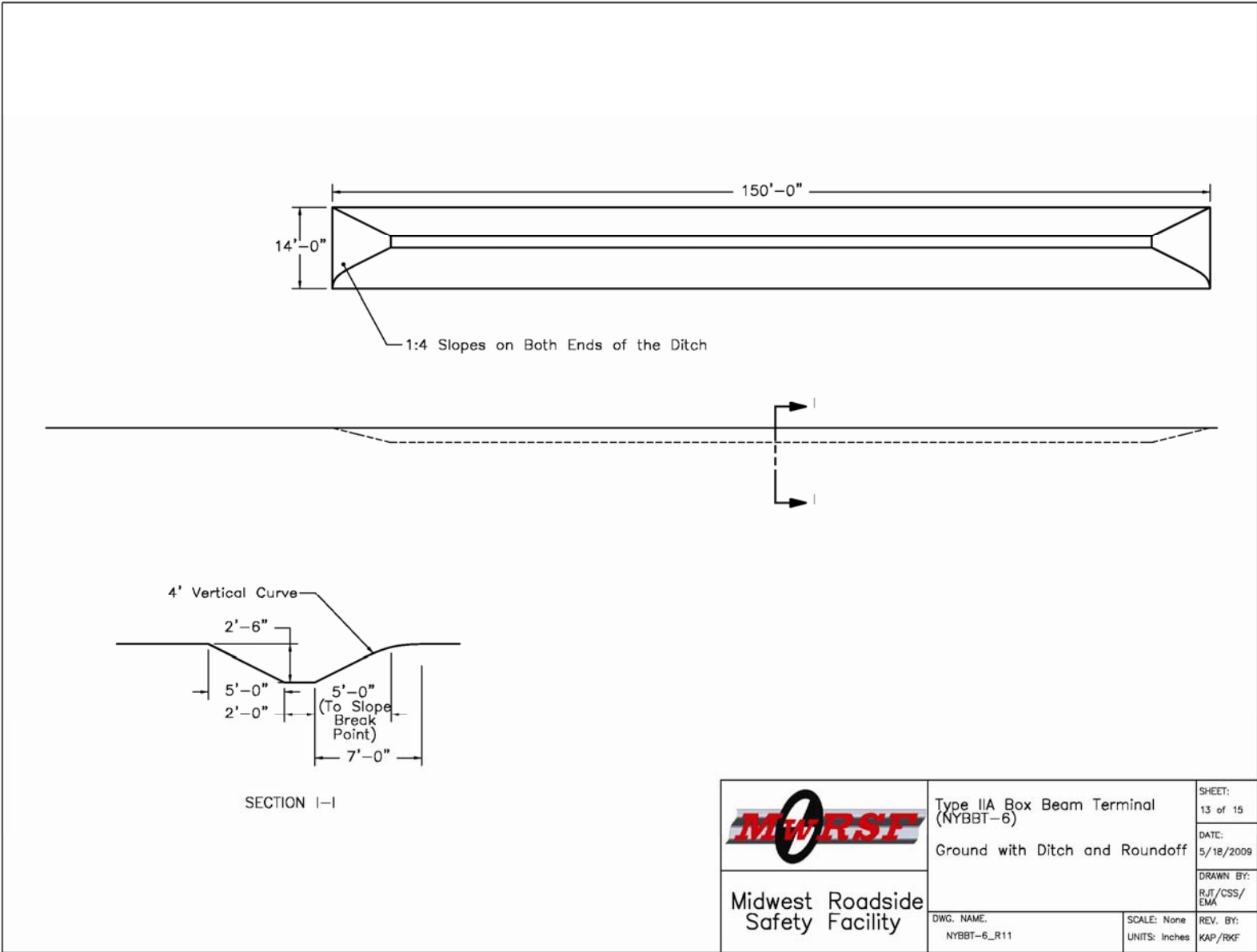


Figure O-13. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

NYBBT-6			
Item No.	QTY.	Description	Material Specifications
a1	26	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	29	ø 1/2" coarse thread 1 5/8" long hex bolt	ASTM A307
a3	31	ø 1/2" hex nut	ASTM A307
a4	23	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	31	ø 1/2" narrow washer	ASTM A307
a6	23	S3 x 5.7 63" long post	A36 Steel
a7	2	S3 x 5.7 84" long post	A36 Steel
b1	22	ø 3/8" coarse thread 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	59	ø 3/4" hex nut	ASTM A325
b5	61	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread 2" long hex bolt	ASTM A307
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" by 17'-11 7/8" long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam anchor post shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread 7 3/4" long hex bolt	ASTM A307
c6	1	S3 x 5.7 84" long post anchor post	A36 Steel
c7	1	6"x6"x3/16" R 35' Curved Box Beam	ASTM A500 Grade B
c8	2	ø 1/2" coarse thread 8" long hex bolt	ASTM A307
c9	4	5" x 3 1/2" x 3/8" box beam shelf angle with ø5/8" slot	A36 Steel
c10	4	ø 1/2" wide washer	ASTM A307

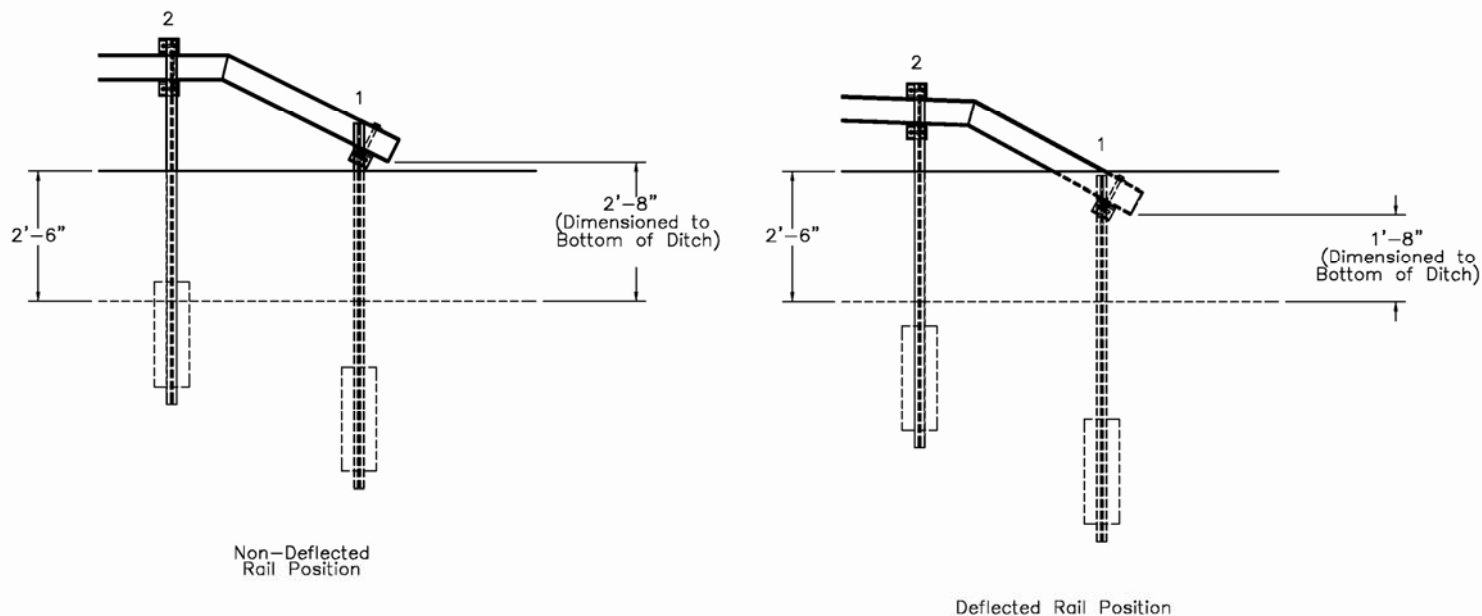
  

 <b>Midwest Roadside Safety Facility</b>	Type IIA Box Beam Terminal (NYBBT-6) Bill of Materials		SHEET: 14 of 15
	DWG. NAME: NYBBT-6_R11	SCALE: None UNITS: Inches	DATE: 5/18/2009 DRAWN BY: RJT/CSS/ EMA REV. BY: KAP/RKF

Figure O-14. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6



- Notes: (1) When constructing the end terminal section (curved box beam and post nos. 1 through 8), set post nos. 6 through 8 in the soil, attach rail to post no. 8, and attach the curved end section of box beam loosely at the splice between post nos. 8 and 9. Allow the box beam to hang free over the ditch in order to acquire the deflection in the end terminal. Utilizing only a reasonable amount of downward force, the deflection should be approximately 6 inches or more when compared to the end terminal section on flat ground (see detail below). Finally, set and attach post nos. 1, 2, and 4 through 8, and tighten remaining hardware in end terminal system. Note that post no. 3 is not attached to the rail.
- (2) During the process, document the amount of effort required to achieve the deflection of the end section for use in future New York Box Beam End Terminal drawings. Also, document the actual amount of deflection that was achieved.
- (3) If 6 inches of deflection cannot be attained with the use of reasonable downward force, contact the office to determine whether full amount of deflection is needed.
- (4) If rail end is depressed 6 inches, the top and bottom of the rail end will be approximately 31 5/16 and 26 inches, respectively, above the ditch bottom.




 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-6)	SHEET: 15 of 15
	Additional Notes	DATE: 5/18/2009
DWG. NAME: NYBBT-6_R11	SCALE: None UNITS: Inches	DRAWN BY: RJT/CSS/ EMA  REV. BY: KAP/RKF

Figure O-15. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-6

**APPENDIX P Modified Type IIA Box Beam Terminal in Ditch System Details -Metric and English Units, Test No. NYBBT-7**

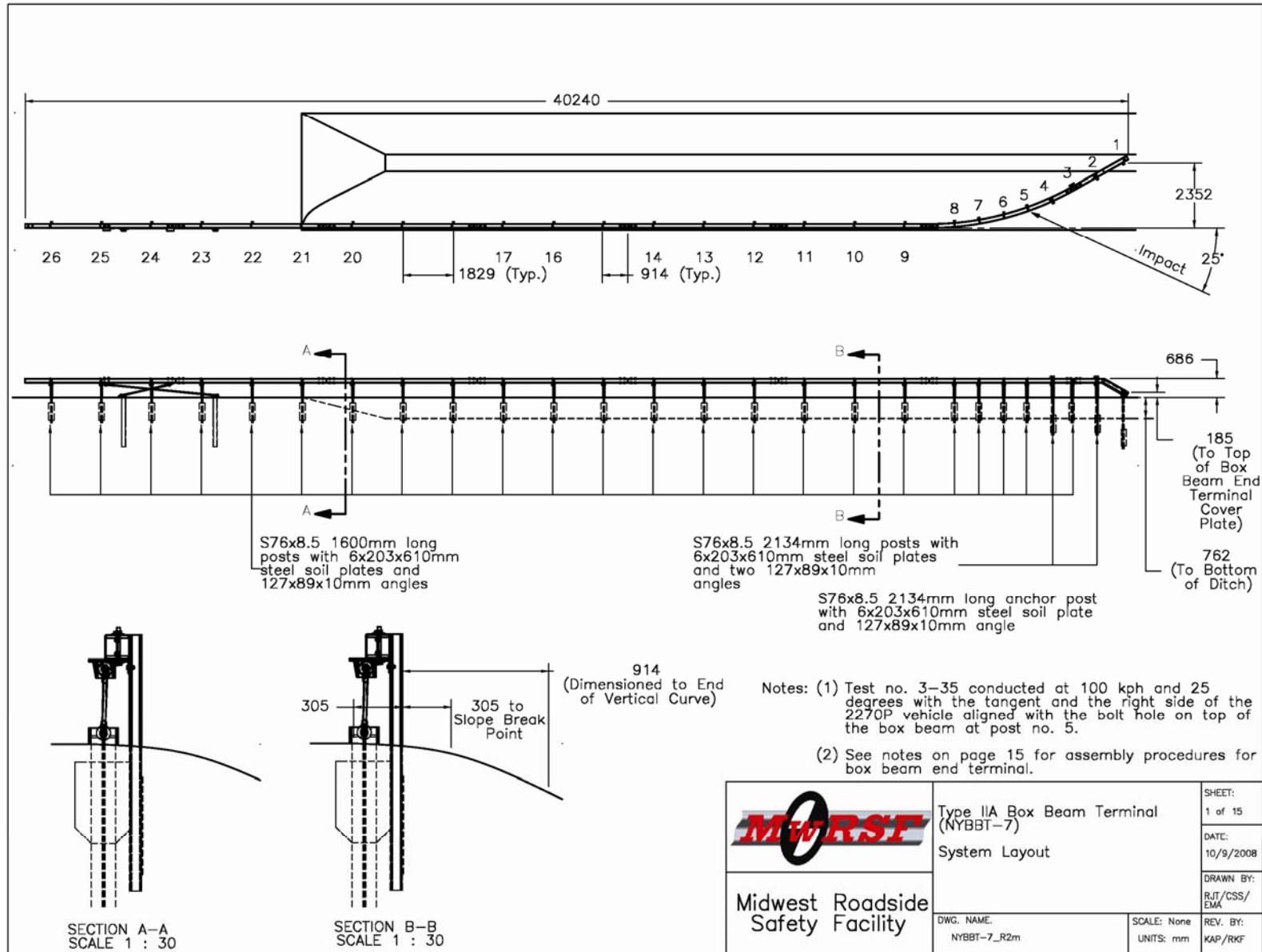


Figure P-1. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

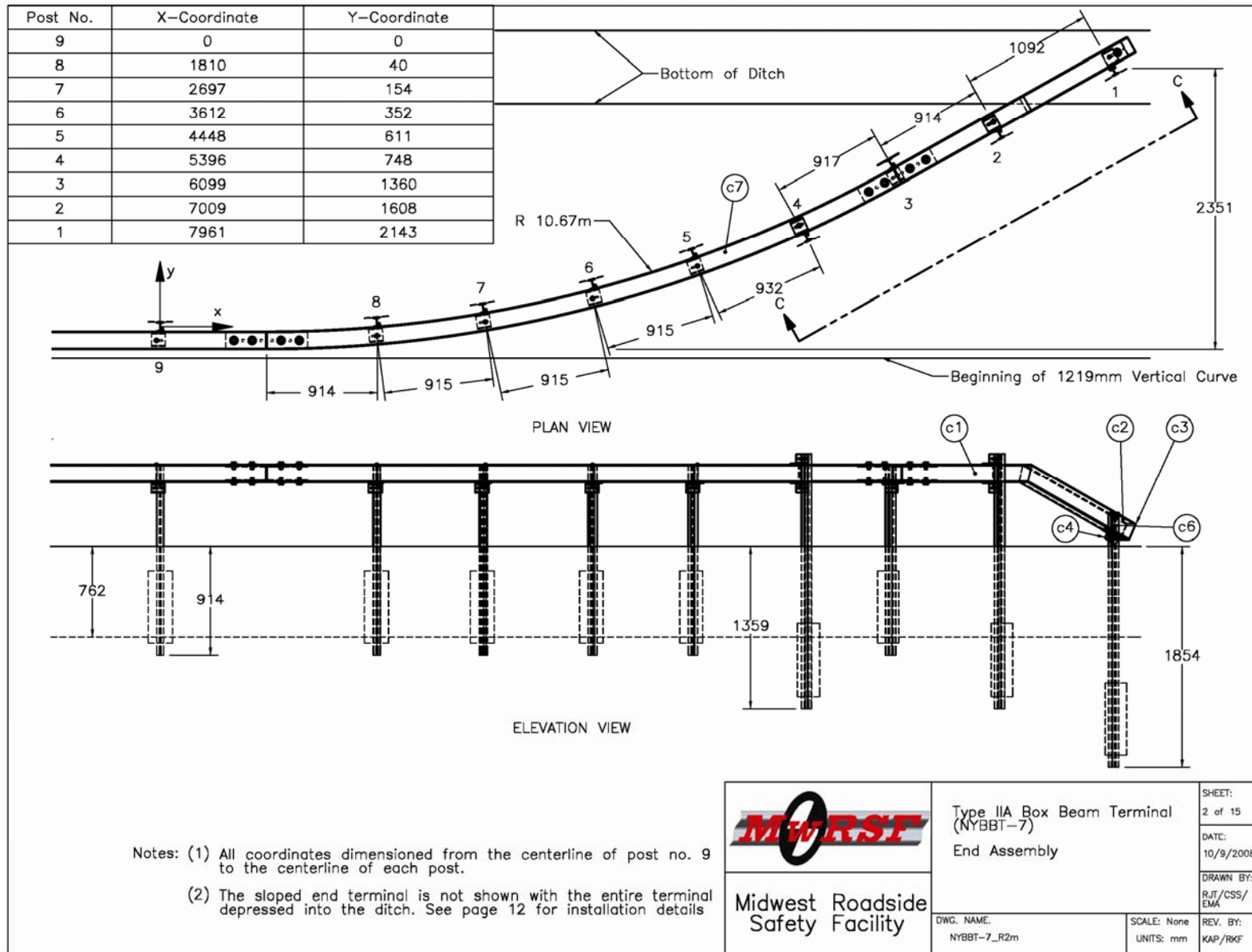


Figure P-2. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

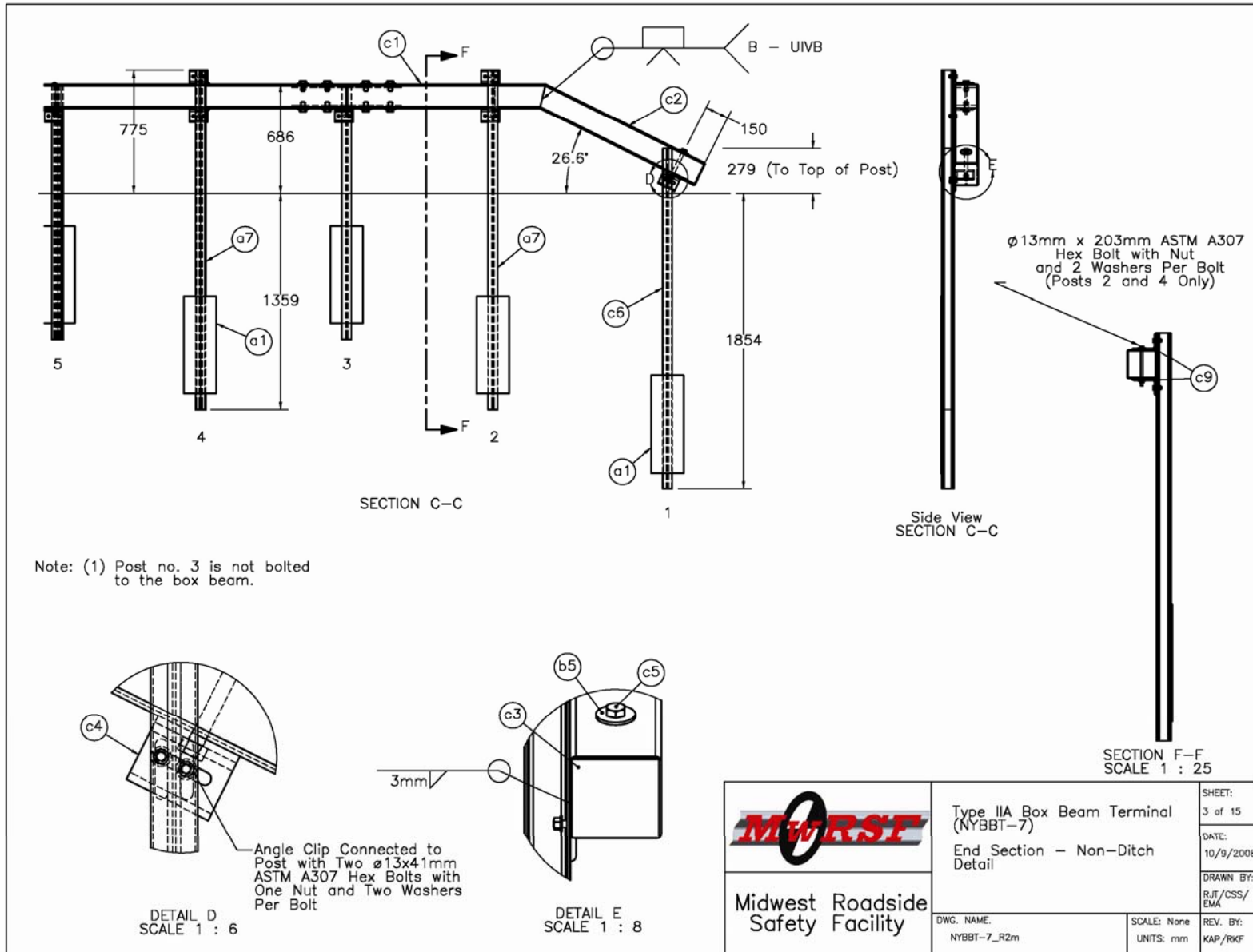


Figure P-3. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

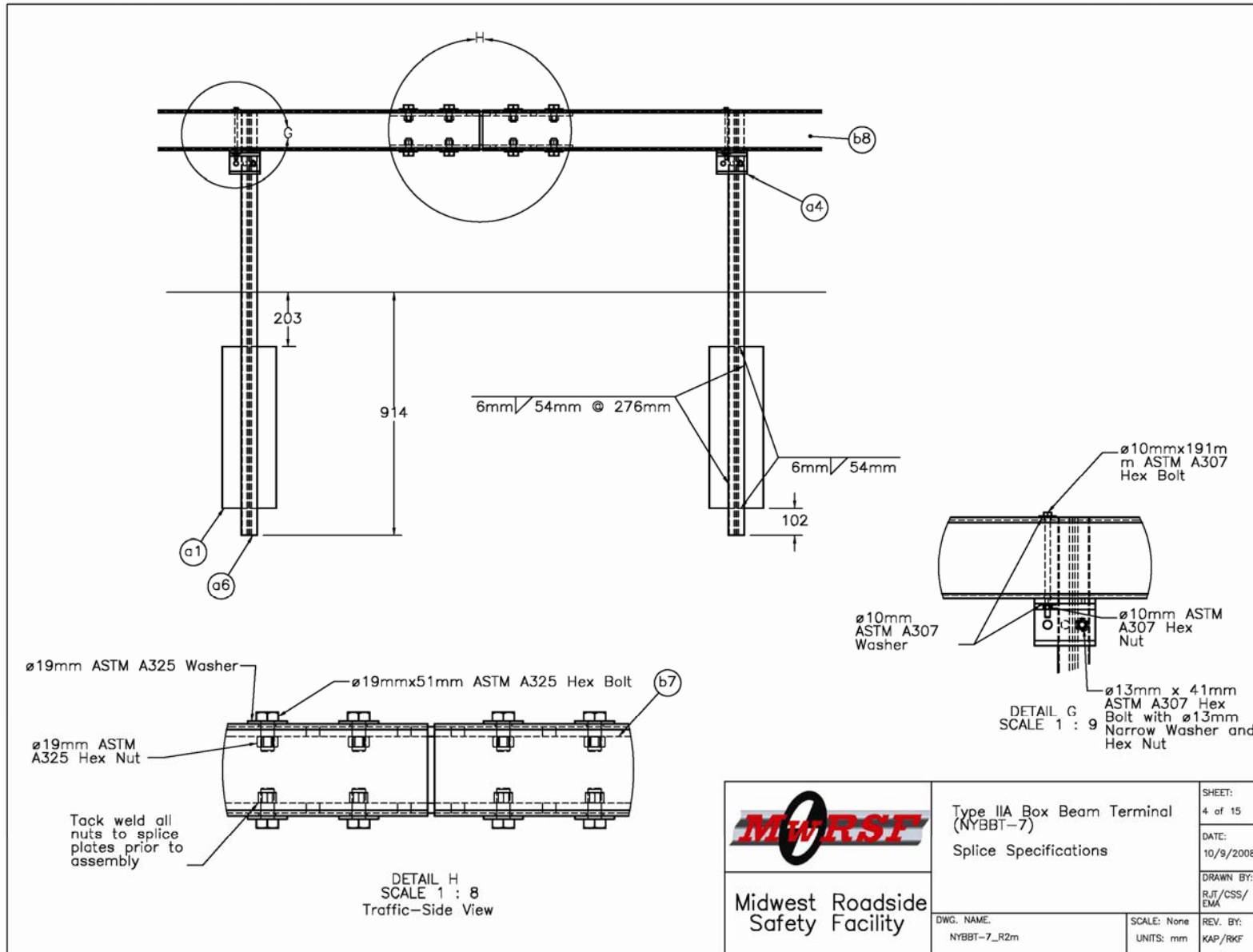


Figure P-4. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

256

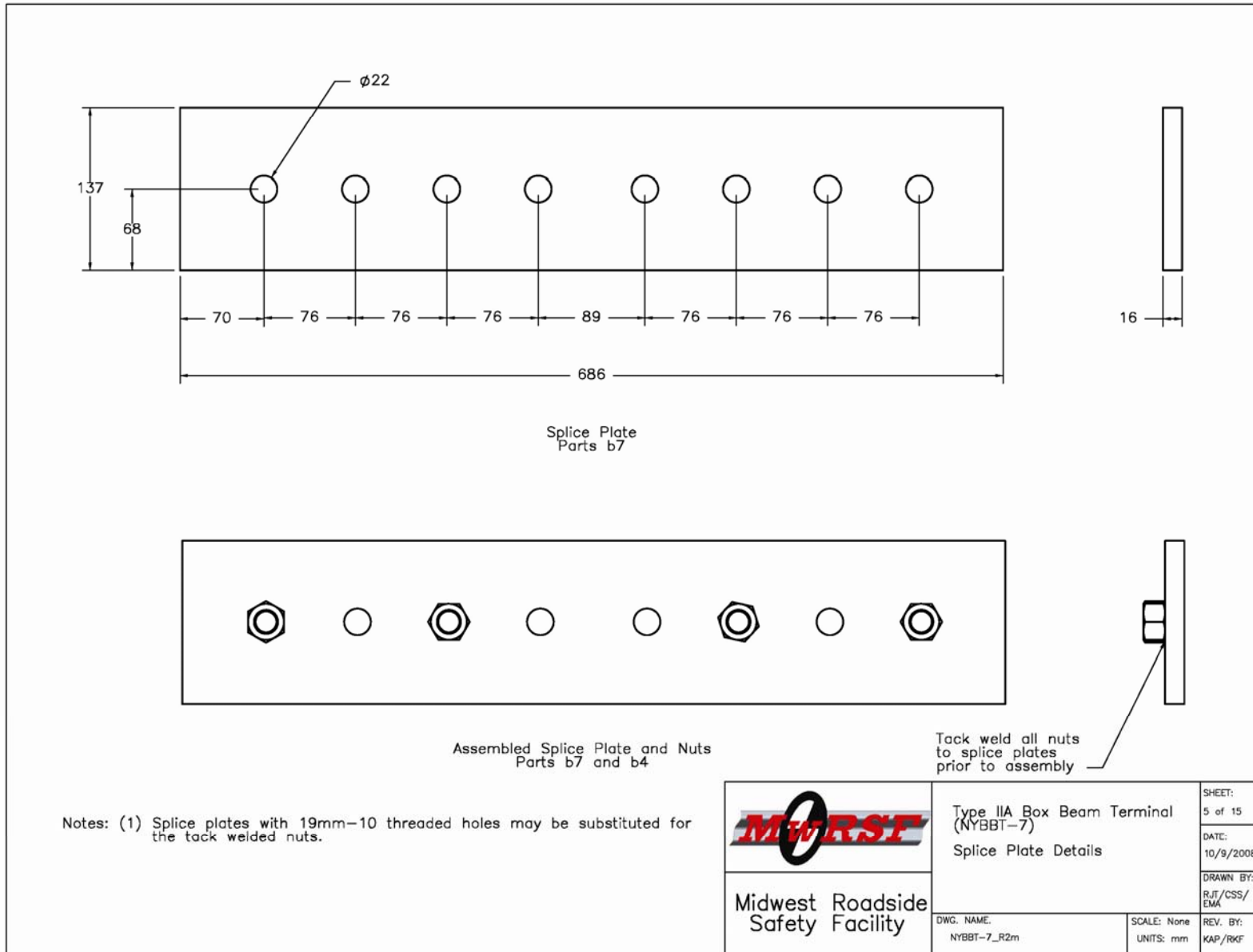


Figure P-5. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

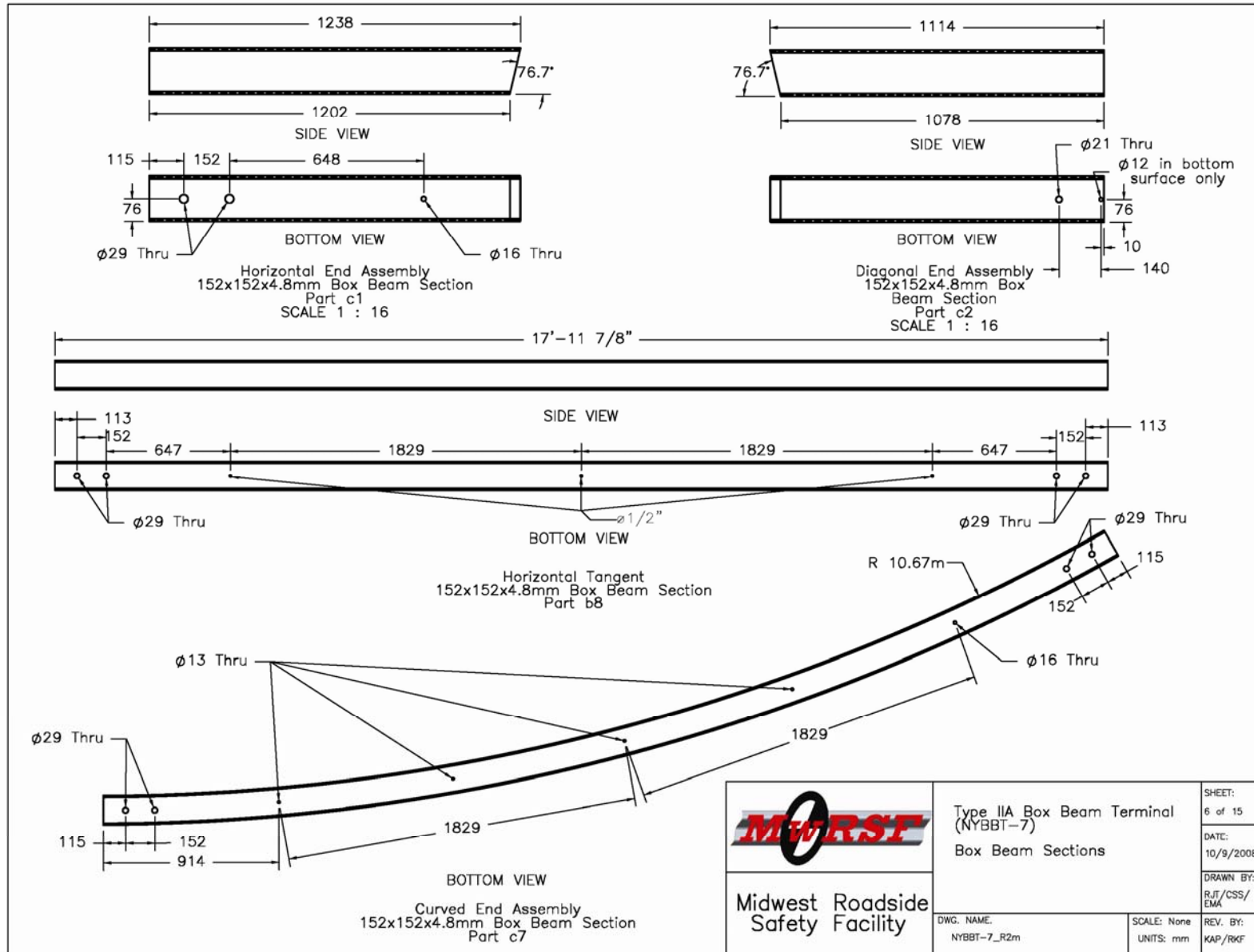


Figure P-6. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7



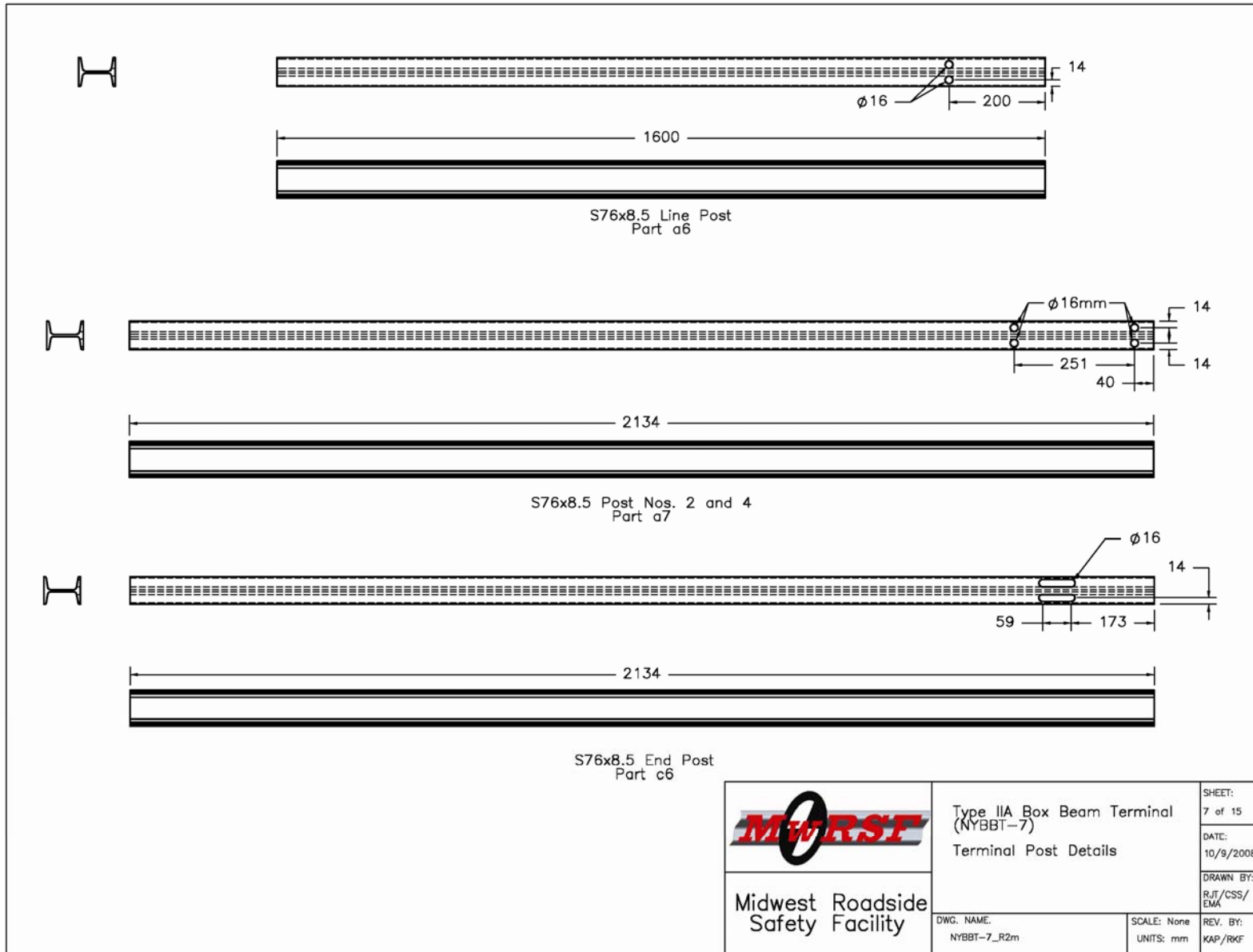


Figure P-7. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

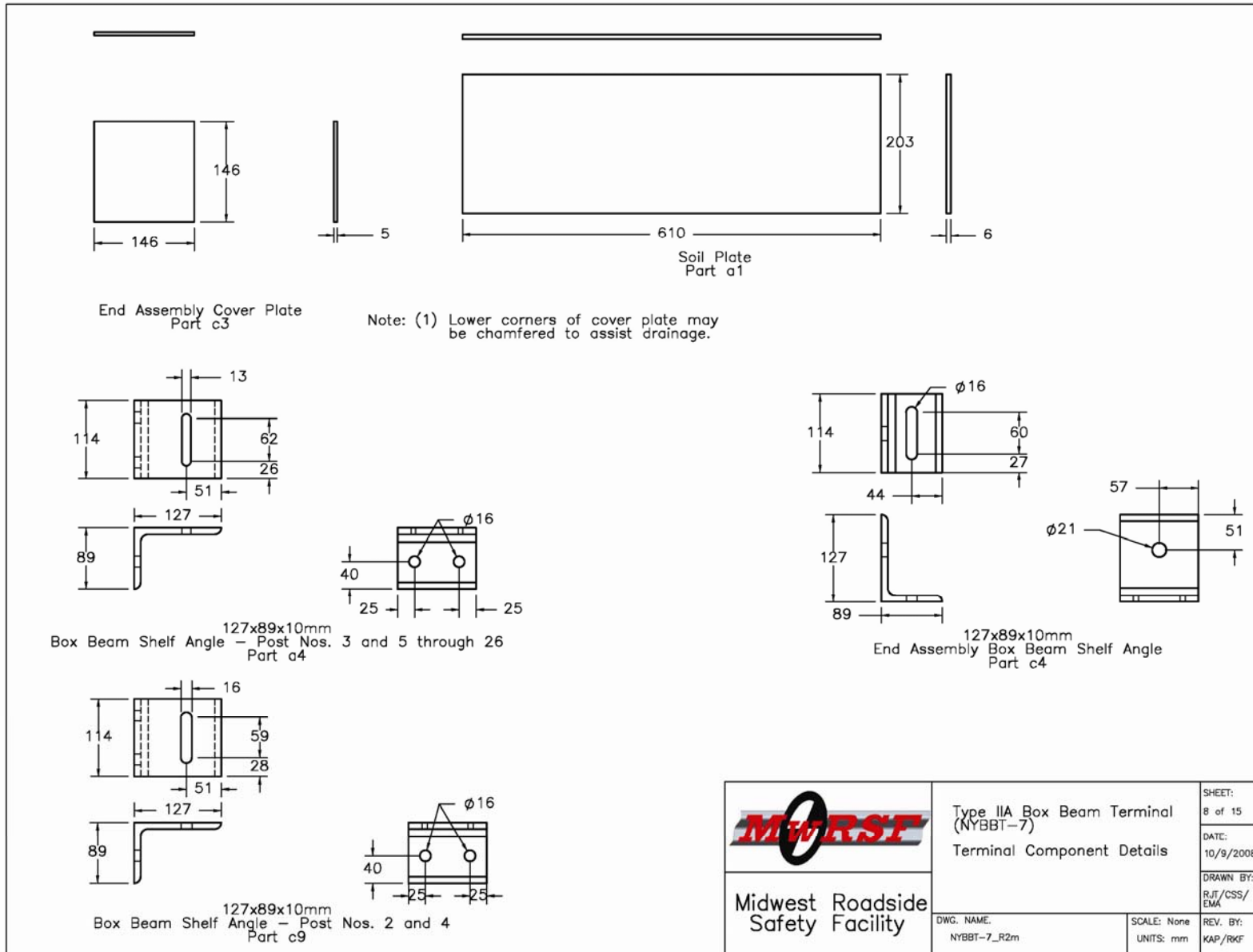


Figure P-8. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

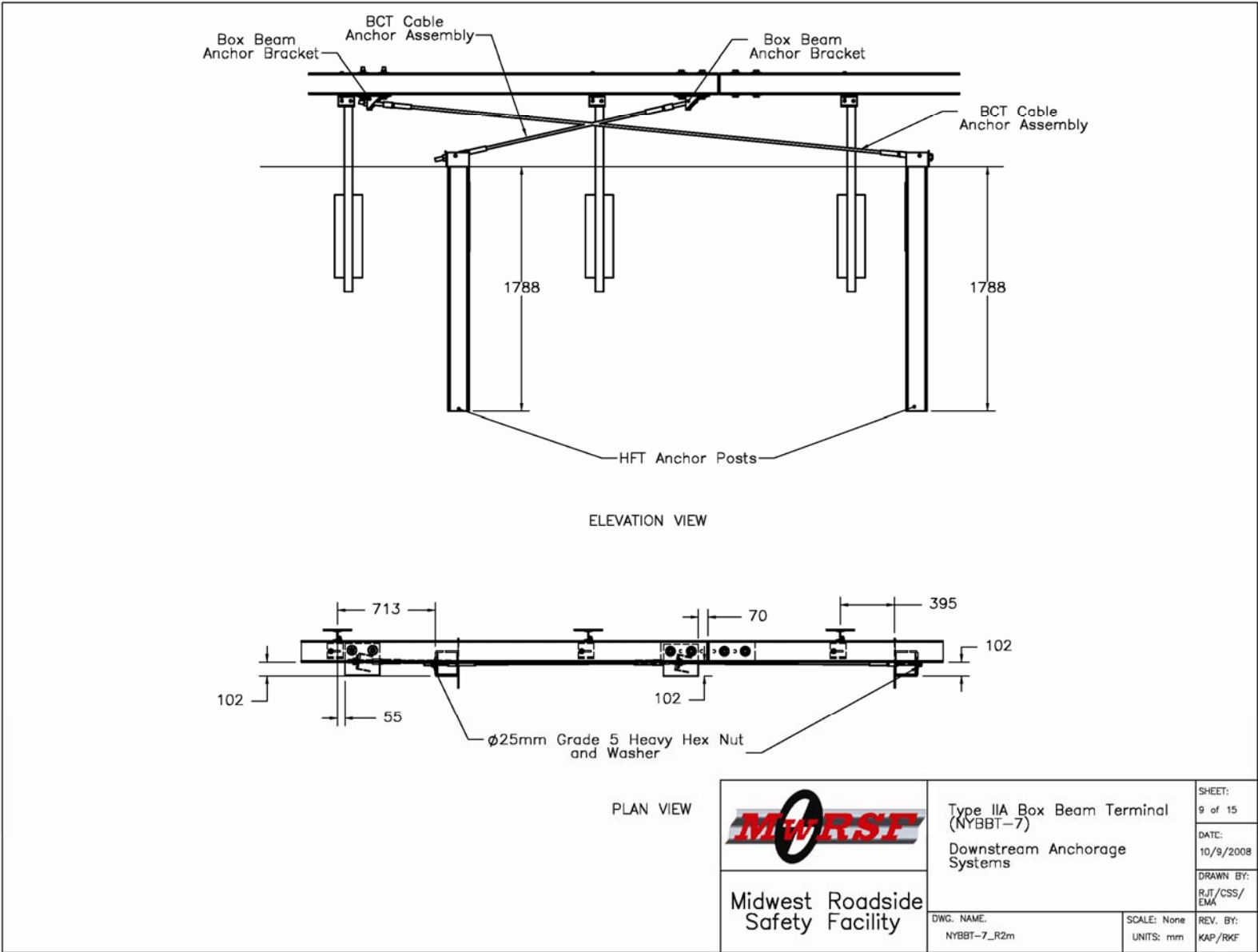


Figure P-9. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7



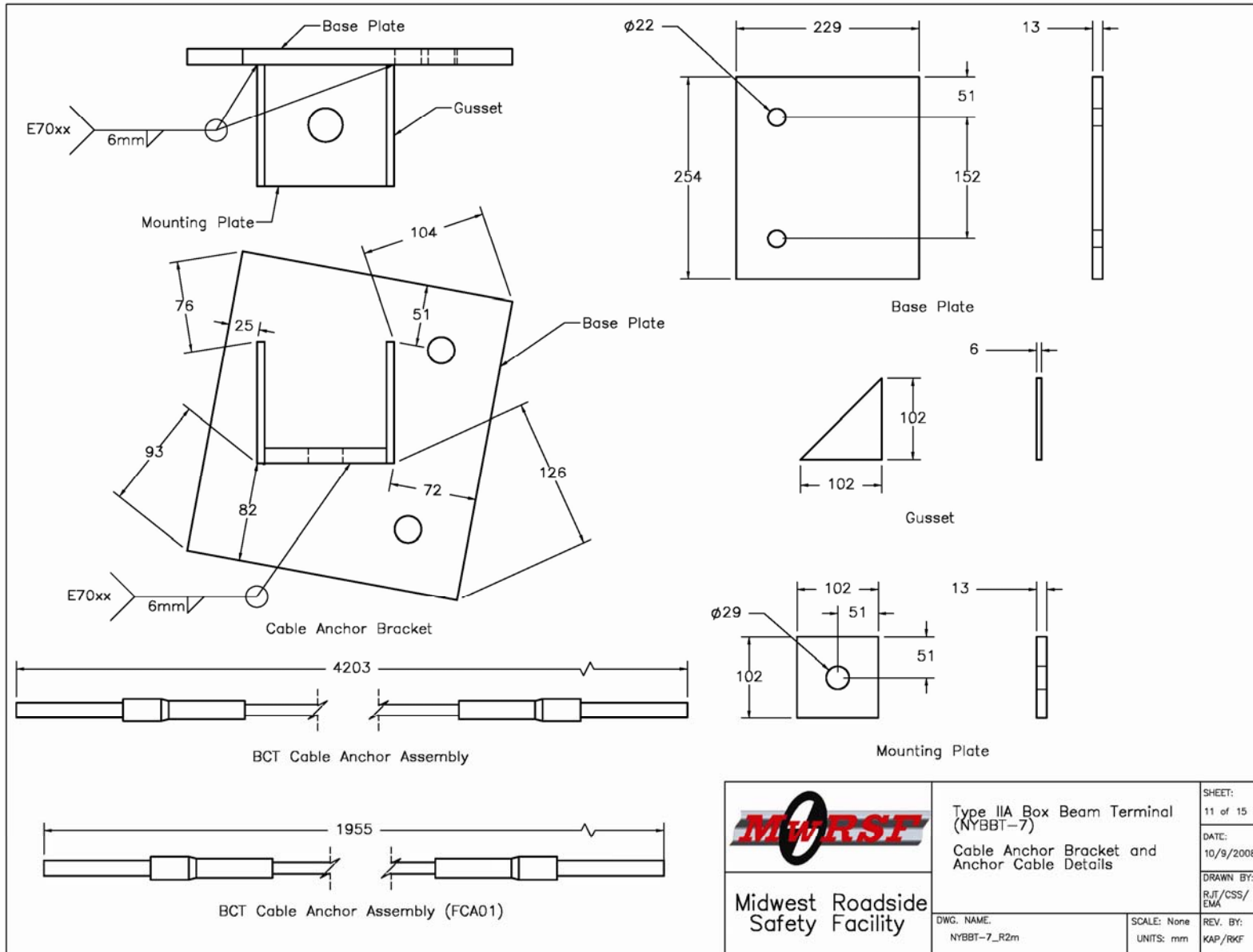



Figure P-11. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-7)	SHEET: 11 of 15
	Cable Anchor Bracket and Anchor Cable Details	DATE: 10/9/2008
DWG. NAME: NYBBT-7_R2m	SCALE: None UNITS: mm	DRAWN BY: RJT/CSS/ EMA
		REV. BY: KAP/RKF

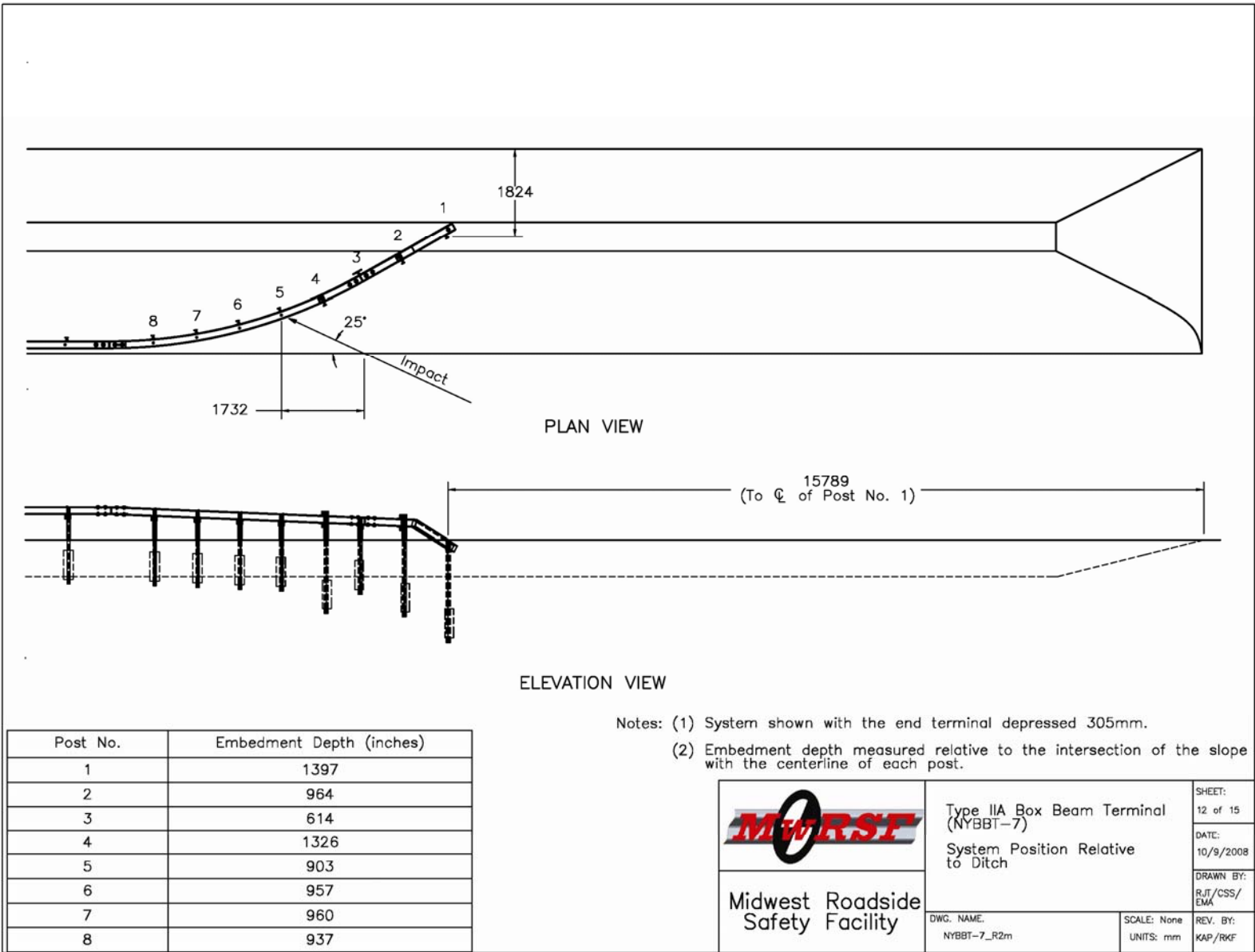


Figure P-12. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

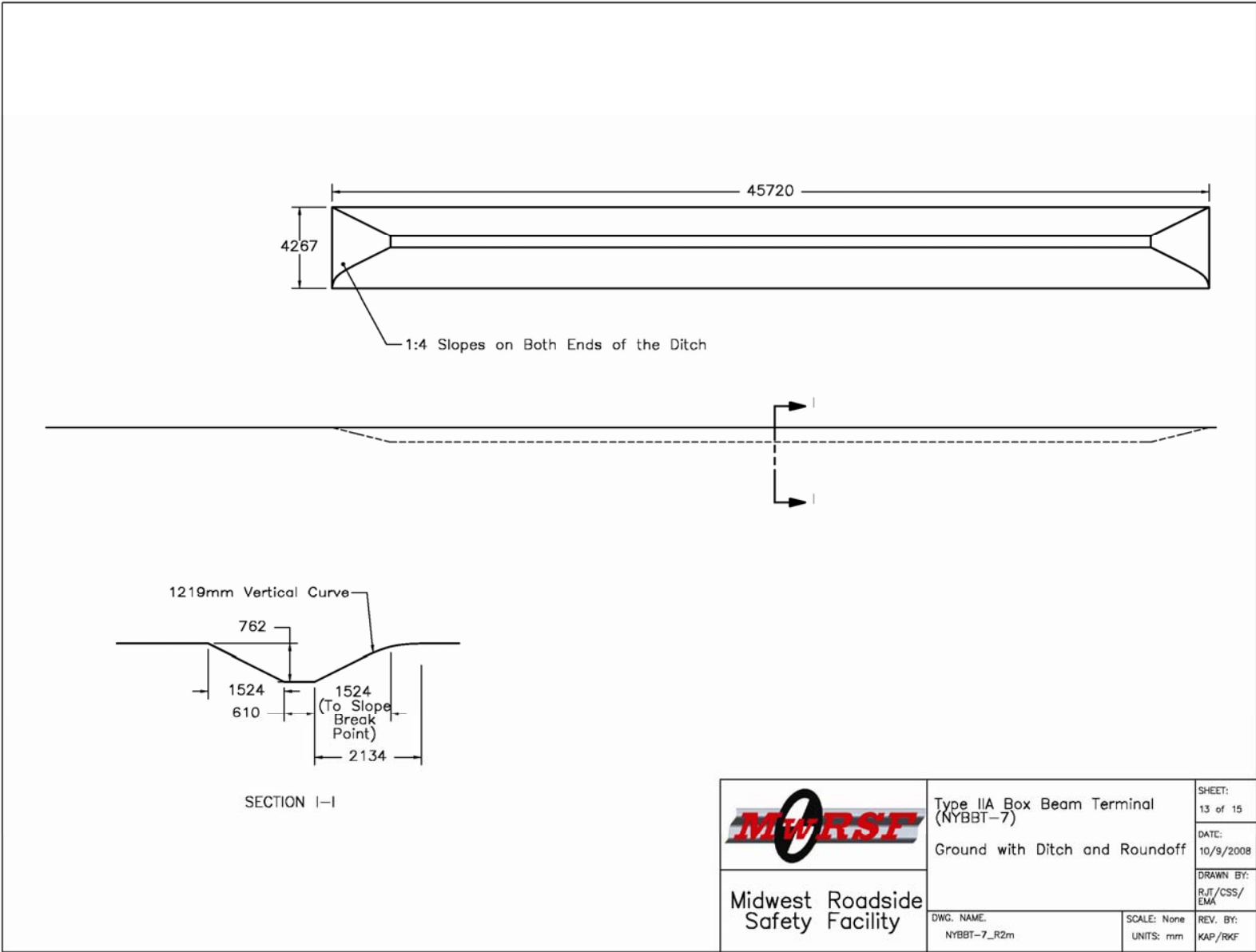


Figure P-13. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

NYBBT-7			
Item No.	QTY.	Description	Material Specifications
a1	26	6 x 203 x 610mm steel soil plate	A36 Steel
a2	29	ø 13mm coarse thread 41mm long hex bolt	ASTM A307
a3	31	ø 13mm hex nut	ASTM A307
a4	23	127 x 89 x 10mm box beam shelf angle	A36 Steel
a5	31	ø 13mm narrow washer	ASTM A307
a6	23	S76x8.5 1600mm long post	A36 Steel
a7	2	S76x8.5 2134mm long post	A36 Steel
b1	22	ø 10mm coarse thread 191mm long hex bolt	ASTM A307
b2	22	ø 10mm hex nut	ASTM A307
b3	44	ø 10mm wide washer	ASTM A307
b4	59	ø 19mm hex nut	ASTM A325
b5	61	ø 19mm wide washer	ASTM A325
b6	56	ø 19mm coarse thread 51mm long hex bolt	ASTM A307
b7	14	686 x 137 x 16mm splice plate	A36 Steel
b8	6	152 x 152 x 4.8mm by 5483mm long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 152 x 152 x 4.8mm box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 152 x 152 x 4.8mm box beam	ASTM A500 Grade B
c3	1	End assembly 4.8mm thick cover plate	A36 Steel
c4	1	127 x 89 x 10mm box beam anchor post shelf angle	A36 Steel
c5	1	ø 19mm coarse thread 197mm long hex bolt	ASTM A307
c6	1	S76x8.5 2134mm long post anchor post	A36 Steel
c7	1	152 x 152 x 4.8mm R 10.67m Curved Box Beam	ASTM A500 Grade B
c8	2	ø 13mm coarse thread 203mm long hex bolt	ASTM A307
c9	4	127 x 89 x 10mm box beam shelf angle with ø16mm slot	A36 Steel
c10	4	ø 13mm wide washer	ASTM A307


 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-7) Bill of Materials		SHEET: 14 of 15
			DATE: 10/9/2008
		DWG. NAME: NYBBT-7_R2m	DRAWN BY: RJT/CSS/ EMA
		SCALE: None UNITS: mm	REV. BY: KAP/RKF

Figure P-14. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7



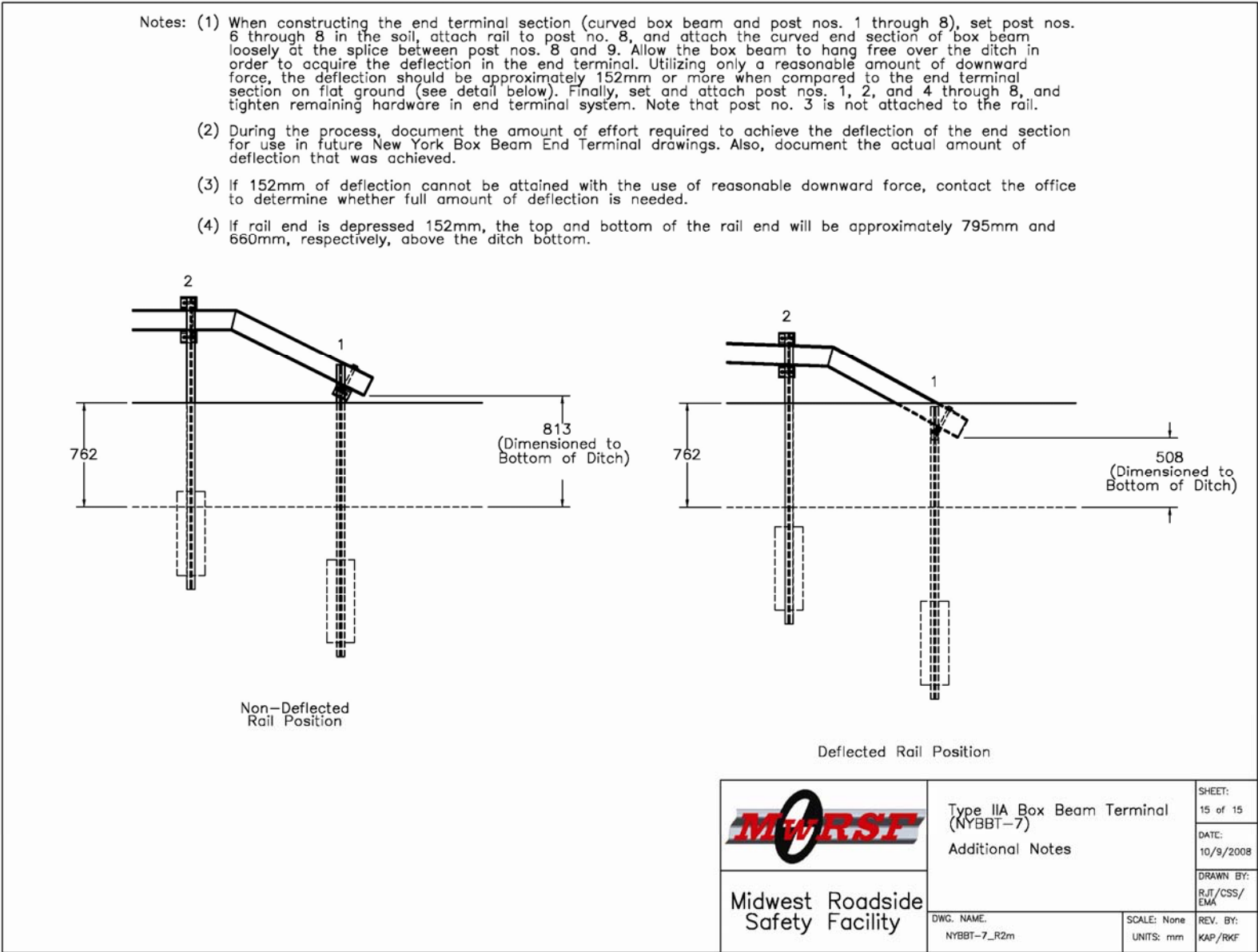


Figure P-15. Modified Type IIA Box Beam Terminal in Ditch System Details (Metric), Test No. NYBBT-7

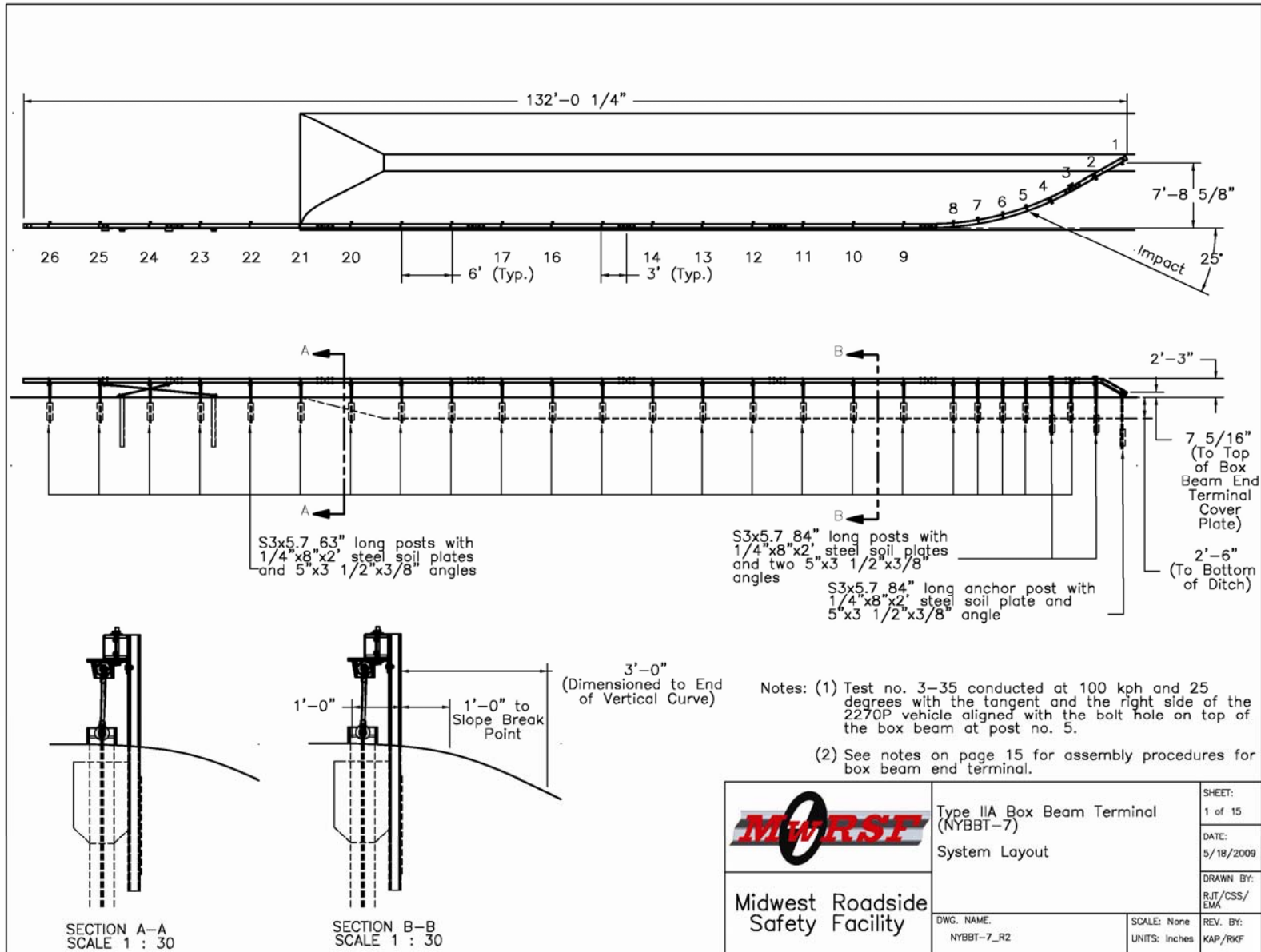


Figure P-16. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

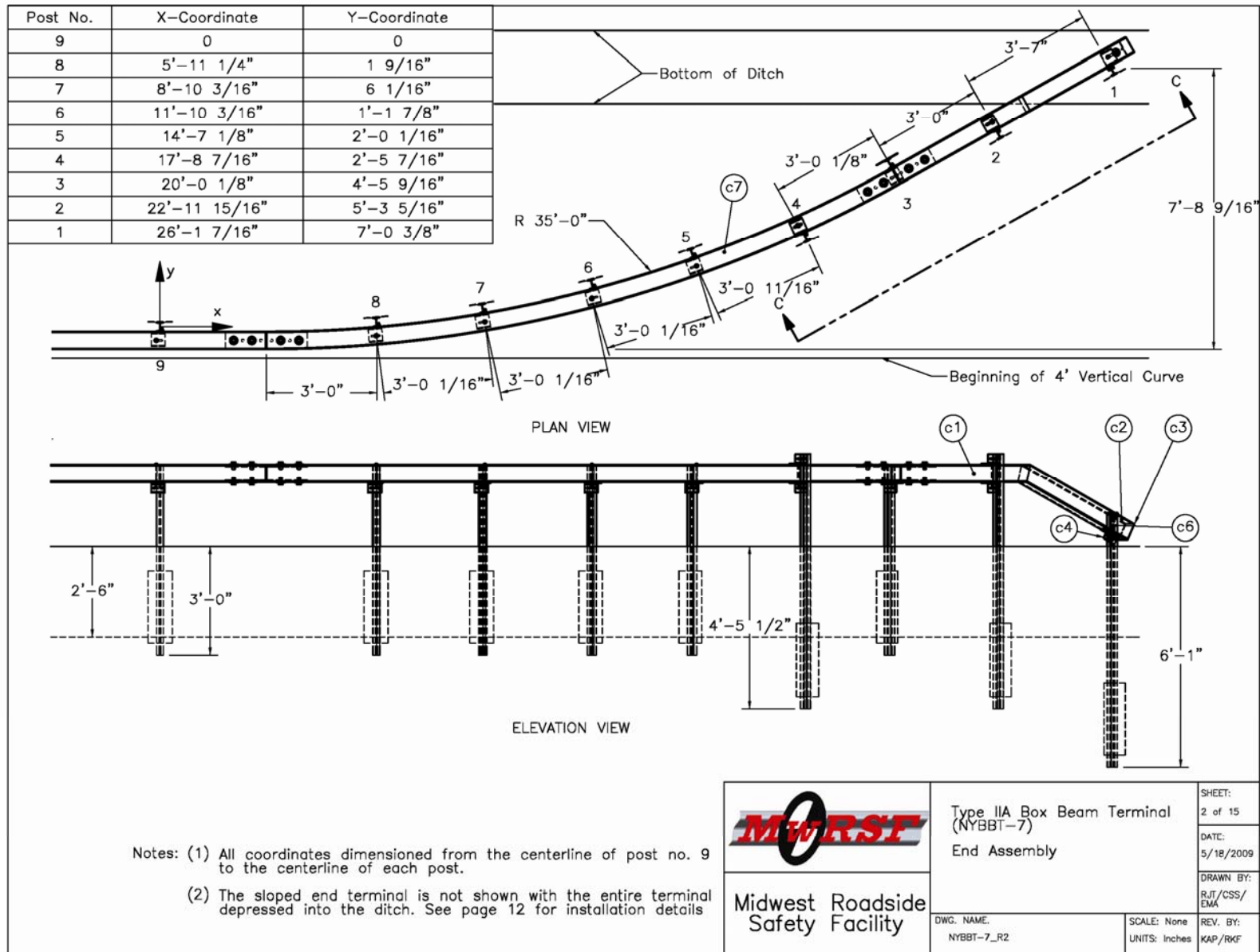


Figure P-17. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

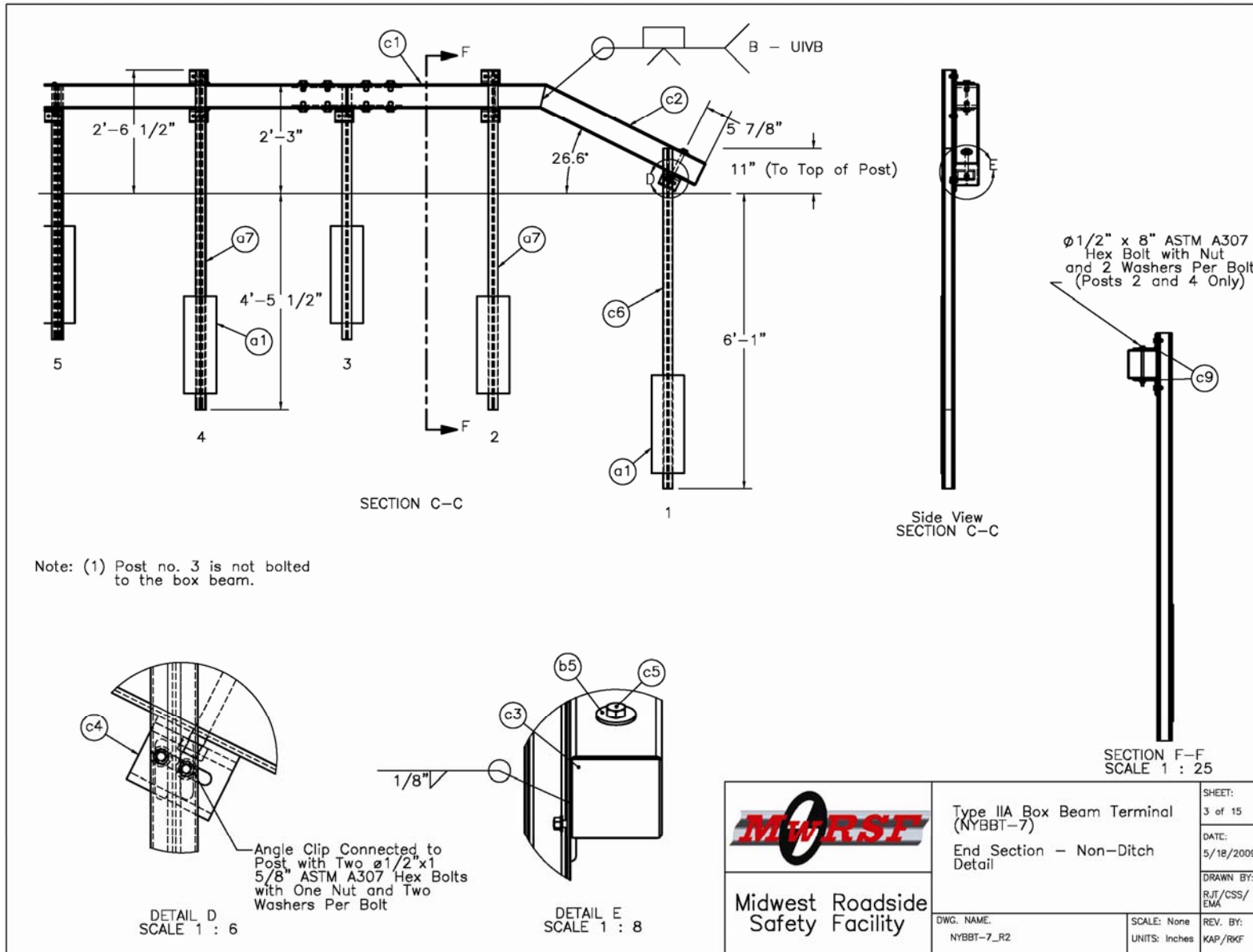


Figure P-18. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

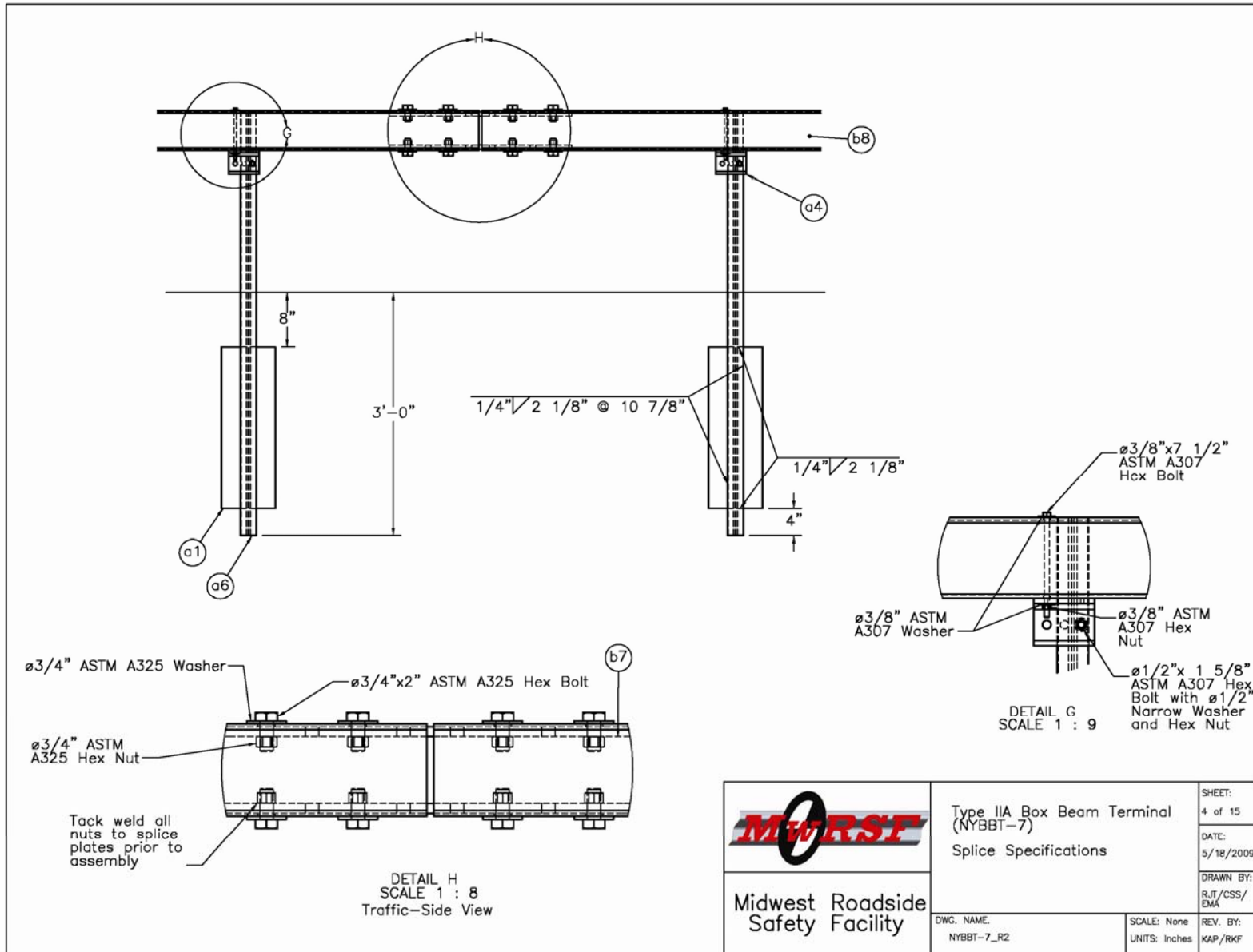


Figure P-19. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

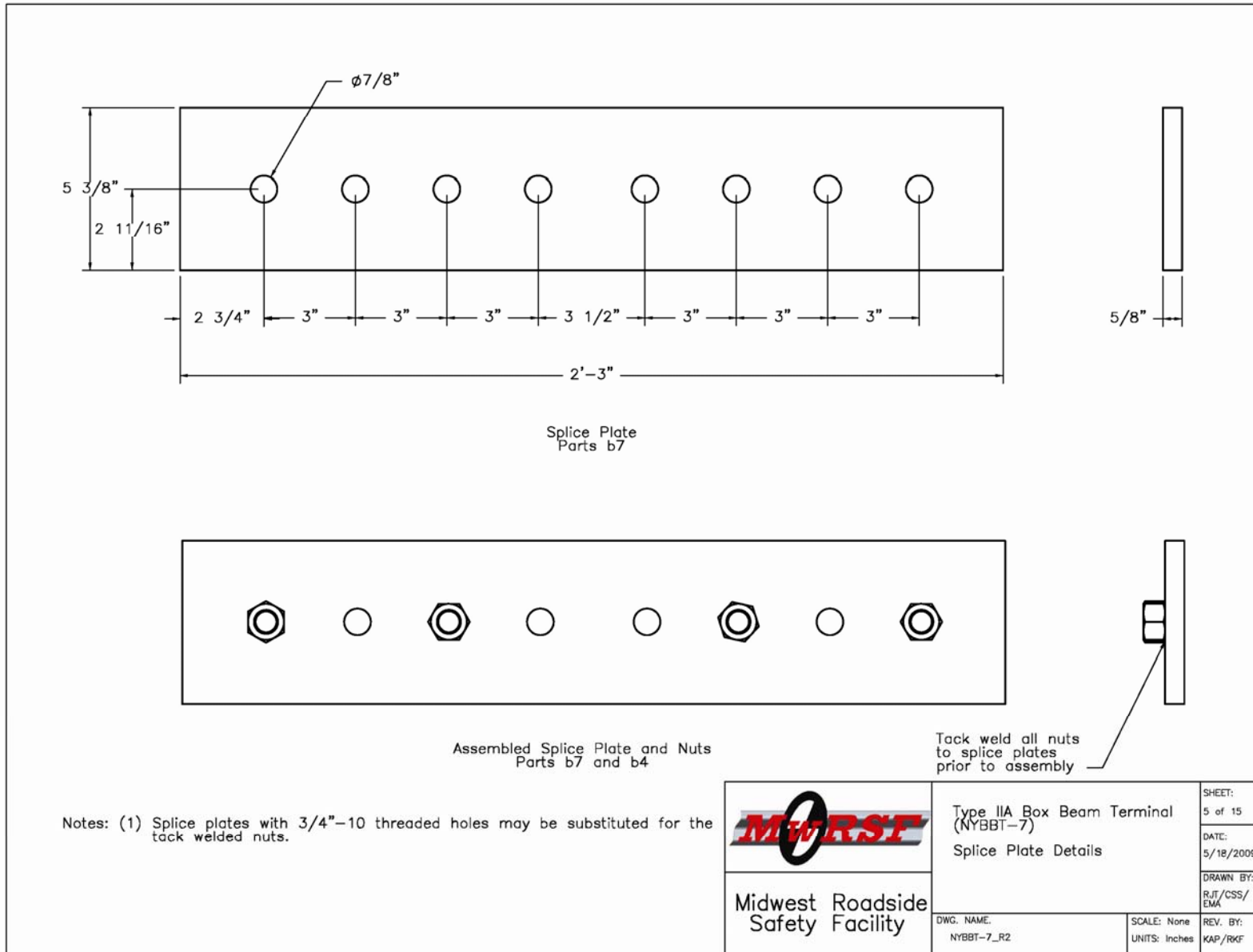


Figure P-20. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

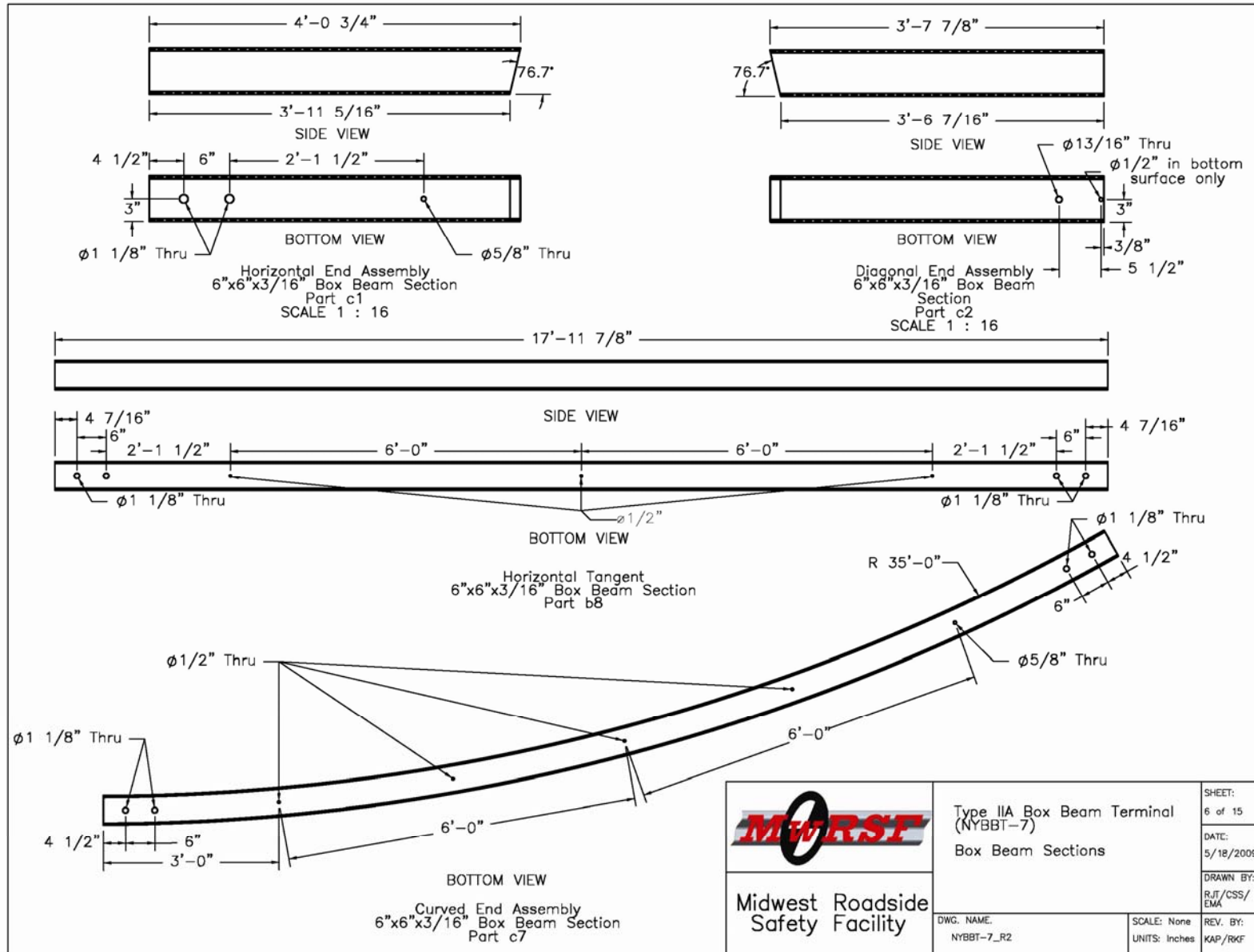


Figure P-21. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7



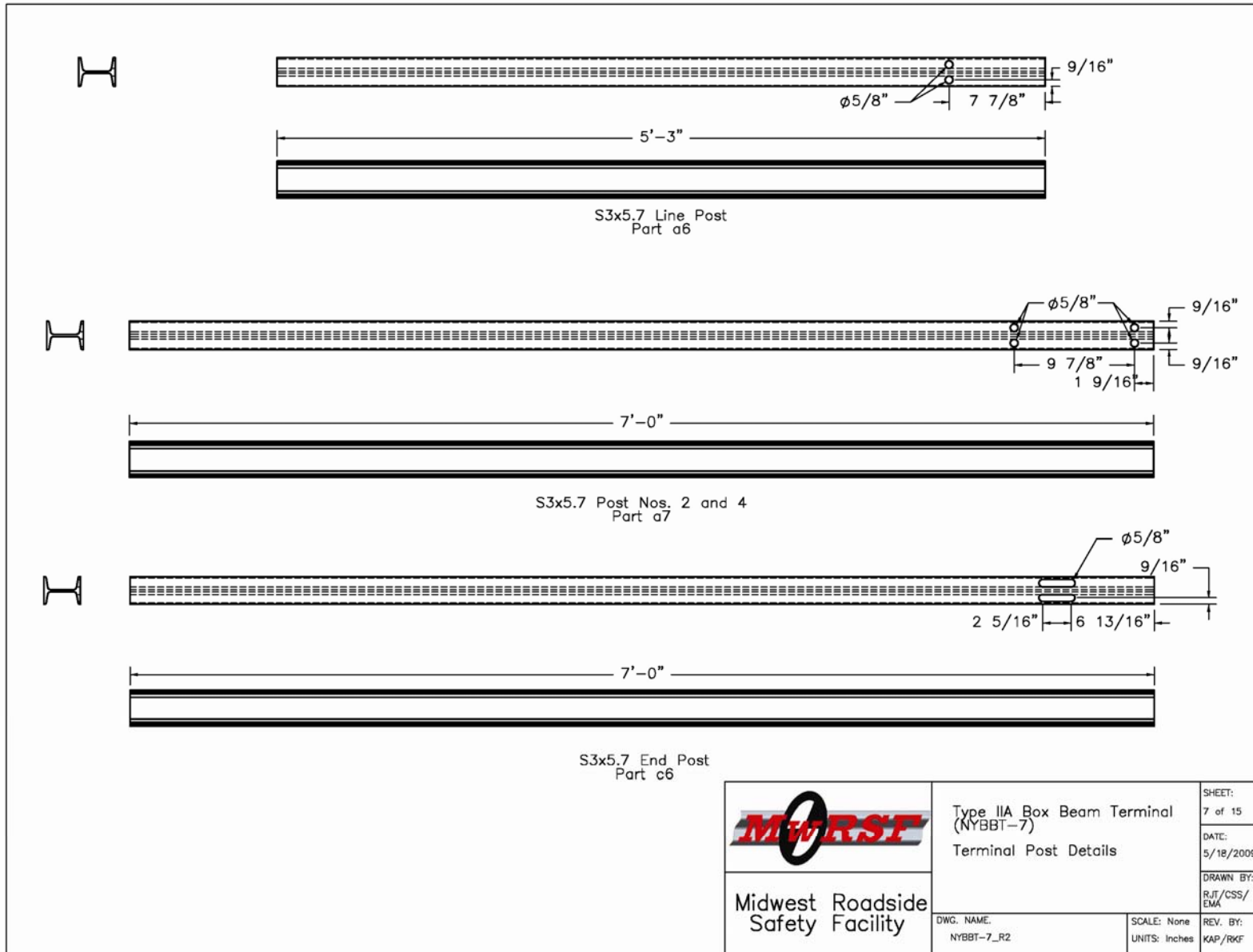


Figure P-22. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7



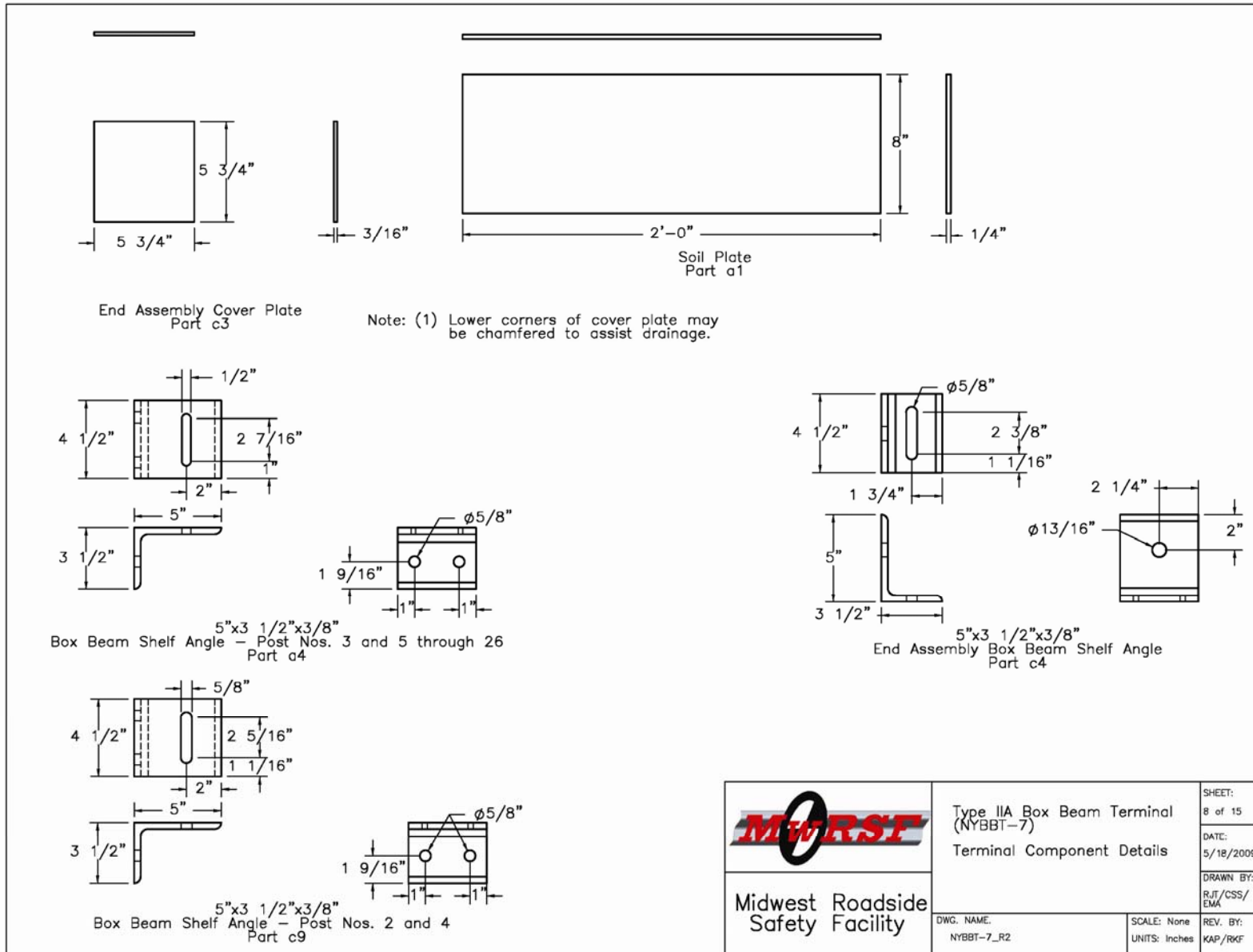


Figure P-23. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

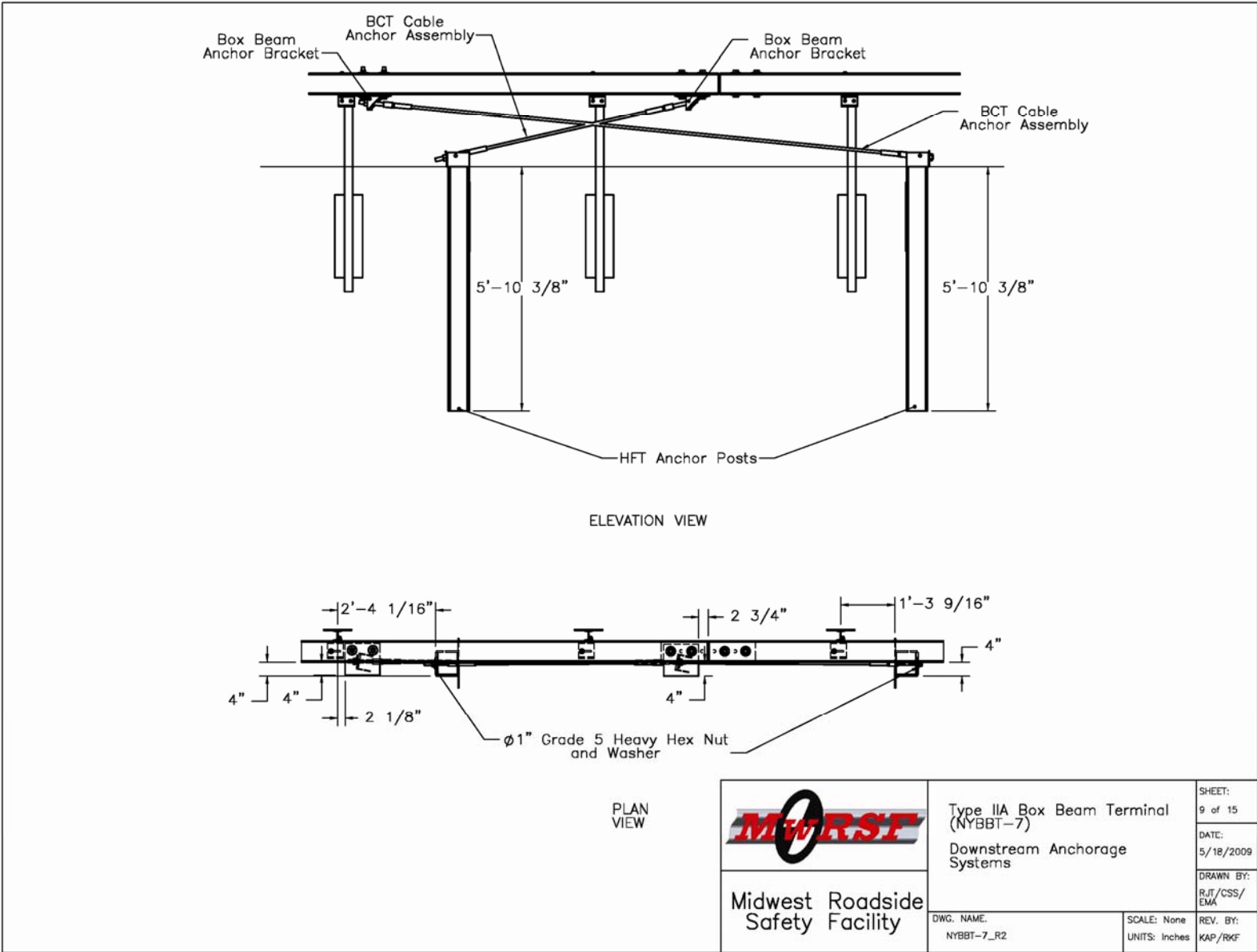


Figure P-24. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

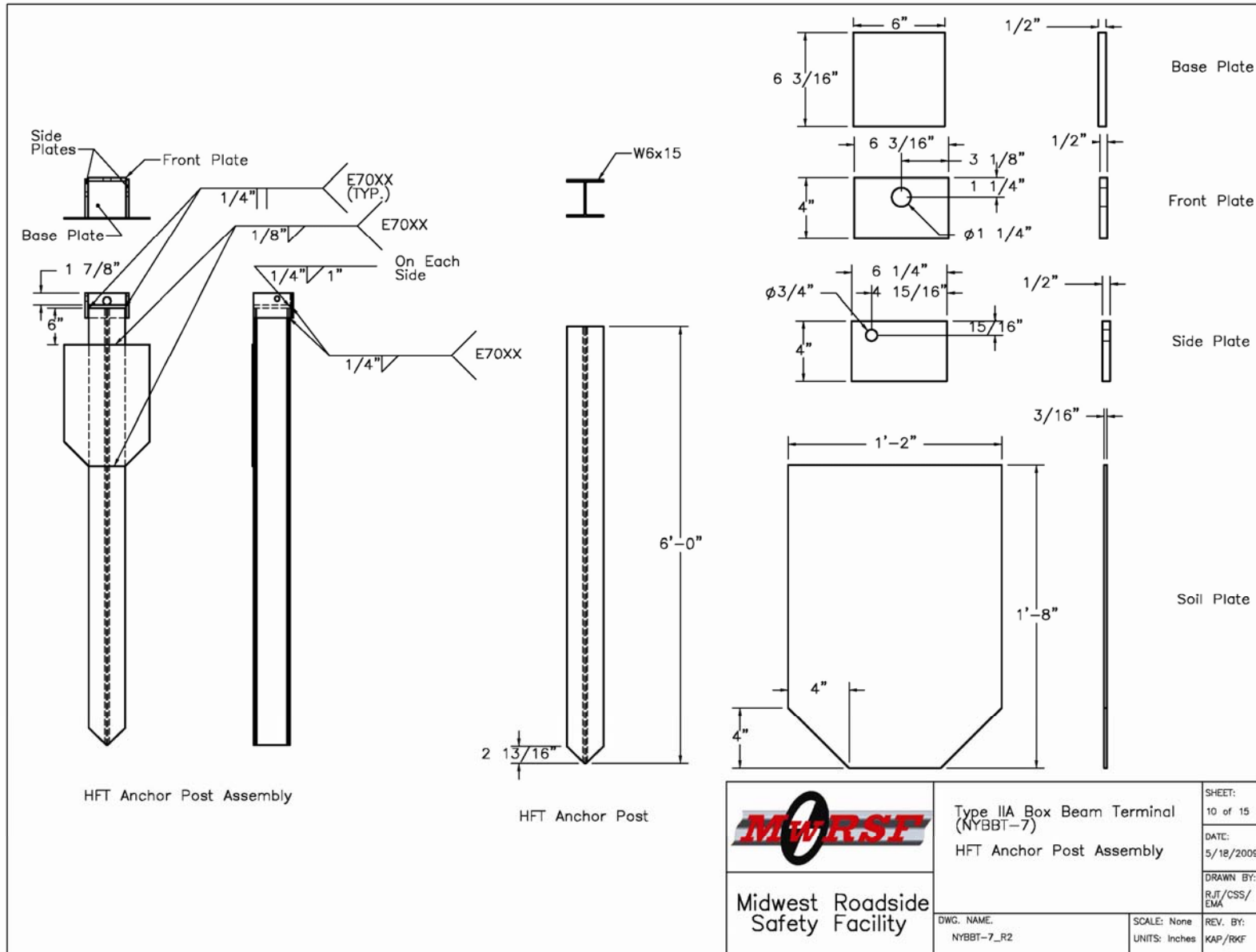


Figure P-25. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

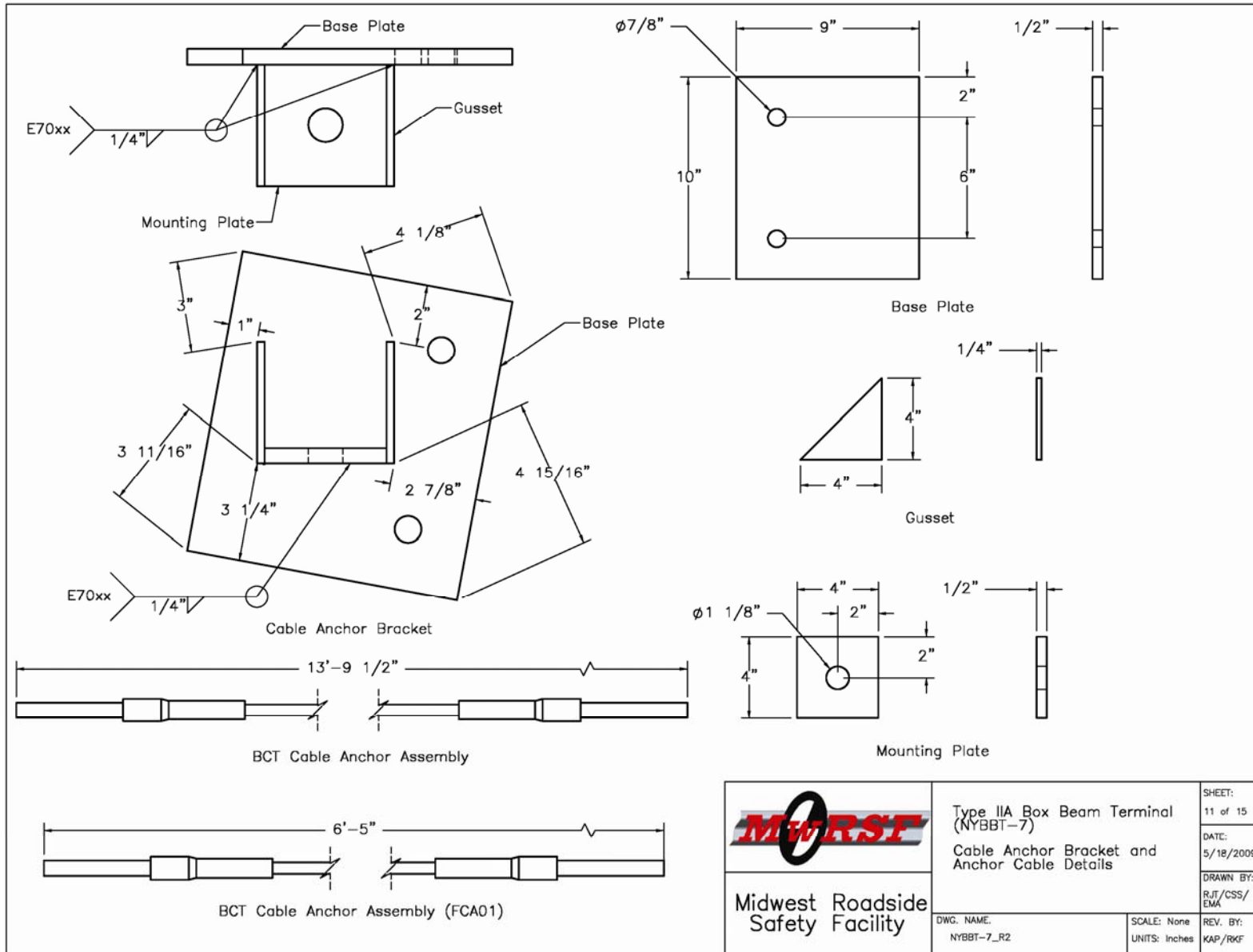


Figure P-26. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

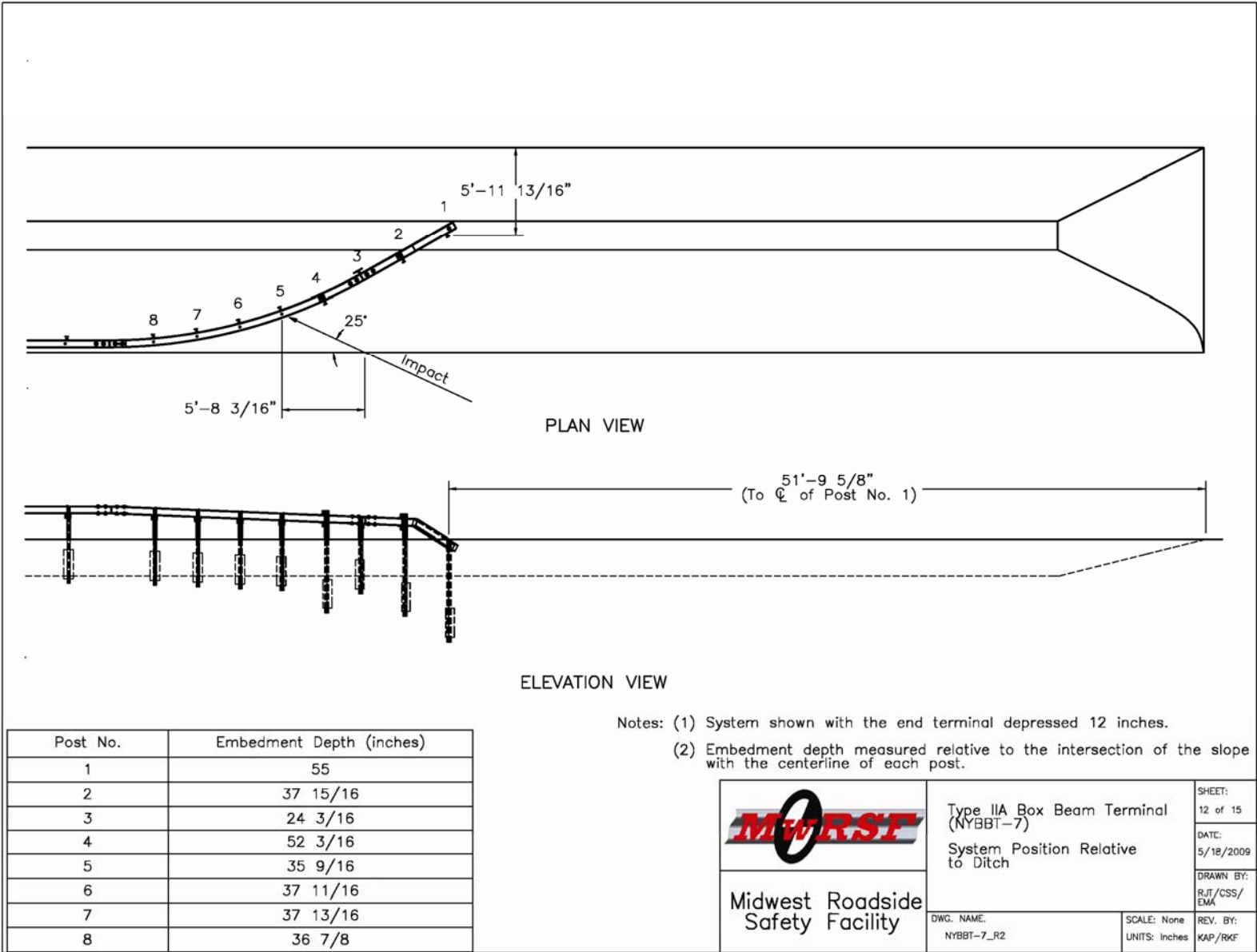


Figure P-27. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

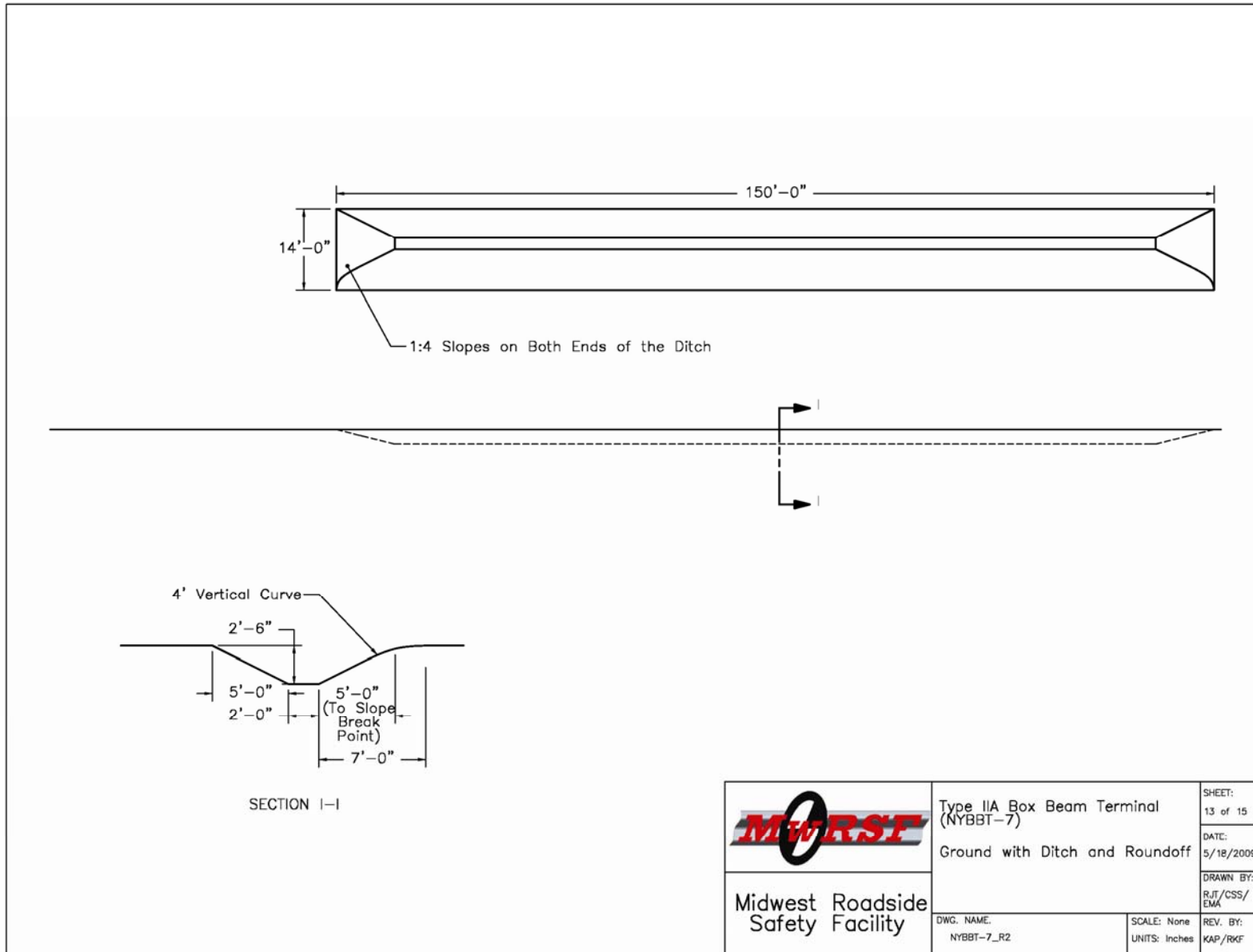


Figure P-28. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

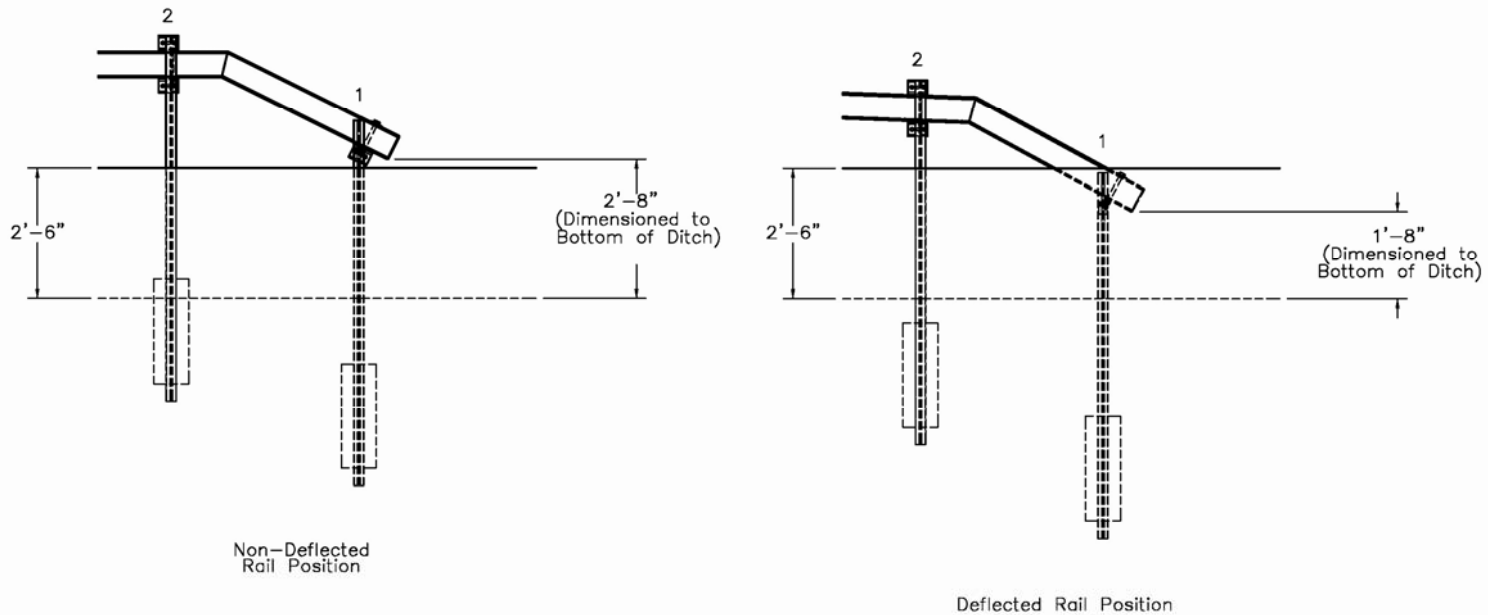
NYBBT-7			
Item No.	QTY.	Description	Material Specifications
a1	26	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	29	ø 1/2" coarse thread 1 5/8" long hex bolt	ASTM A307
a3	31	ø 1/2" hex nut	ASTM A307
a4	23	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	31	ø 1/2" narrow washer	ASTM A307
a6	23	S3 x 5.7 6.3" long post	A36 Steel
a7	2	S3 x 5.7 8.4" long post	A36 Steel
b1	22	ø 3/8" coarse thread 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	59	ø 3/4" hex nut	ASTM A325
b5	61	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread 2" long hex bolt	ASTM A307
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" by 17'-11 7/8" long box beam	ASTM A500 Grade B
c1	1	End assembly horizontal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam anchor post shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread 7 3/4" long hex bolt	ASTM A307
c6	1	S3 x 5.7 8.4" long post anchor post	A36 Steel
c7	1	6"x6"x3/16" R 35' Curved Box Beam	ASTM A500 Grade B
c8	2	ø 1/2" coarse thread 8" long hex bolt	ASTM A307
c9	4	127 x 89 x 10mm box beam shelf angle with ø16mm slot	A36 Steel
c10	4	ø 1/2" wide washer	ASTM A307

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-7) Bill of Materials	SHEET: 14 of 15 DATE: 5/18/2009 DRAWN BY: RJJ/CSS/ EMA
	DWG. NAME: NYBBT-7_R2	SCALE: None UNITS: Inches

Figure P-29. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7

- Notes: (1) When constructing the end terminal section (curved box beam and post nos. 1 through 8), set post nos. 6 through 8 in the soil, attach rail to post no. 8, and attach the curved end section of box beam loosely at the splice between post nos. 8 and 9. Allow the box beam to hang free over the ditch in order to acquire the deflection in the end terminal. Utilizing only a reasonable amount of downward force, the deflection should be approximately 6 inches or more when compared to the end terminal section on flat ground (see detail below). Finally, set and attach post nos. 1, 2, and 4 through 8, and tighten remaining hardware in end terminal system. Note that post no. 3 is not attached to the rail.
- (2) During the process, document the amount of effort required to achieve the deflection of the end section for use in future New York Box Beam End Terminal drawings. Also, document the actual amount of deflection that was achieved.
- (3) If 6 inches of deflection cannot be attained with the use of reasonable downward force, contact the office to determine whether full amount of deflection is needed.
- (4) If rail end is depressed 6 inches, the top and bottom of the rail end will be approximately 31 5/16 and 26 inches, respectively, above the ditch bottom.




 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (NYBBT-7)	SHEET: 15 of 15
	Additional Notes	DATE: 5/18/2009
DWG. NAME: NYBBT-7_R2	SCALE: None UNITS: Inches	DRAWN BY: RJT/CSS/ EMA  REV. BY: KAP/RKF

Figure P-30. Modified Type IIA Box Beam Terminal in Ditch System Details (English), Test No. NYBBT-7



**APPENDIX Q Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-6**

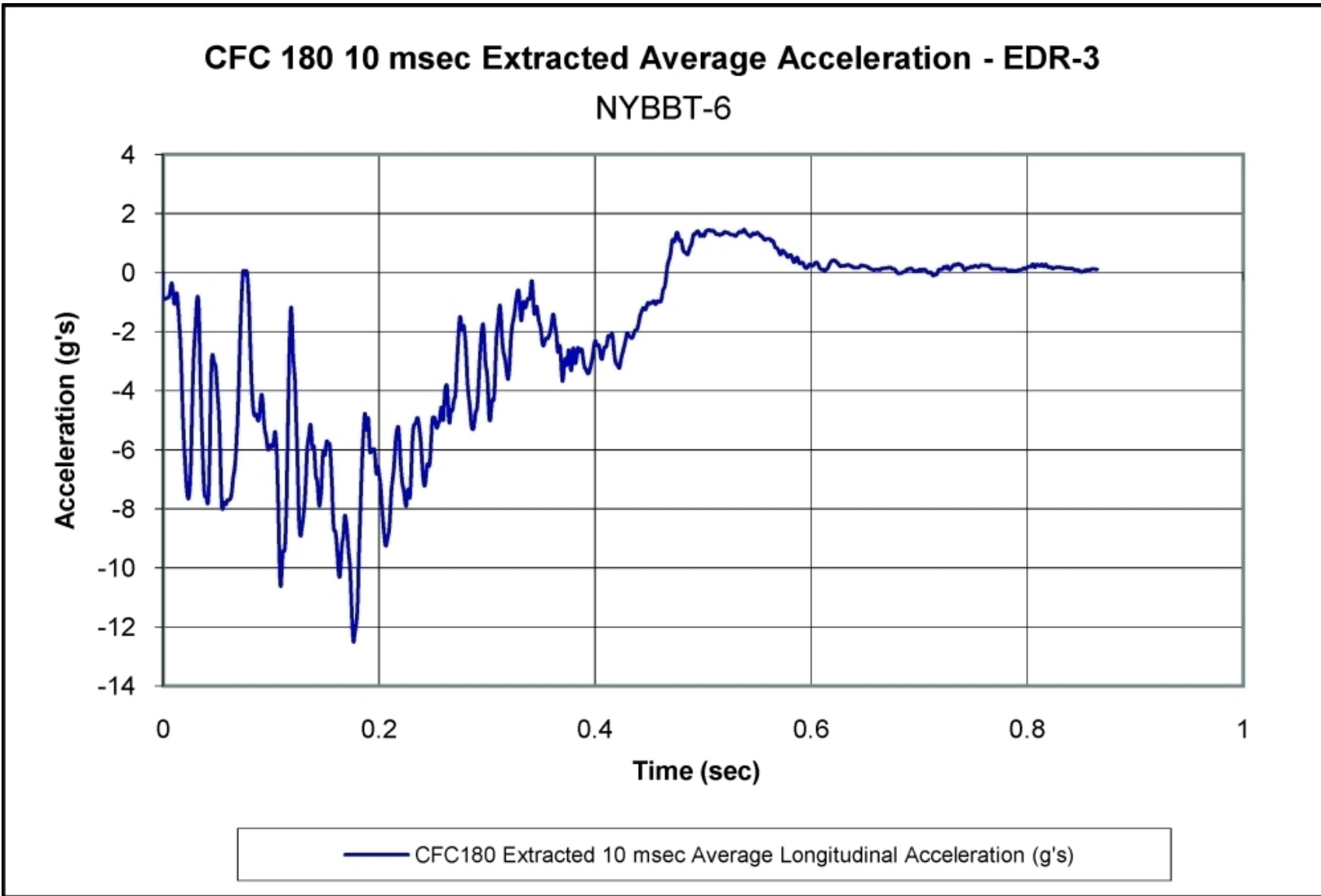


Figure Q-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-6

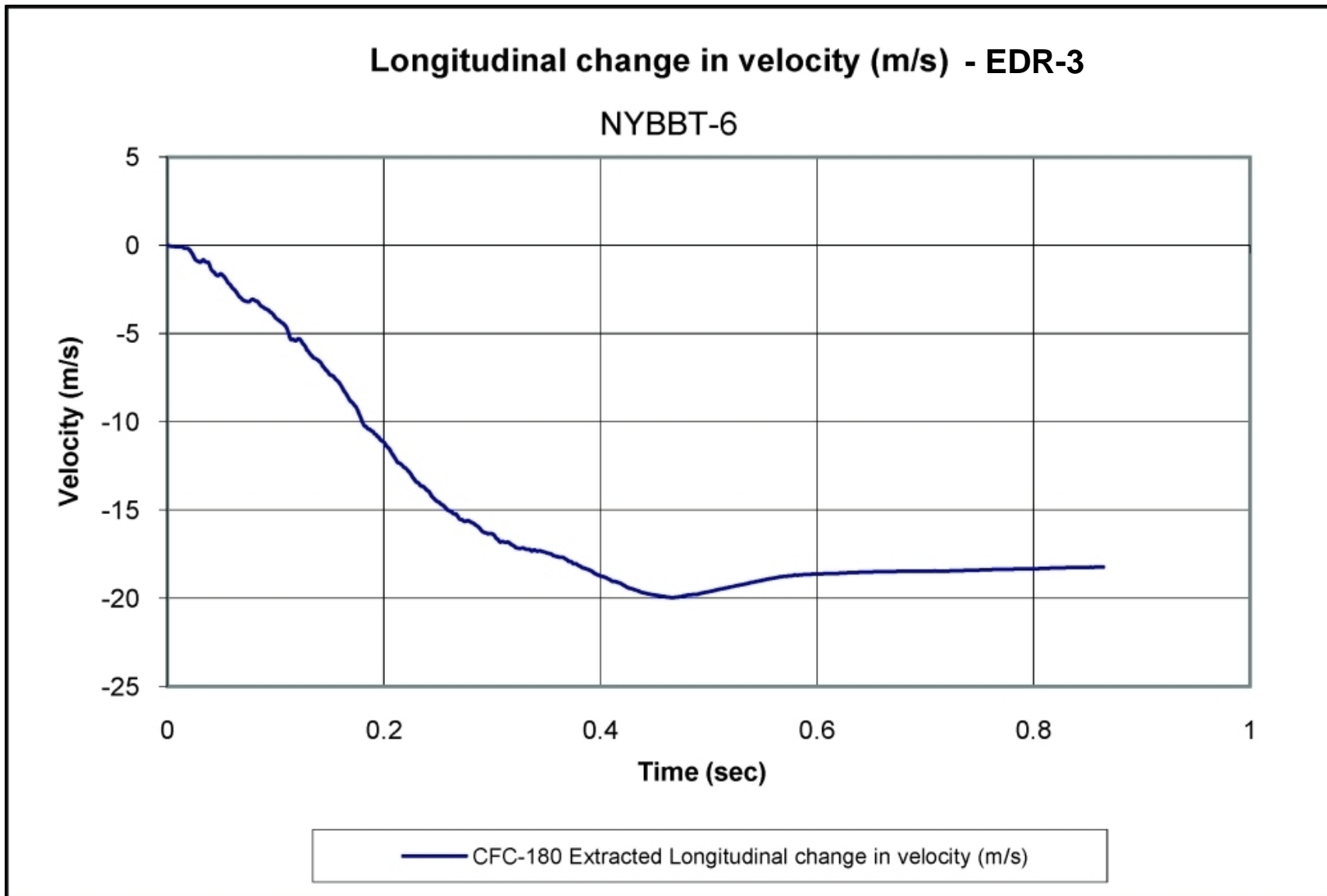


Figure Q-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-6

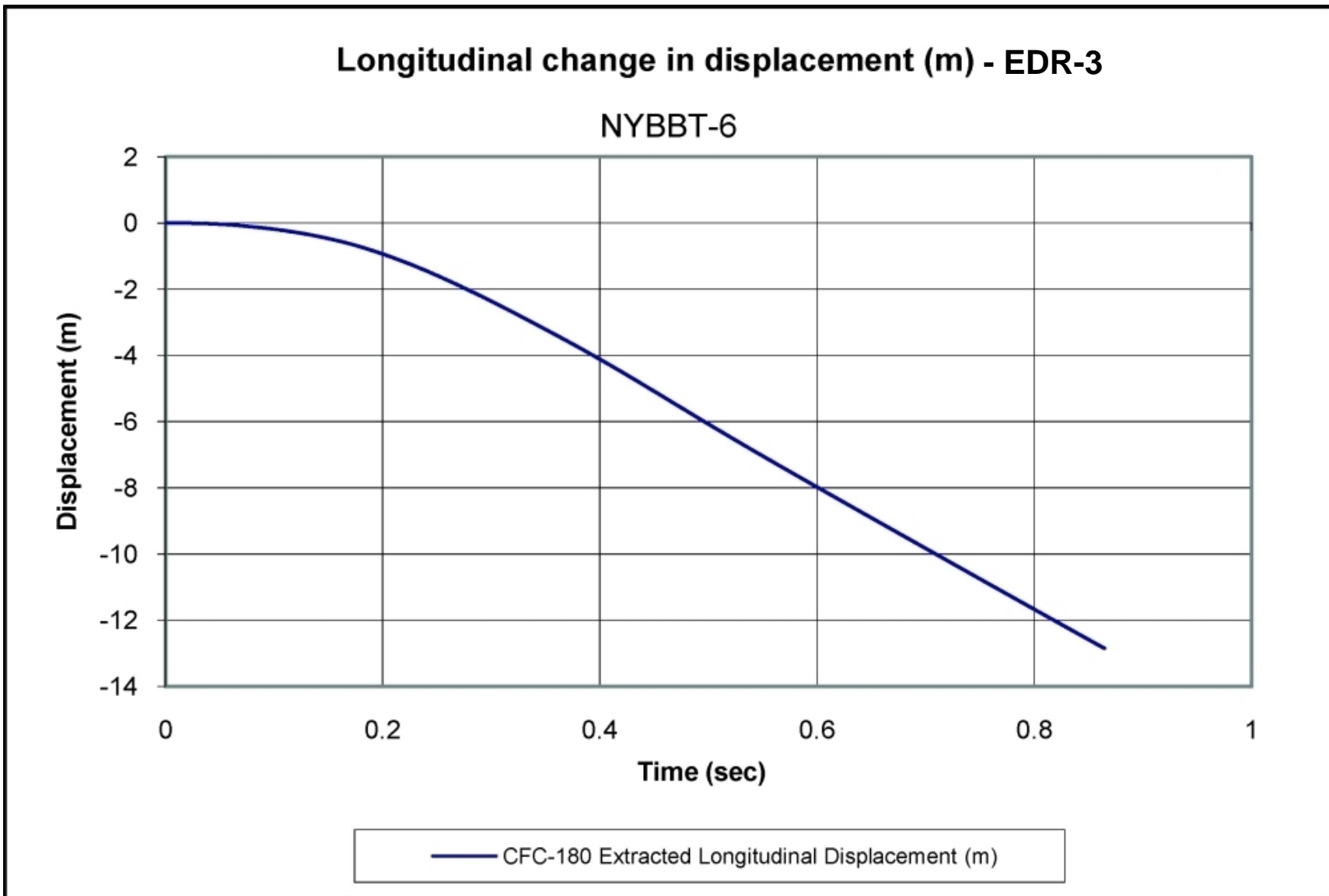


Figure Q-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-6

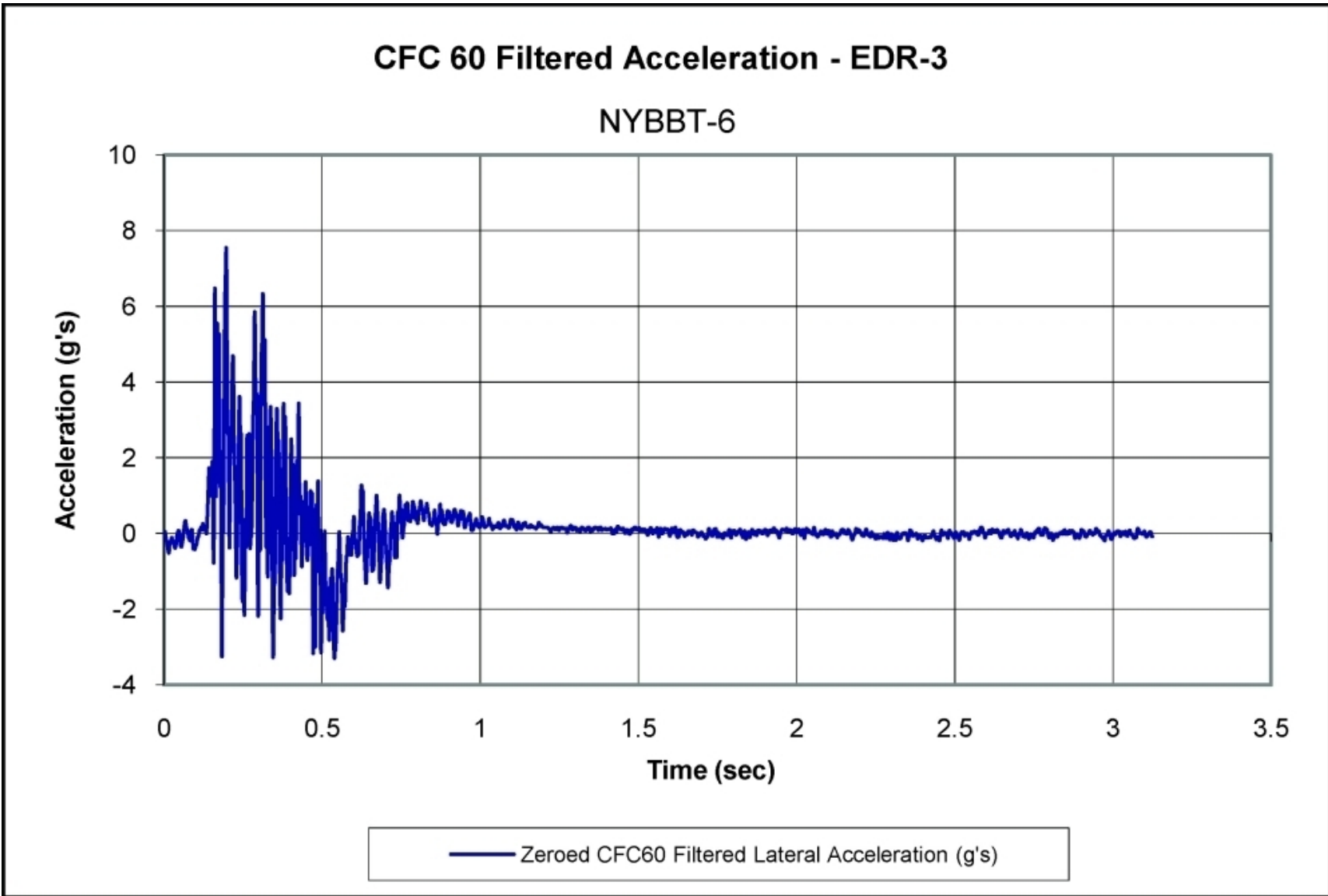


Figure Q-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-6

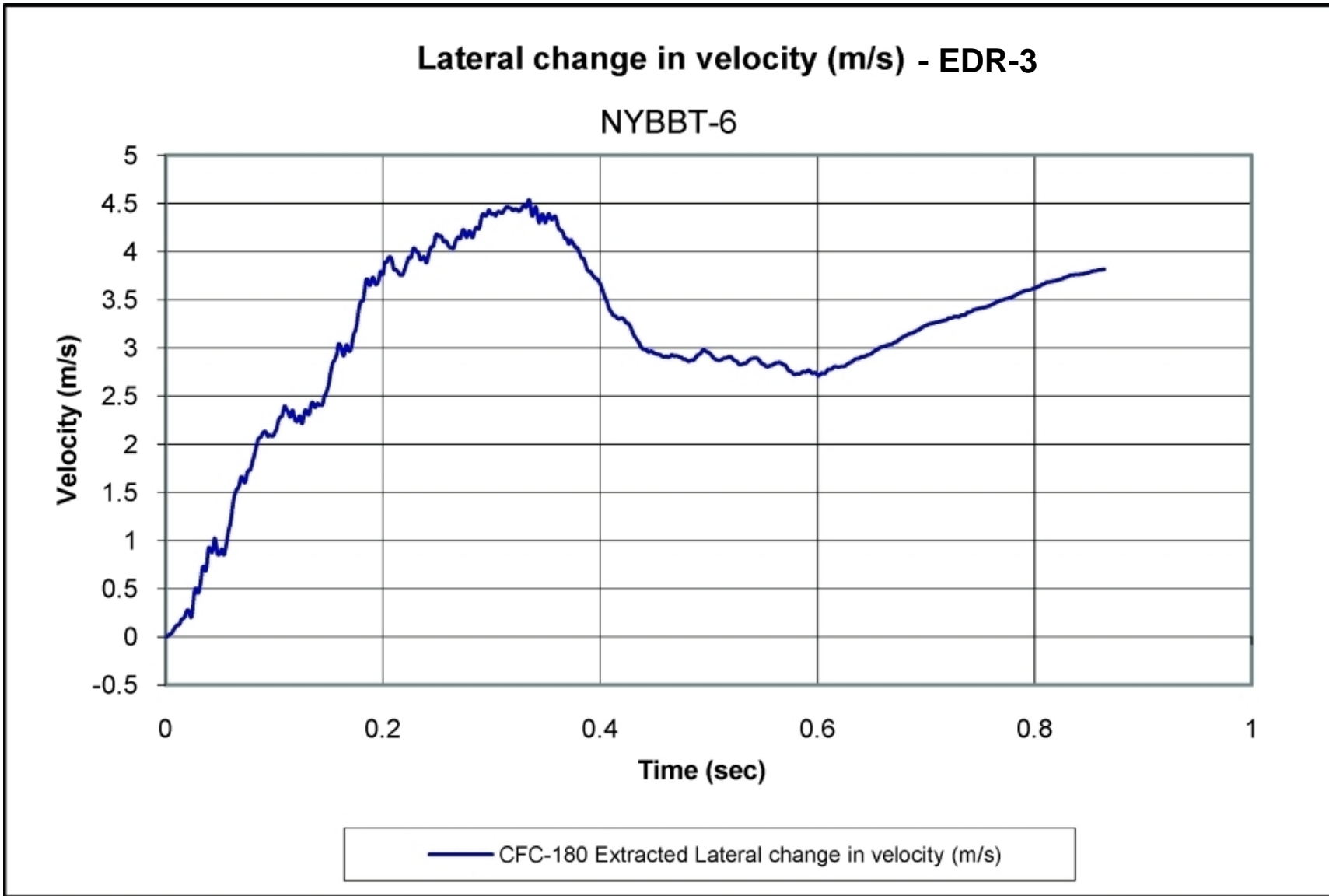


Figure Q-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-6

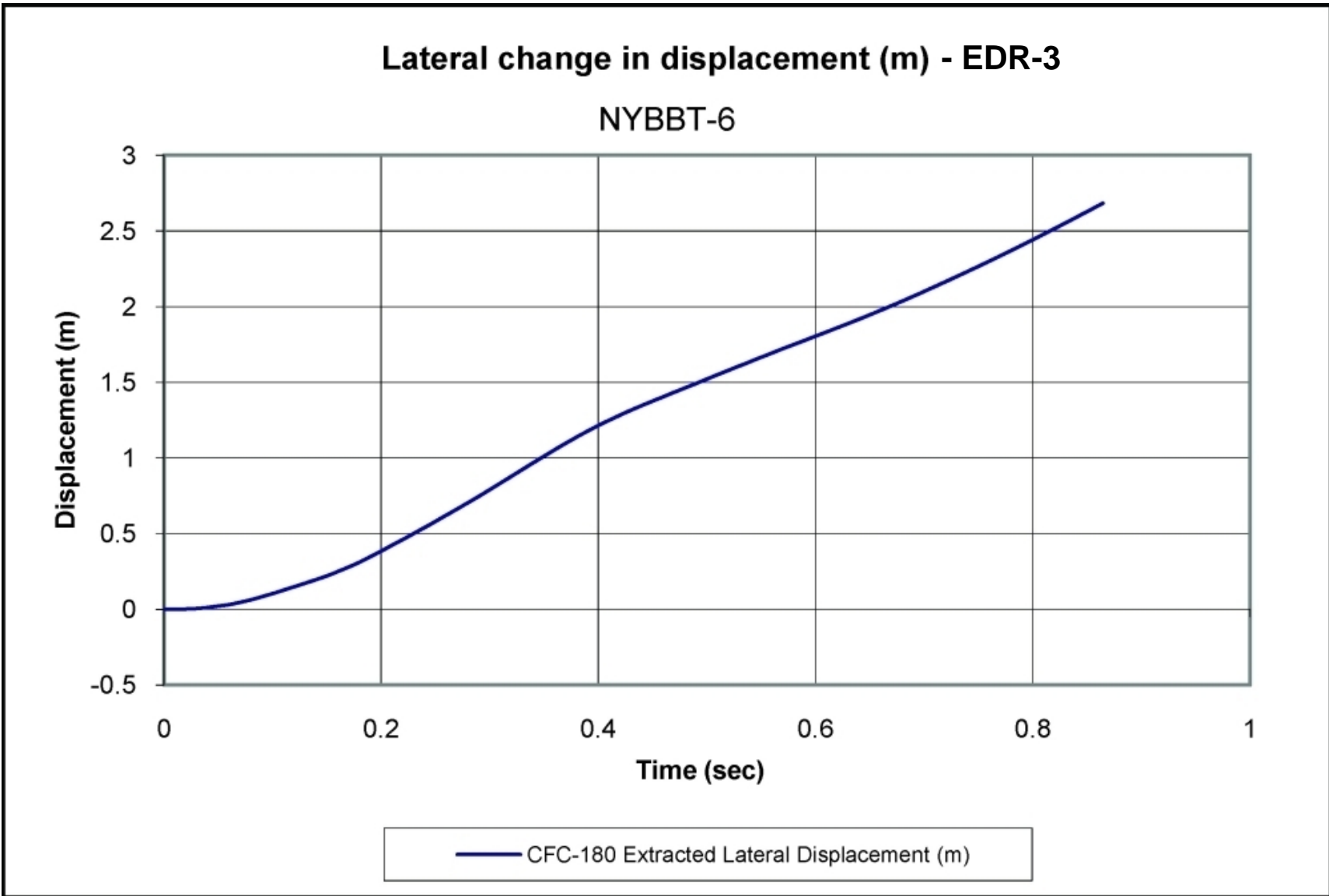


Figure Q-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-6

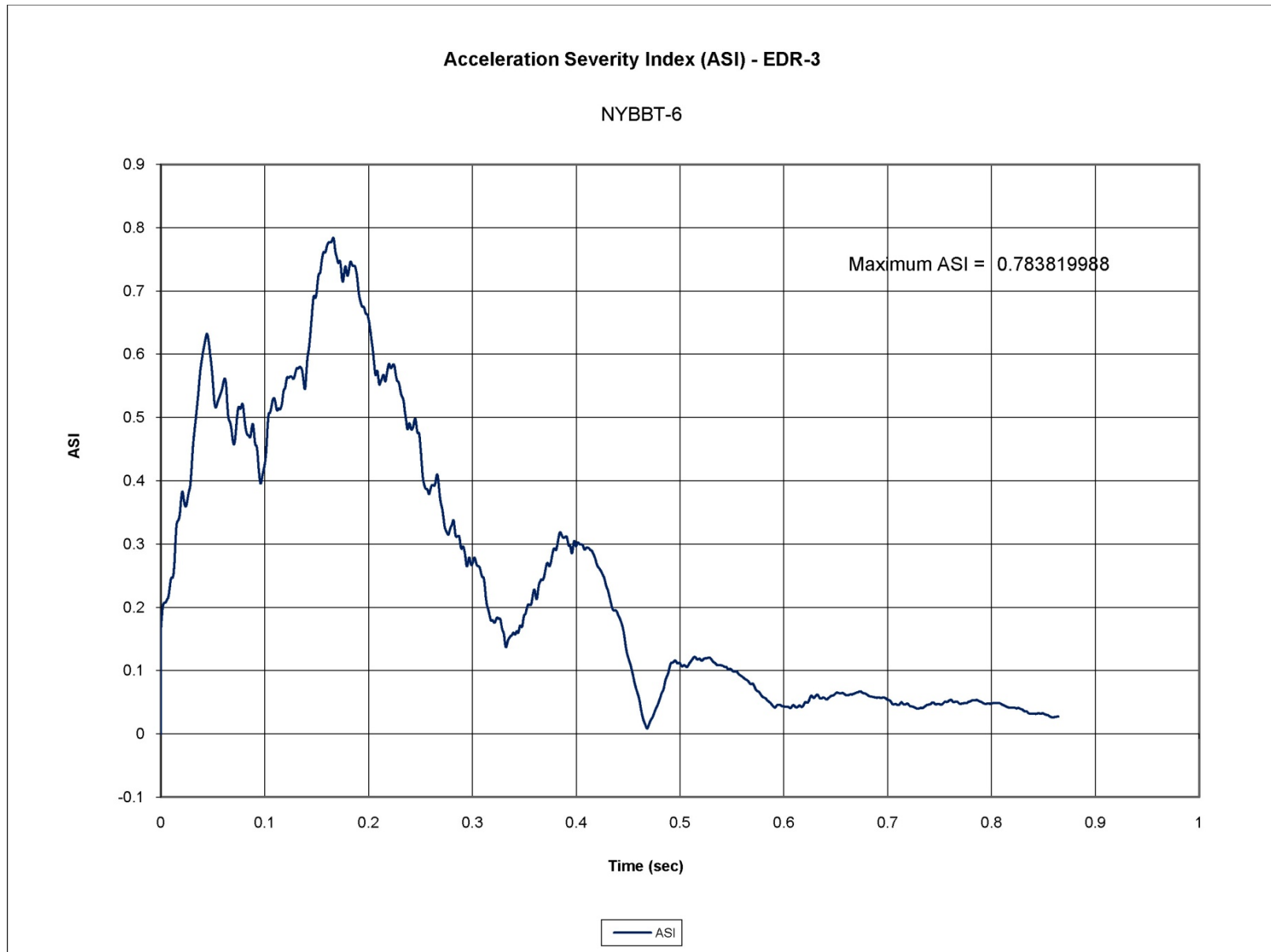


Figure Q-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-6



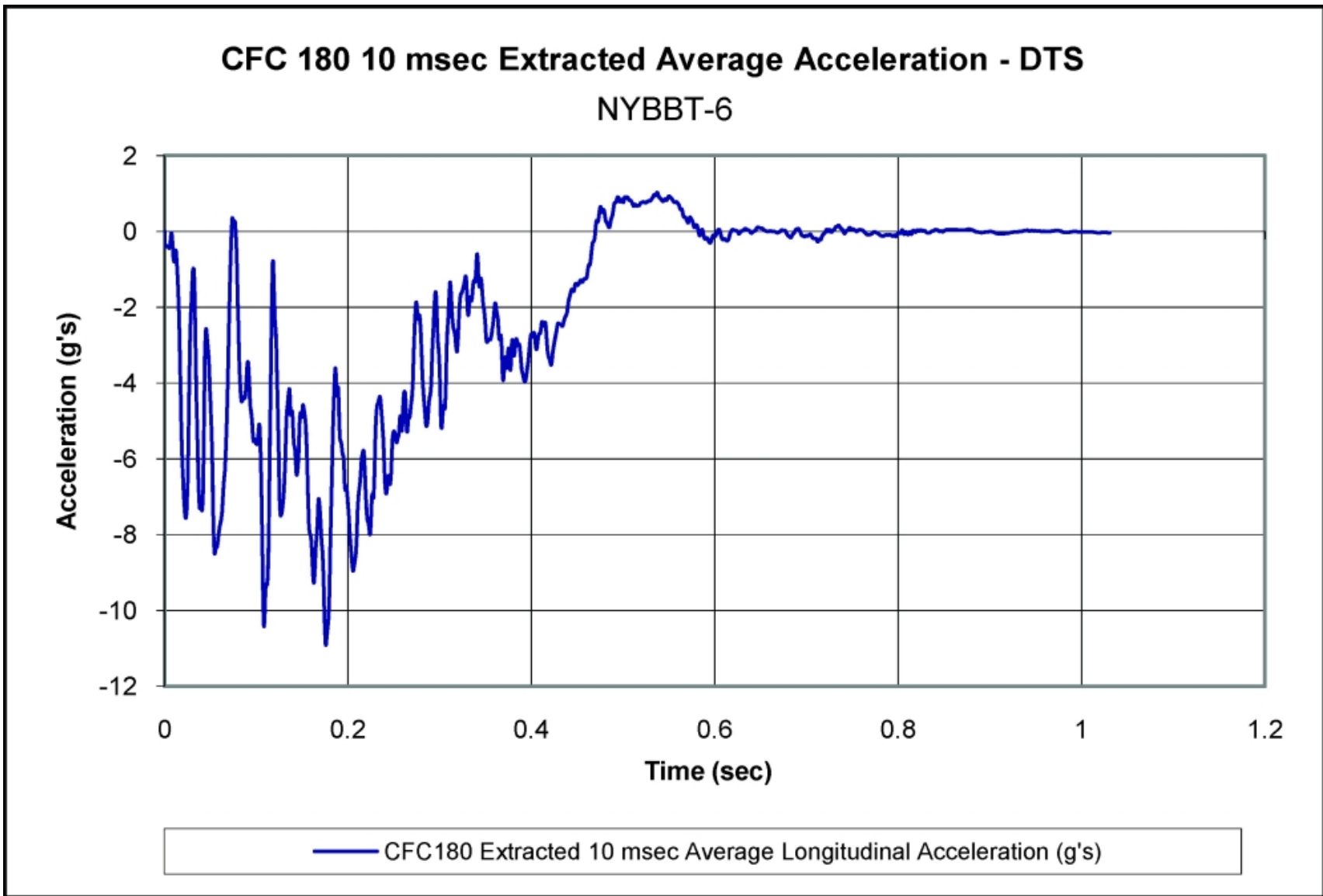


Figure Q-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-6

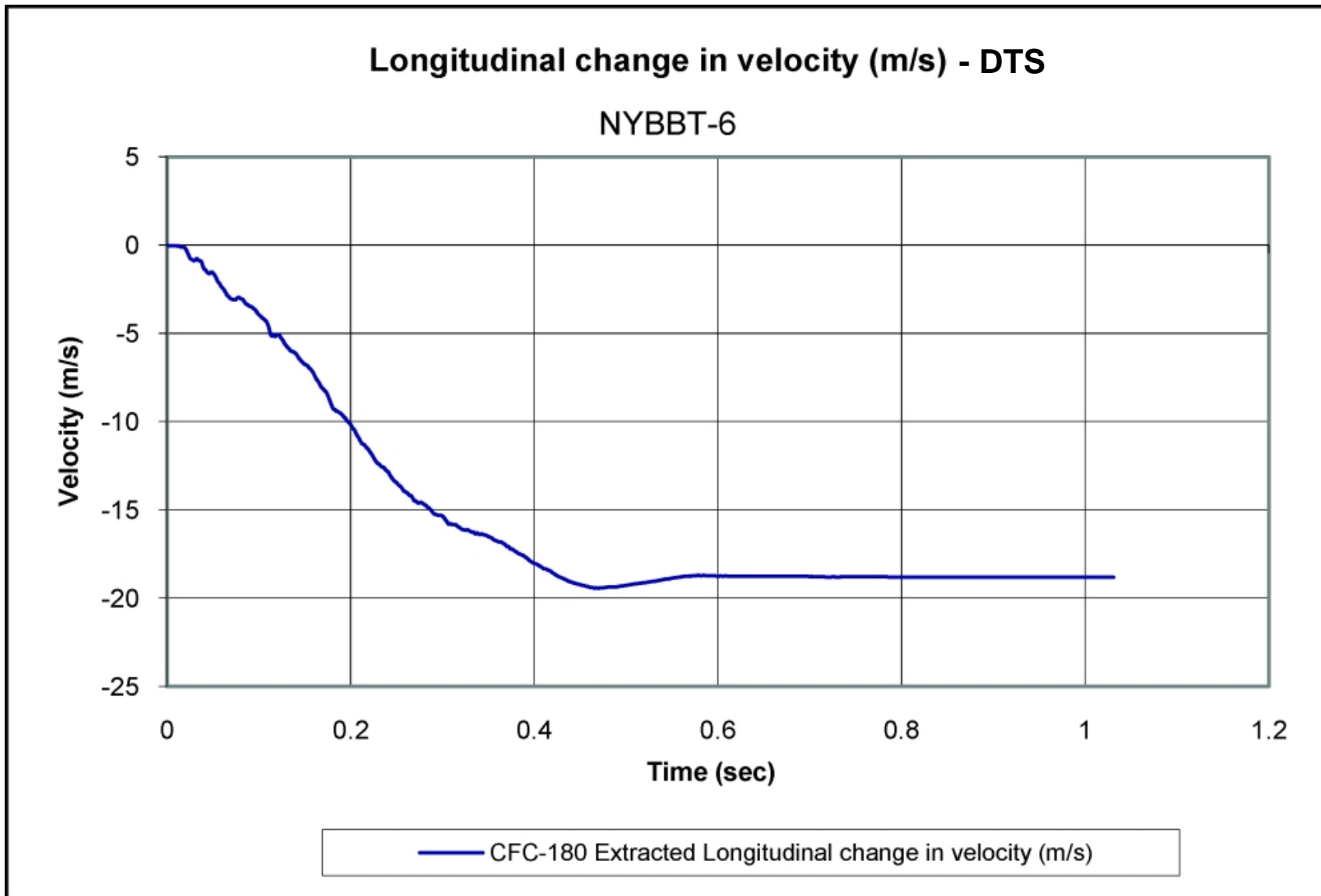


Figure Q-9. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-6

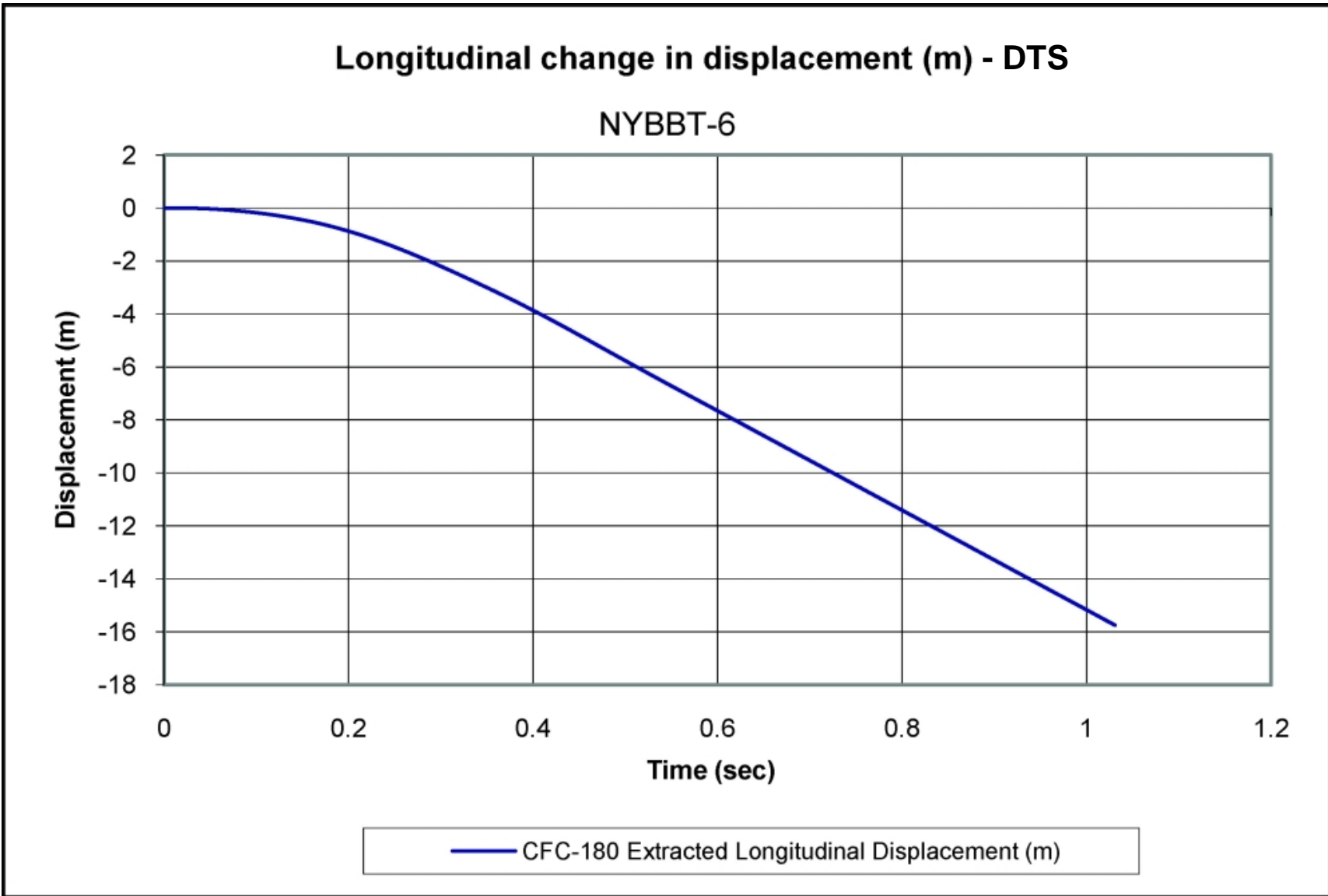


Figure Q-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-6

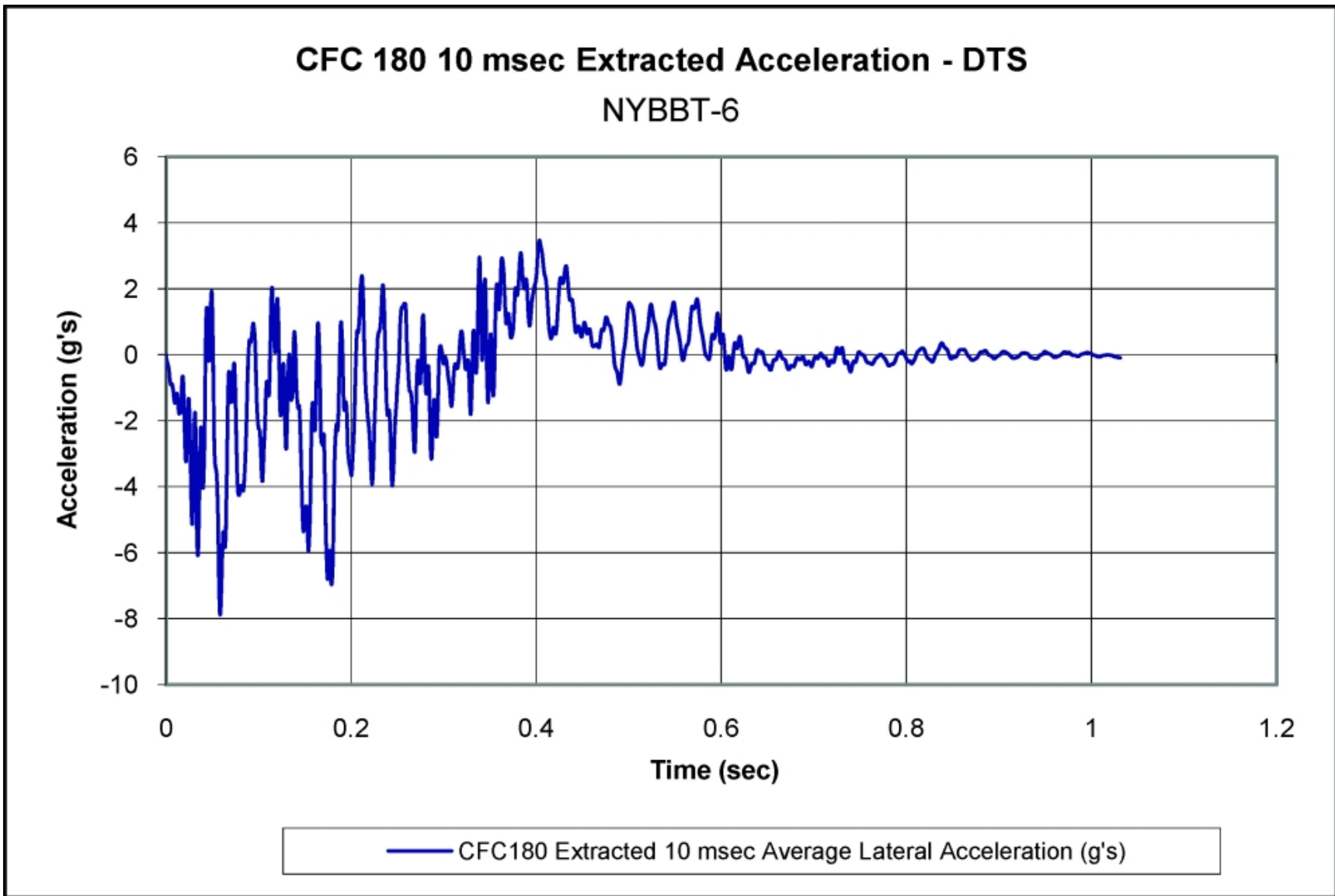


Figure Q-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-6

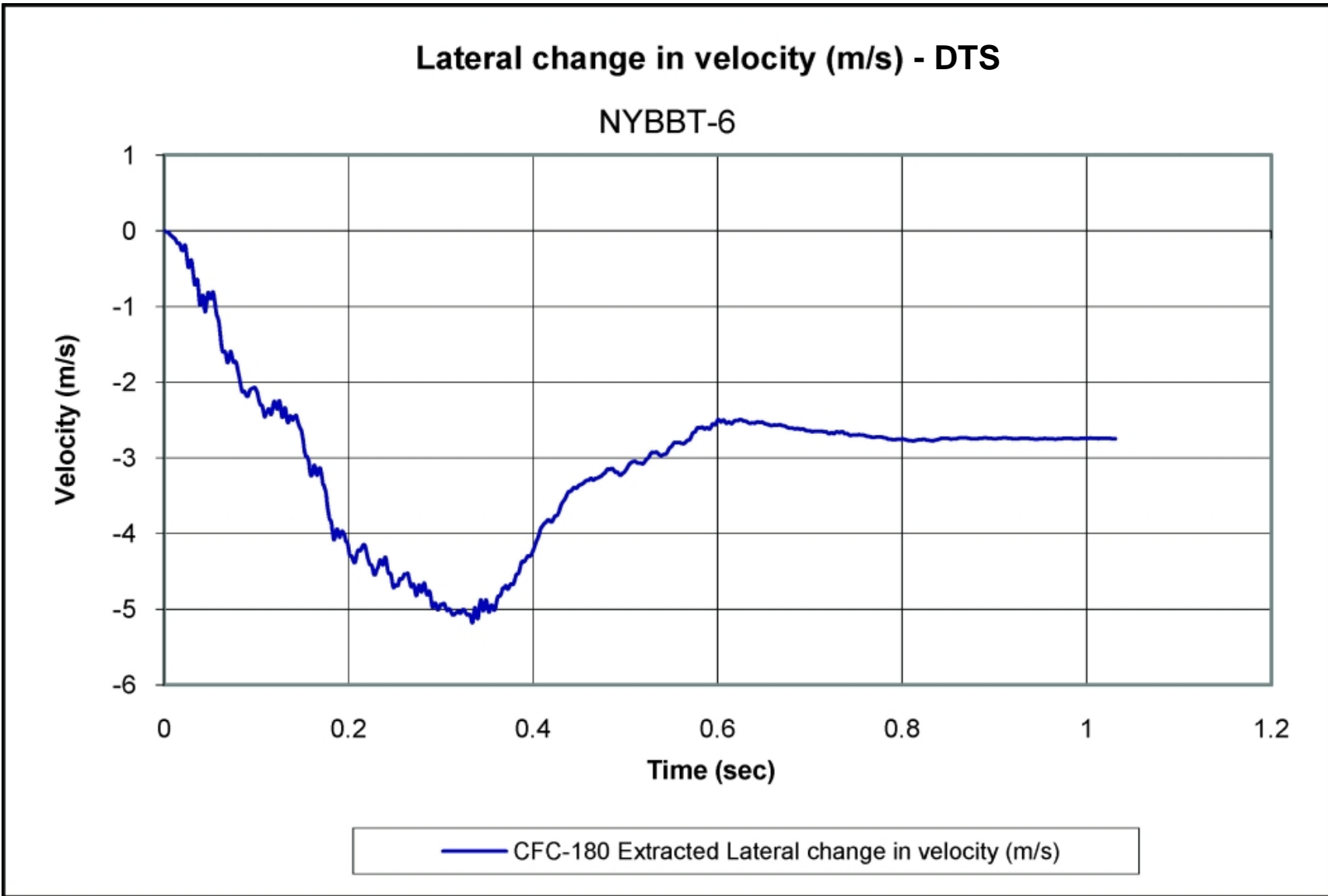


Figure Q-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-6

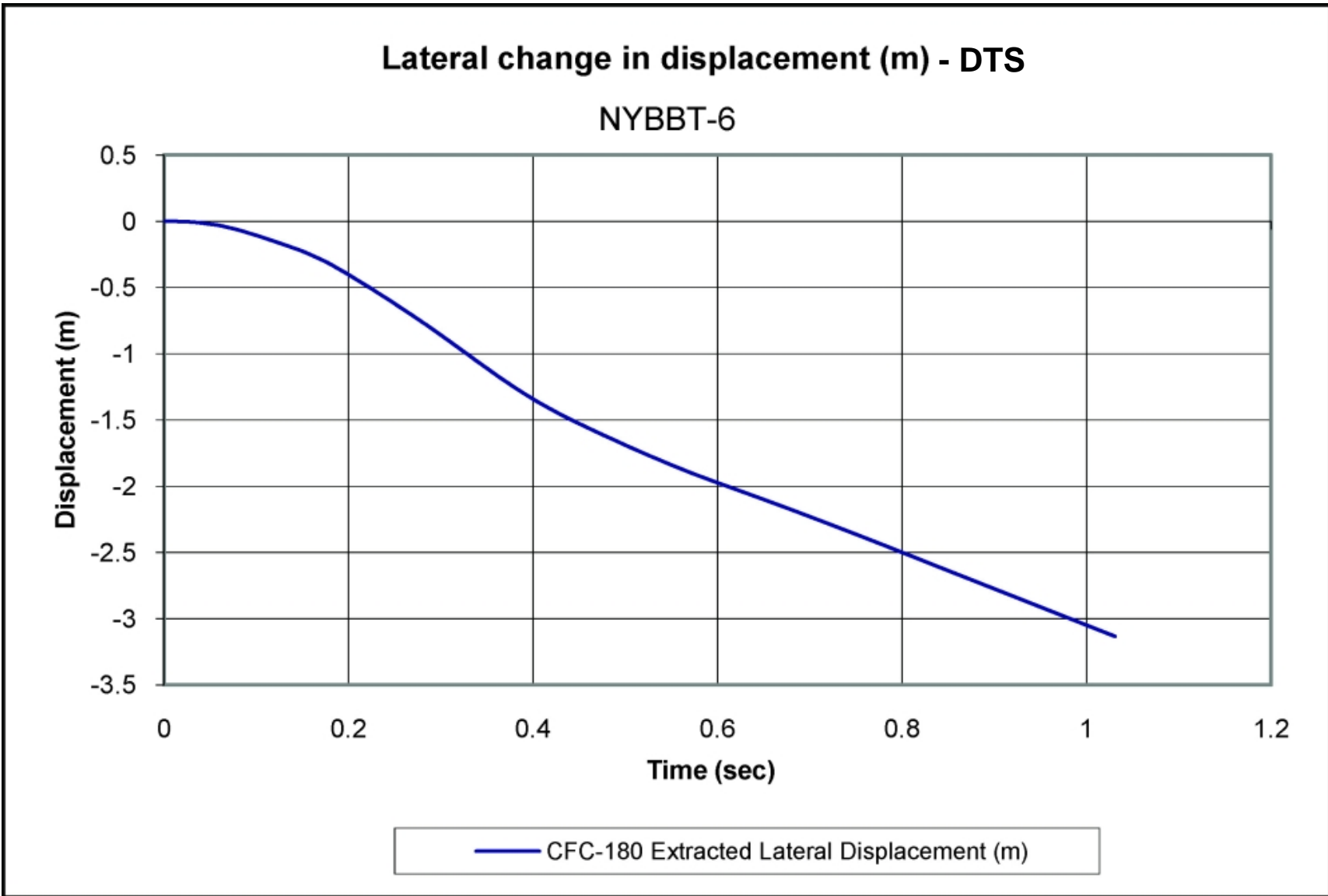


Figure Q-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-6

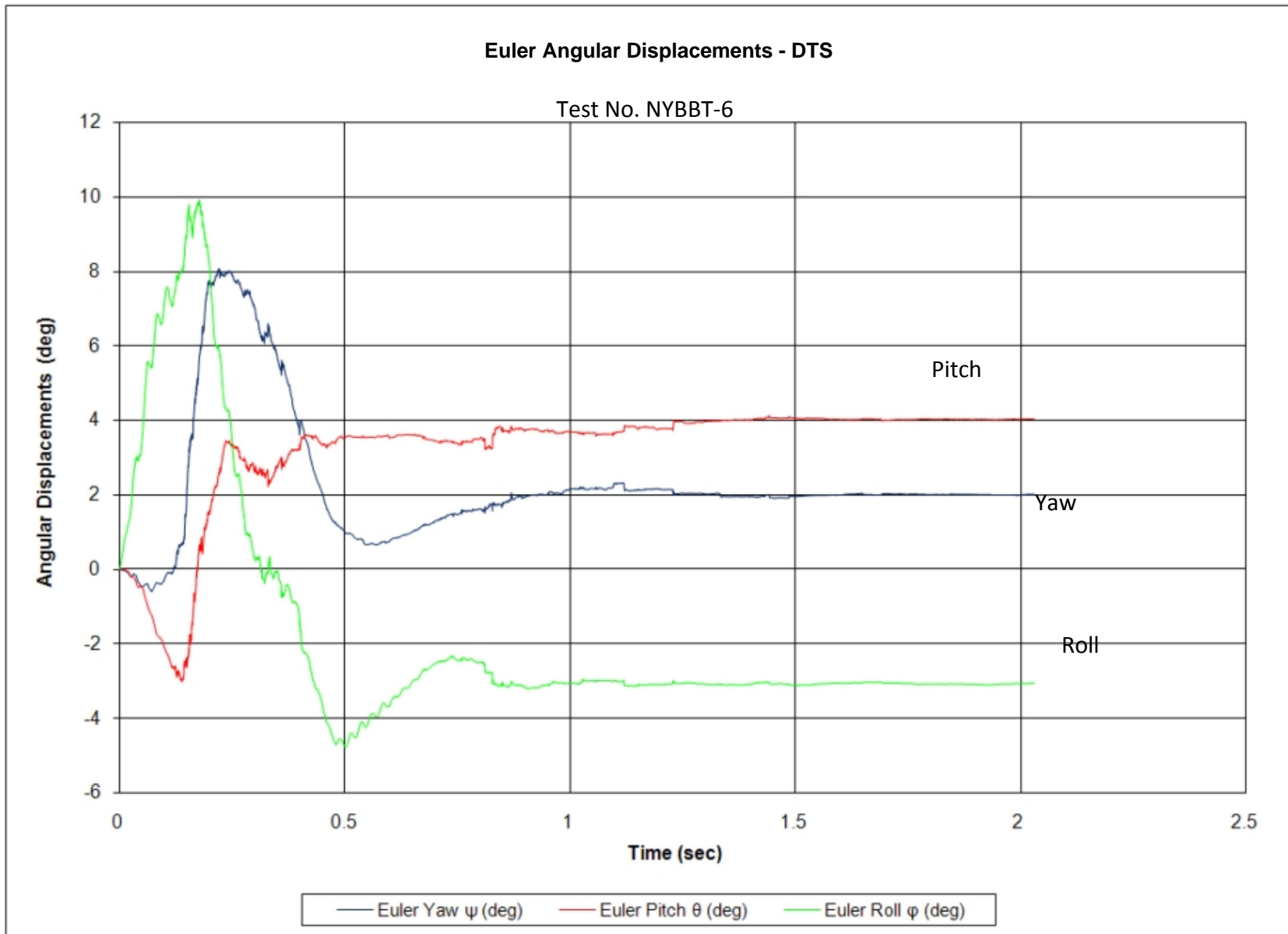


Figure Q-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-6

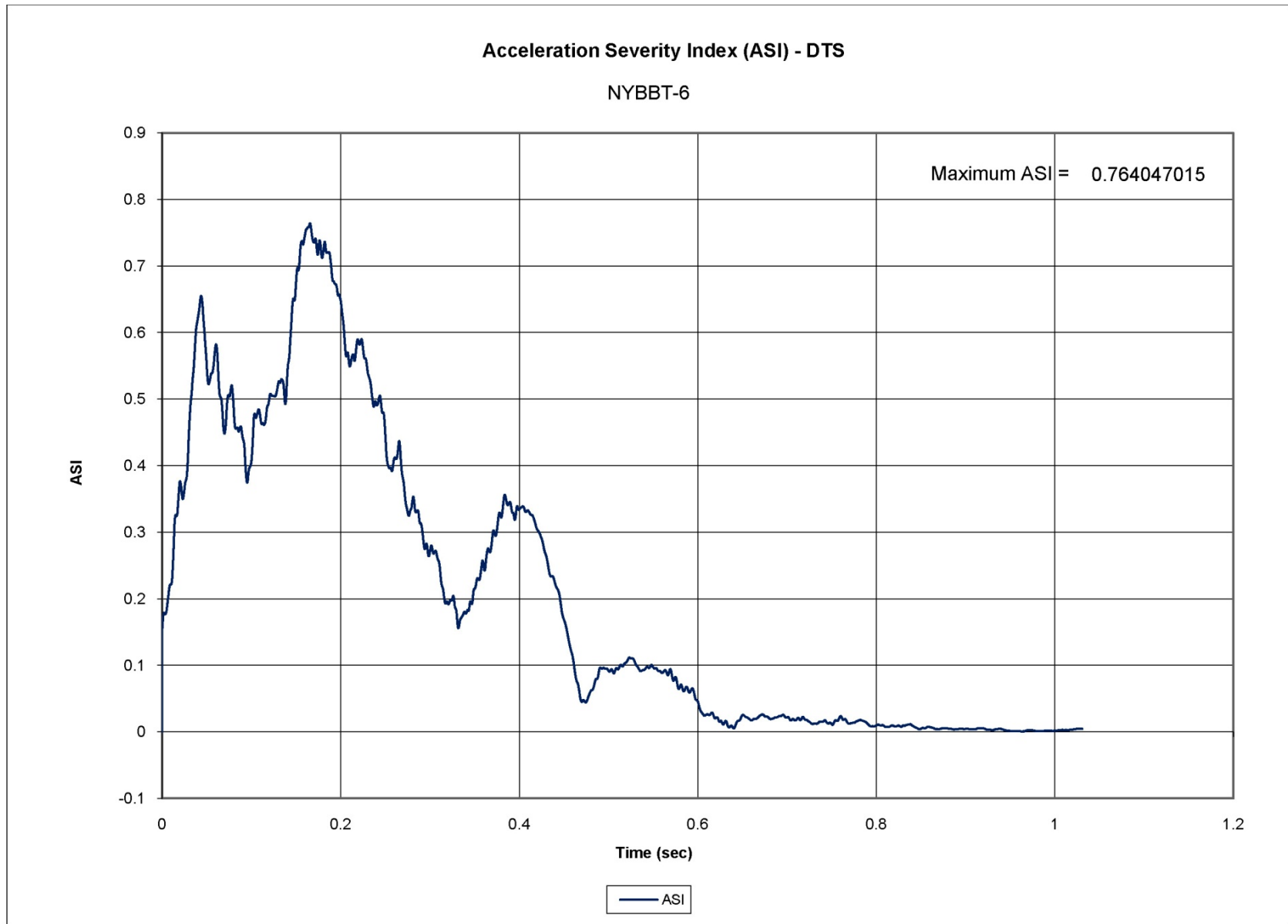


Figure Q-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-6



**APPENDIX R Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-7**

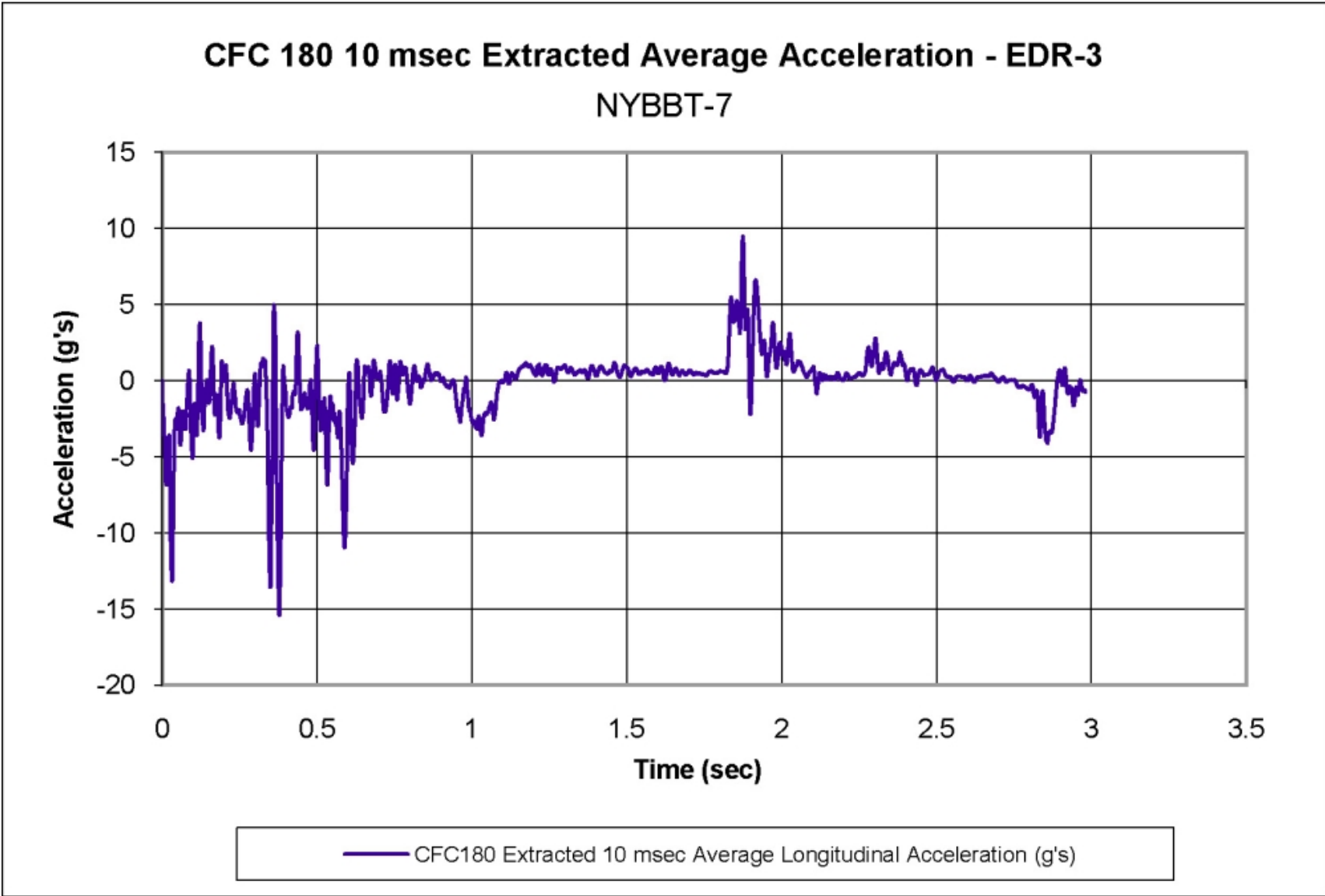


Figure R-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-7

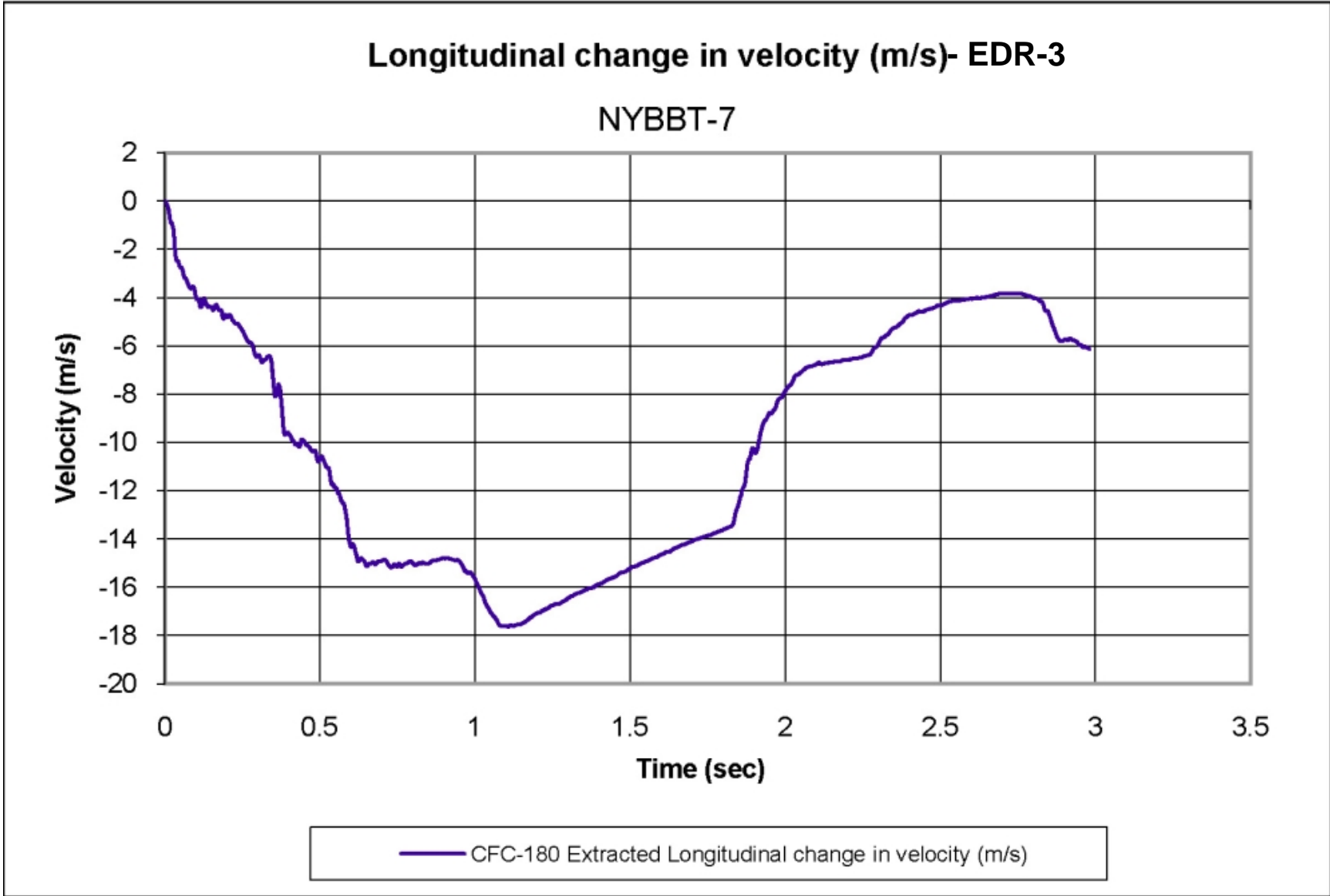


Figure R-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-7

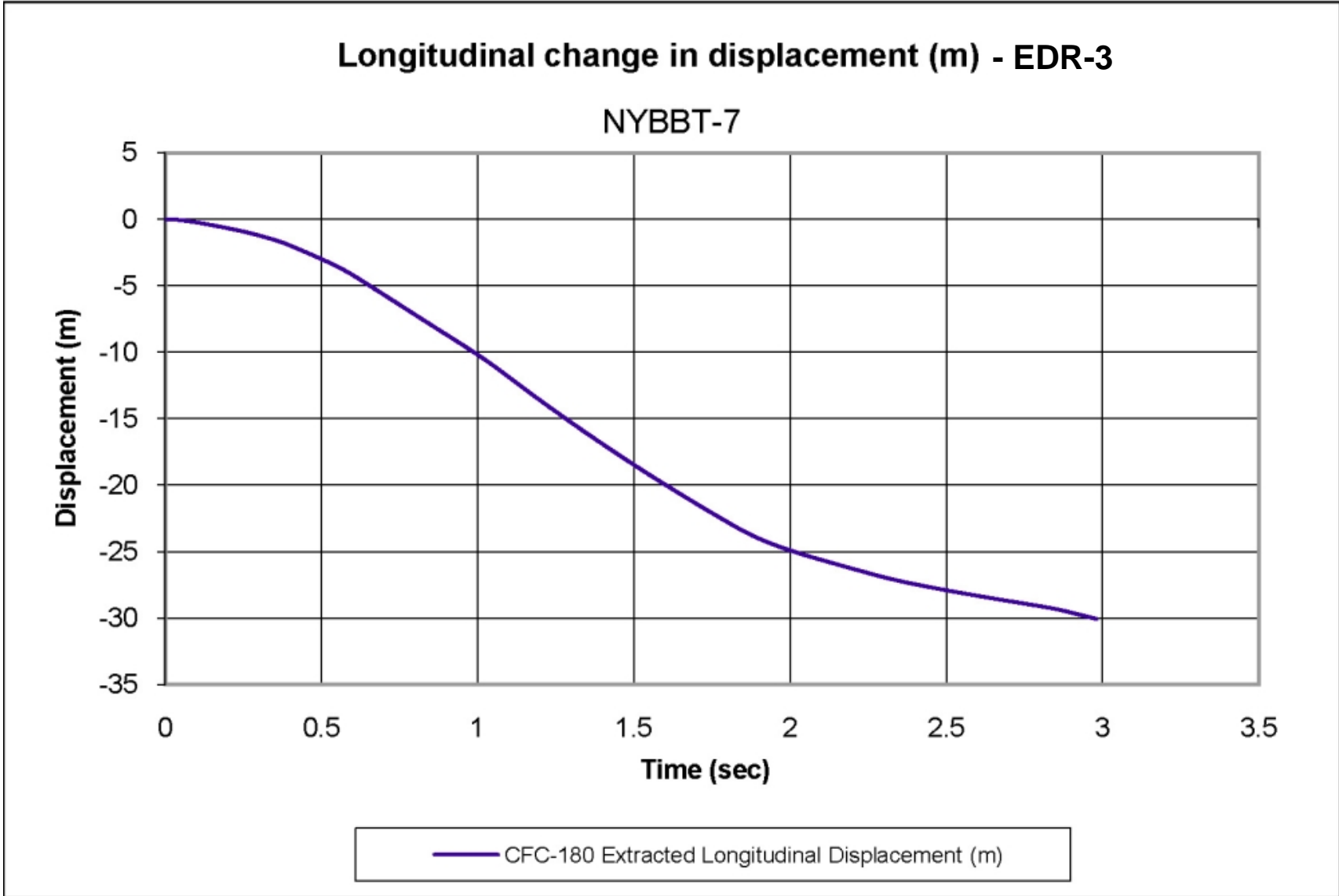


Figure R-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-7

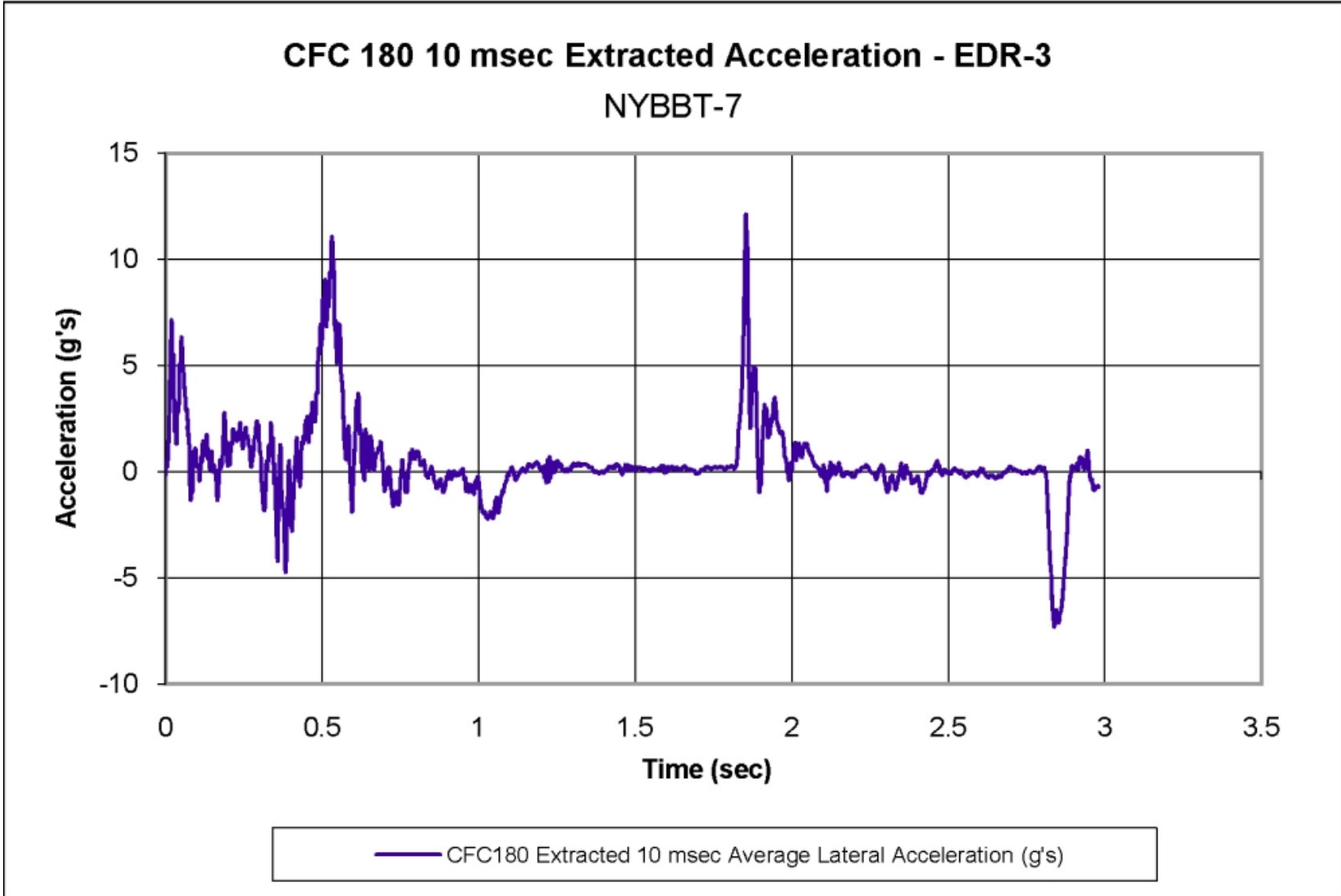


Figure R-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-7

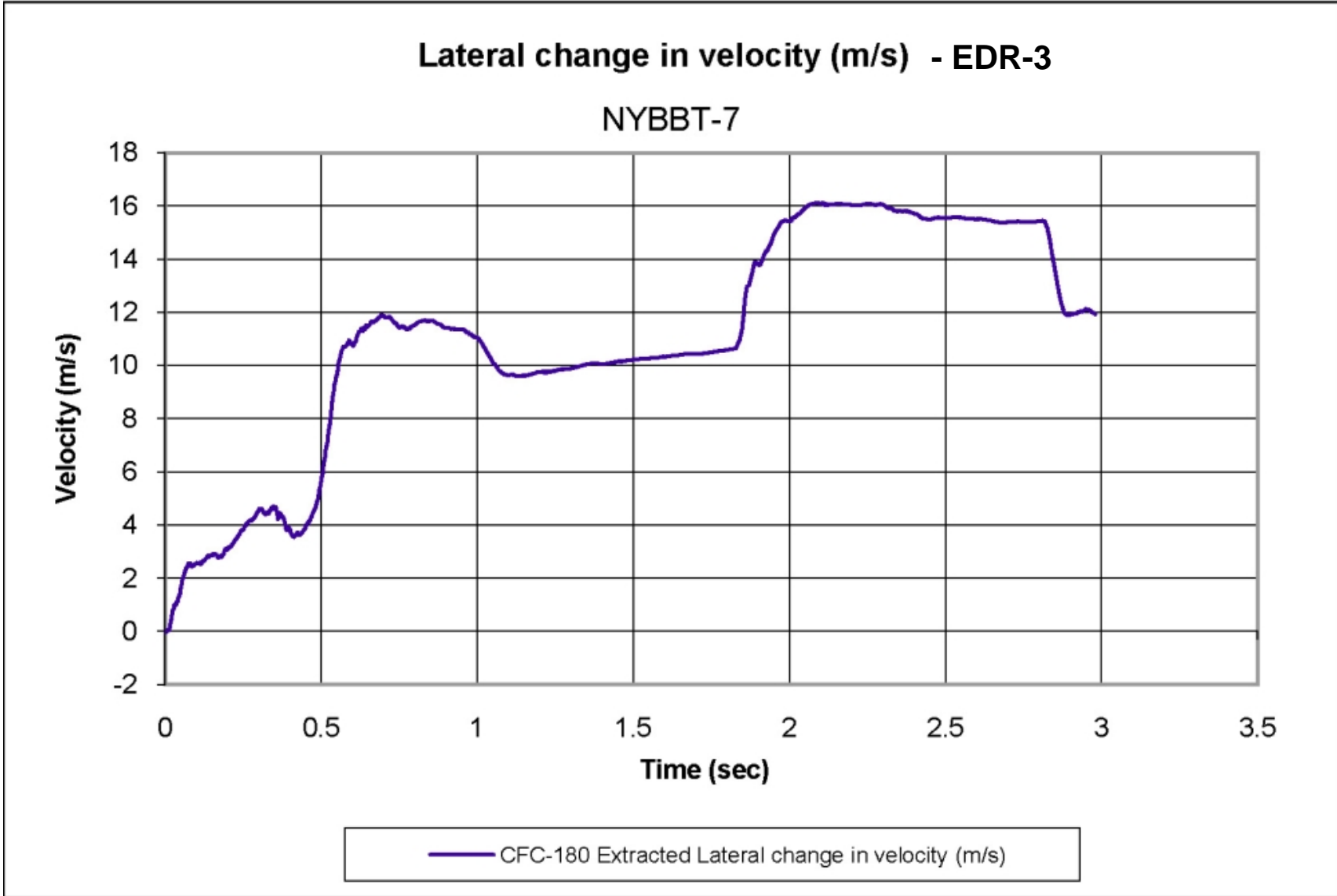


Figure R-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-7

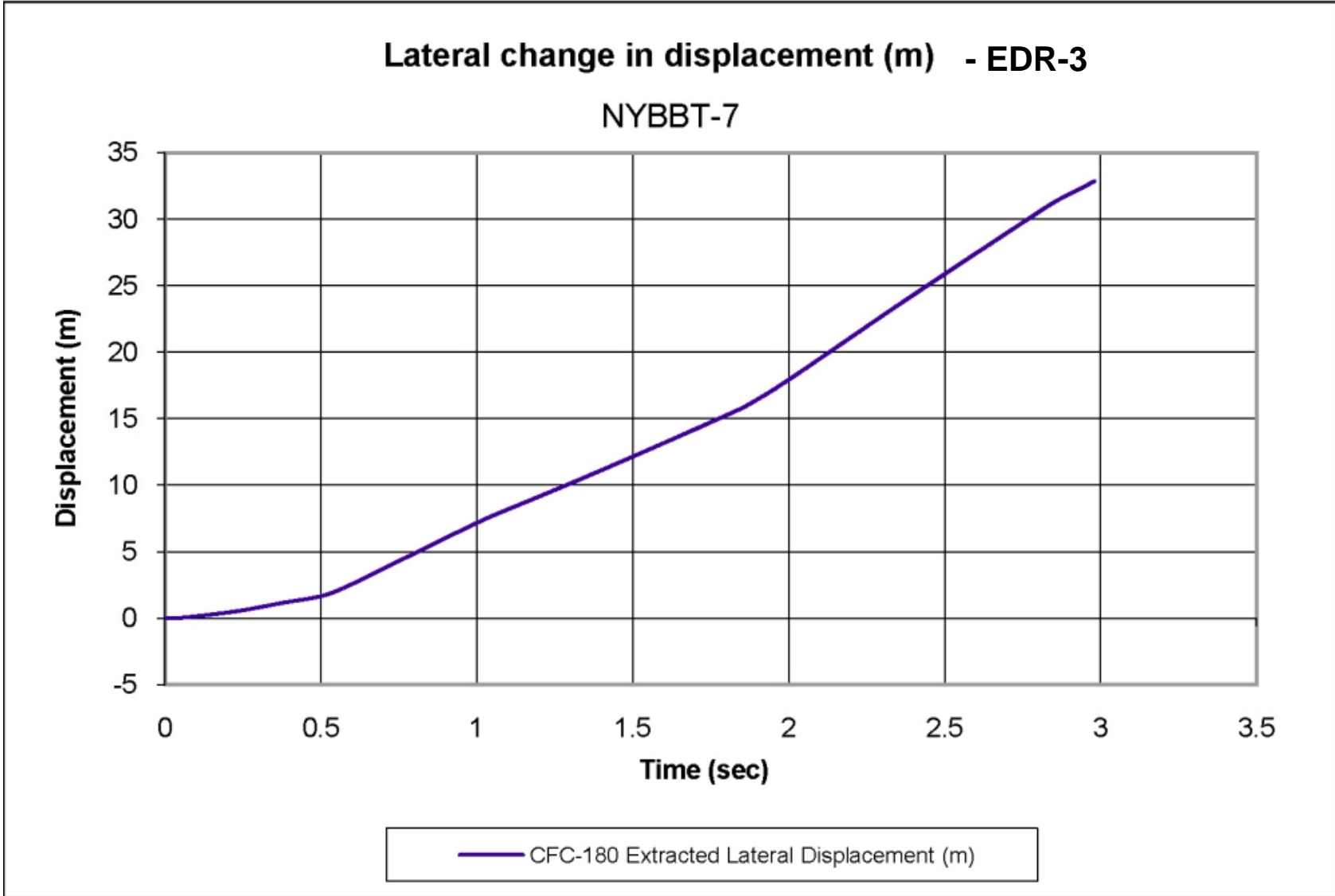


Figure R-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-7

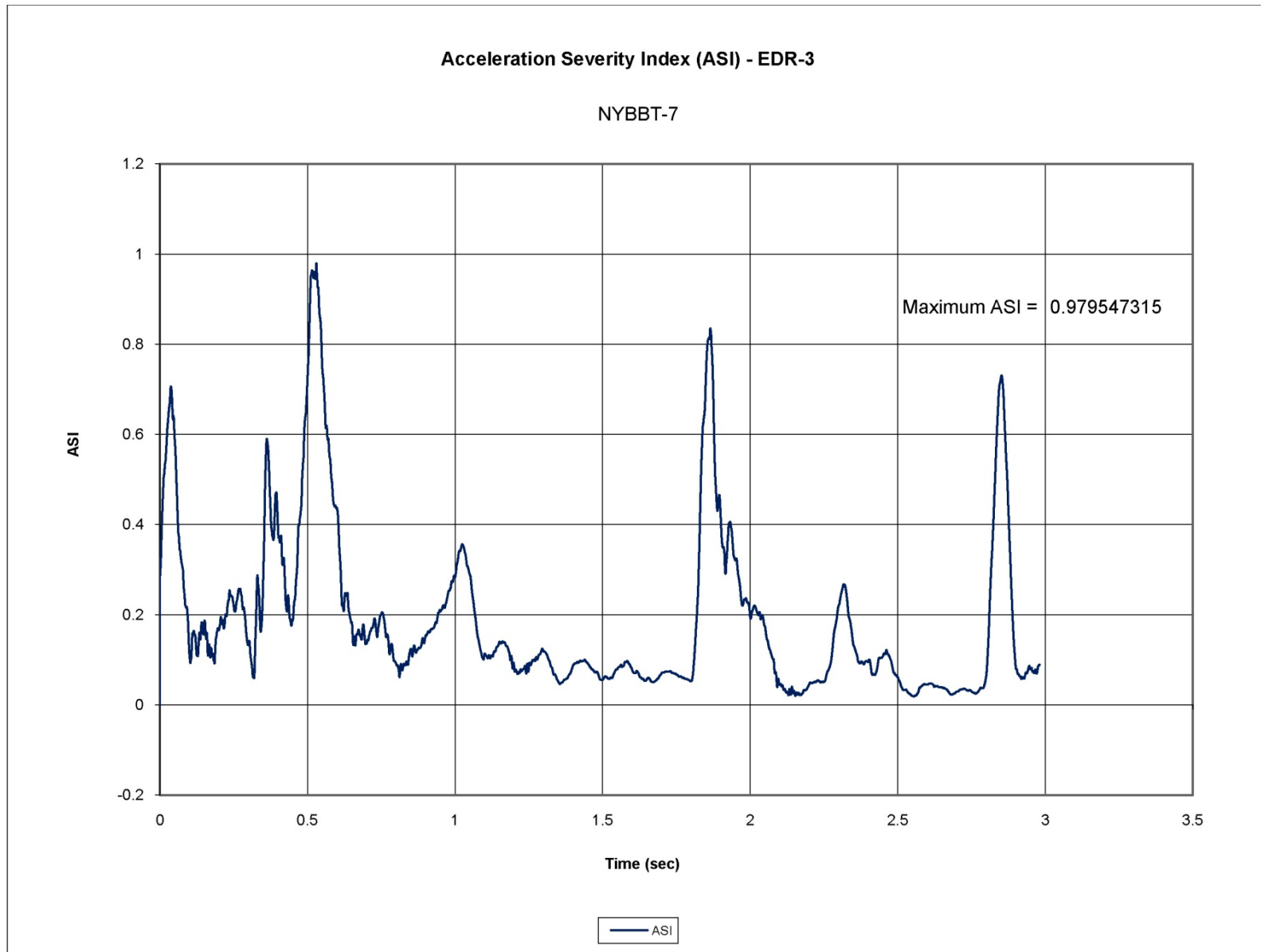


Figure R-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-7



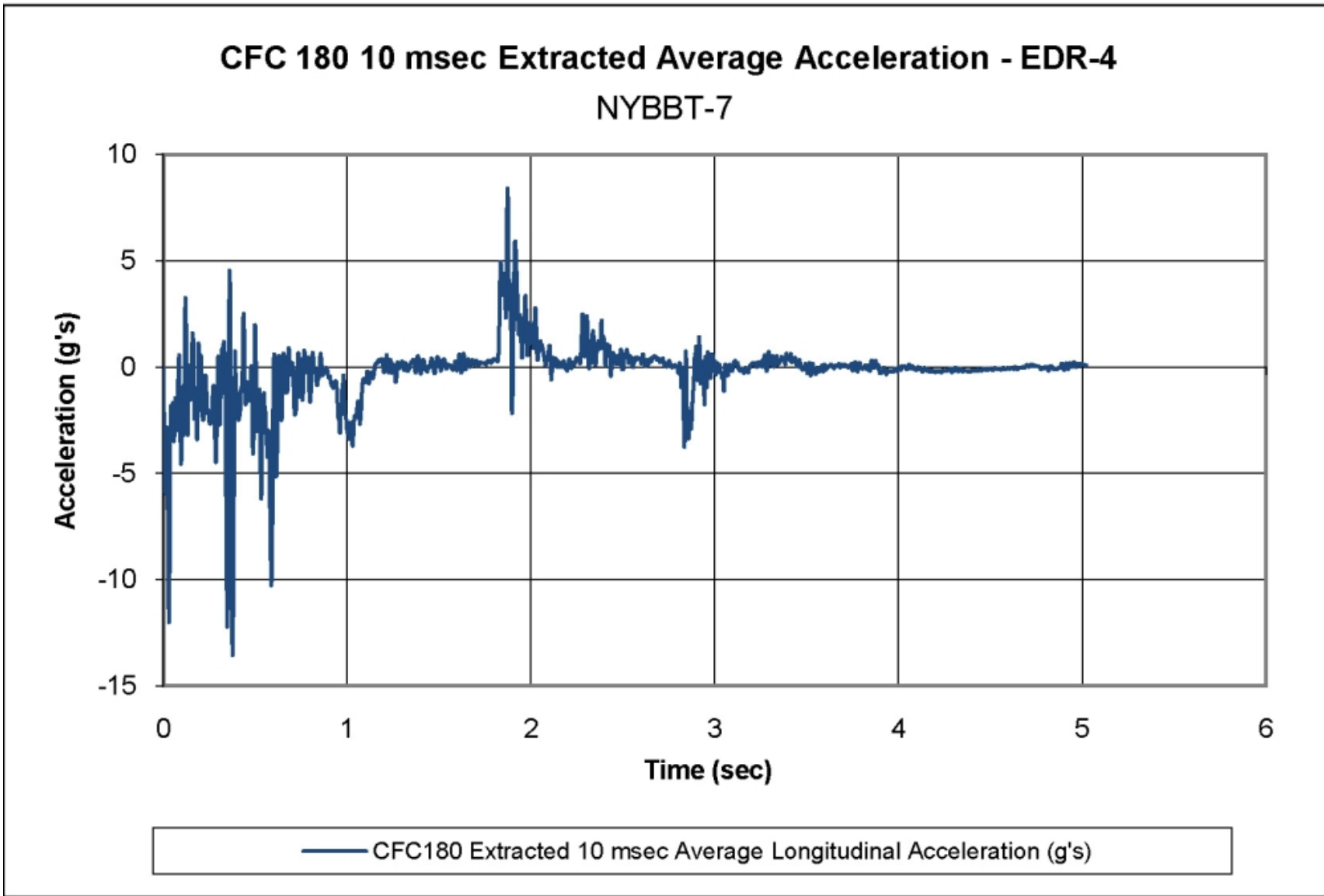


Figure R-8. Graph of Longitudinal Occupant Deceleration (EDR-4), Test No. NYBBT-7

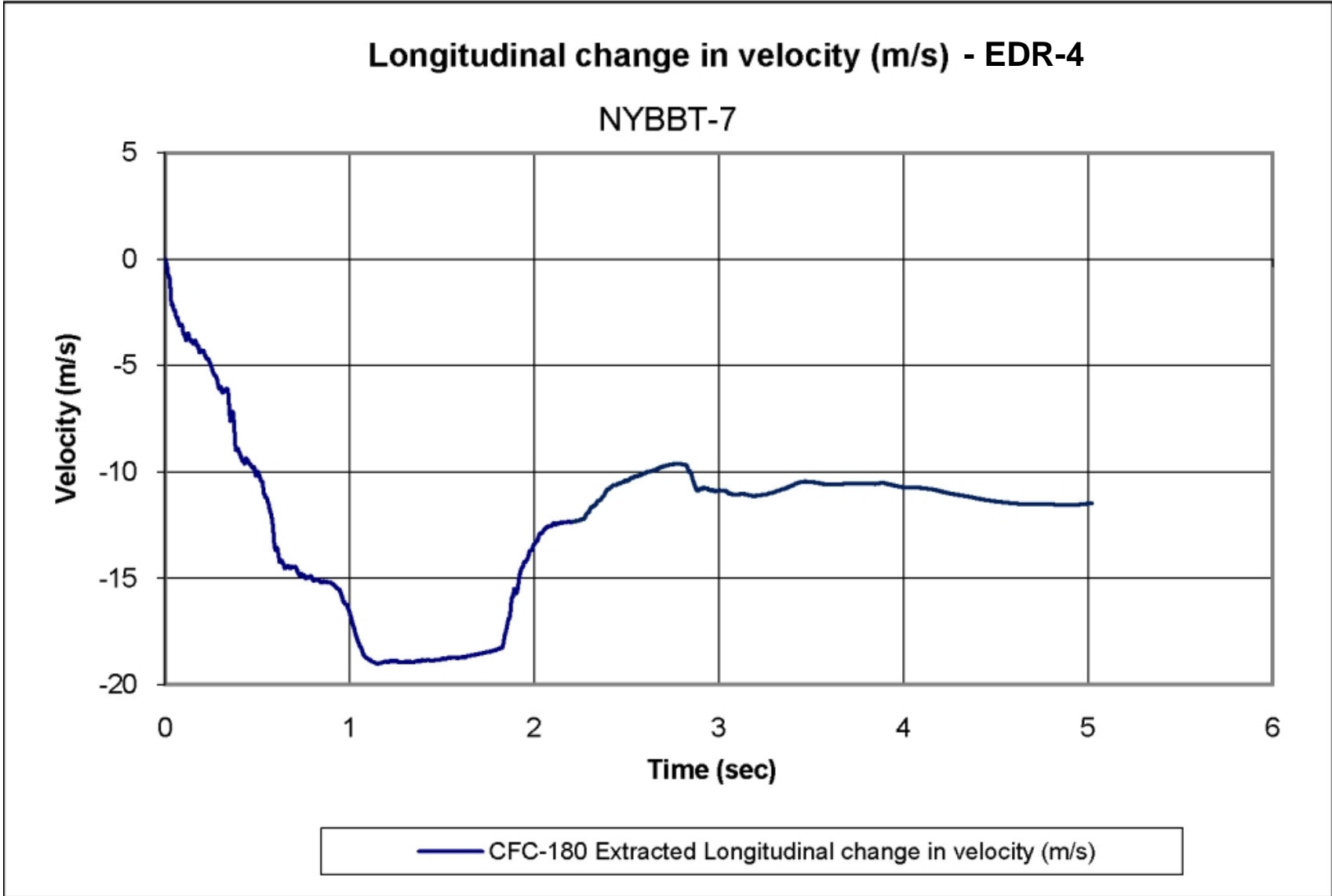


Figure R-9. Graph of Longitudinal Occupant Impact Velocity (EDR-4), Test No. NYBBT-7

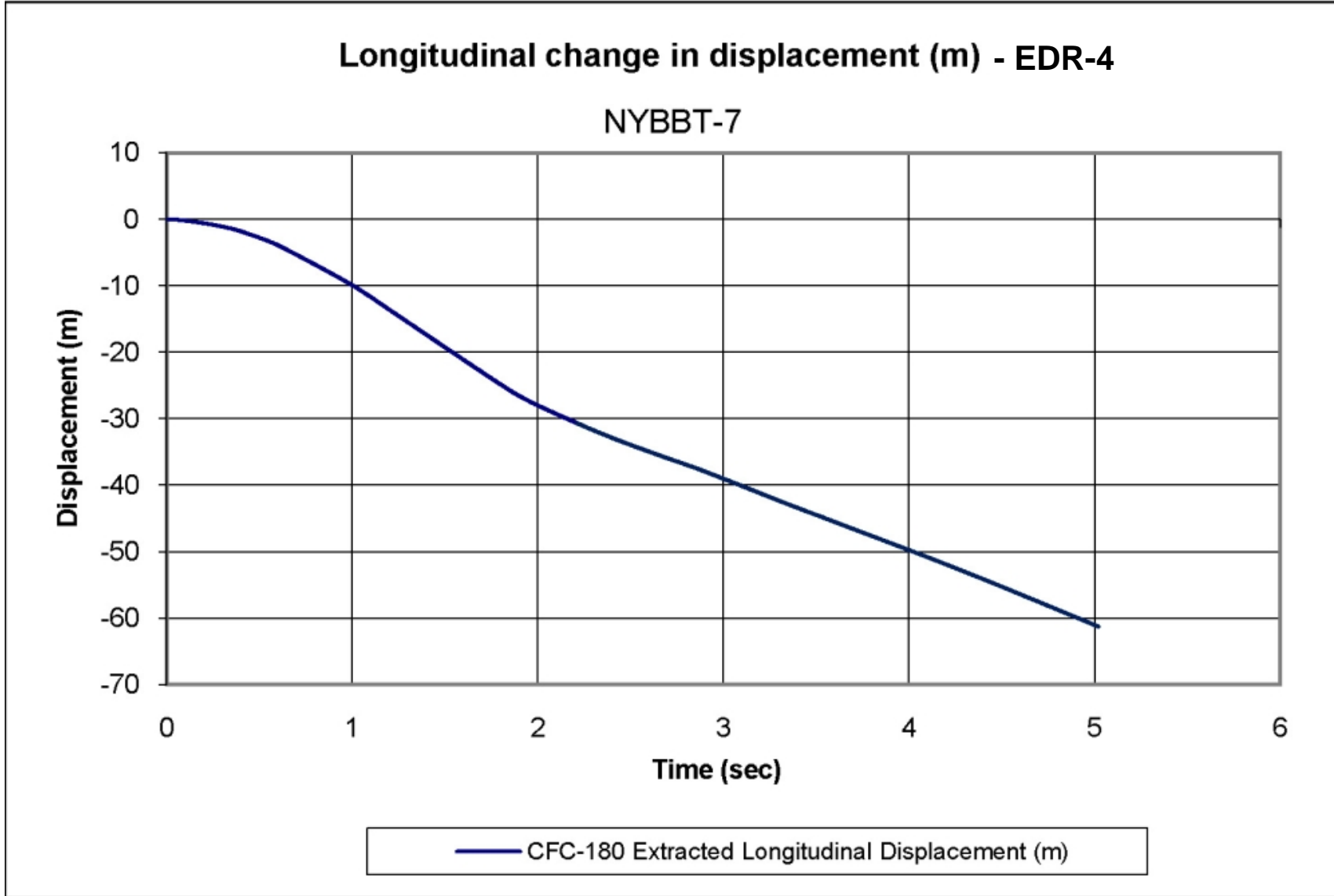


Figure R-10. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-7

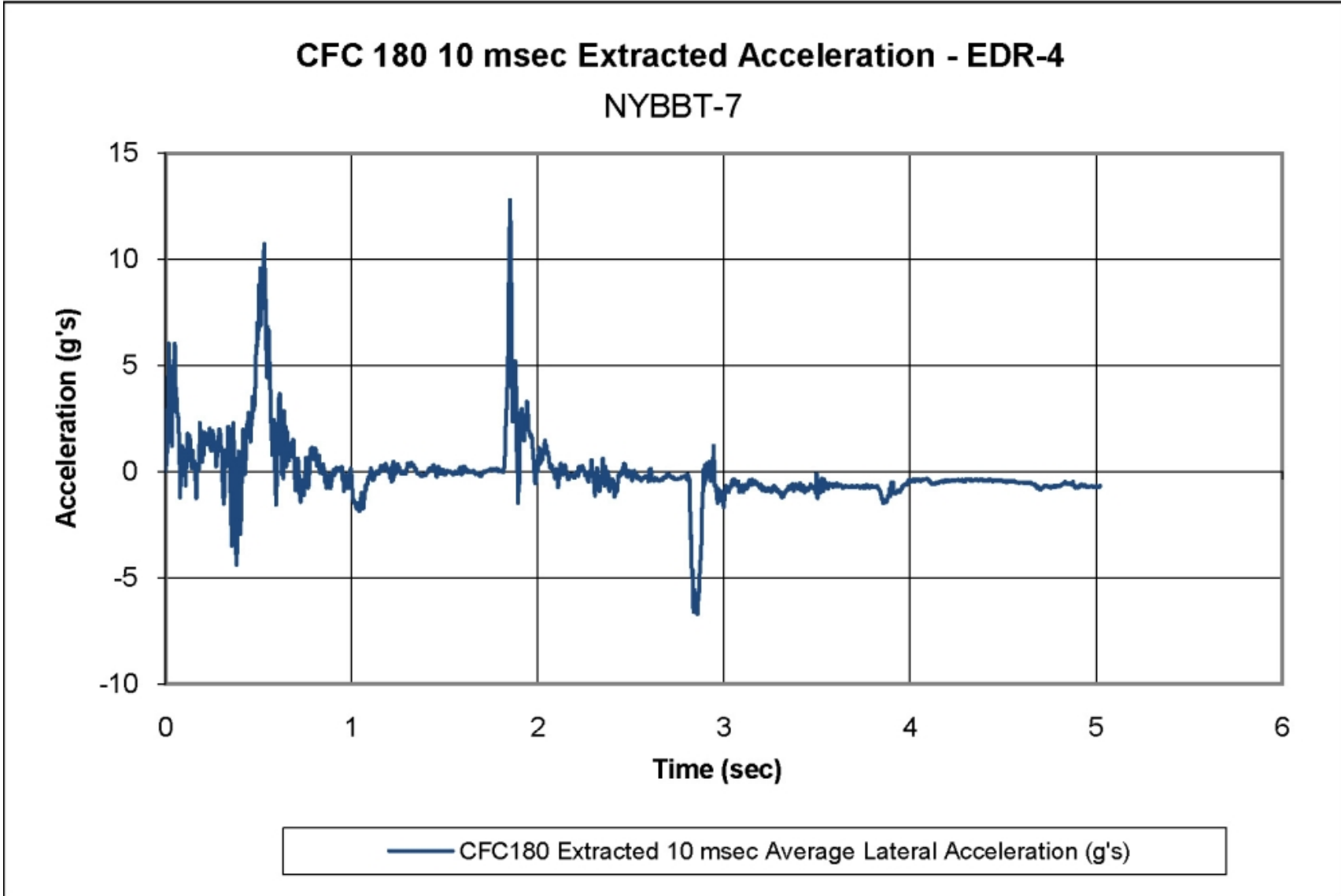


Figure R-11. Graph of Lateral Occupant Deceleration (EDR-4), Test No. NYBBT-7

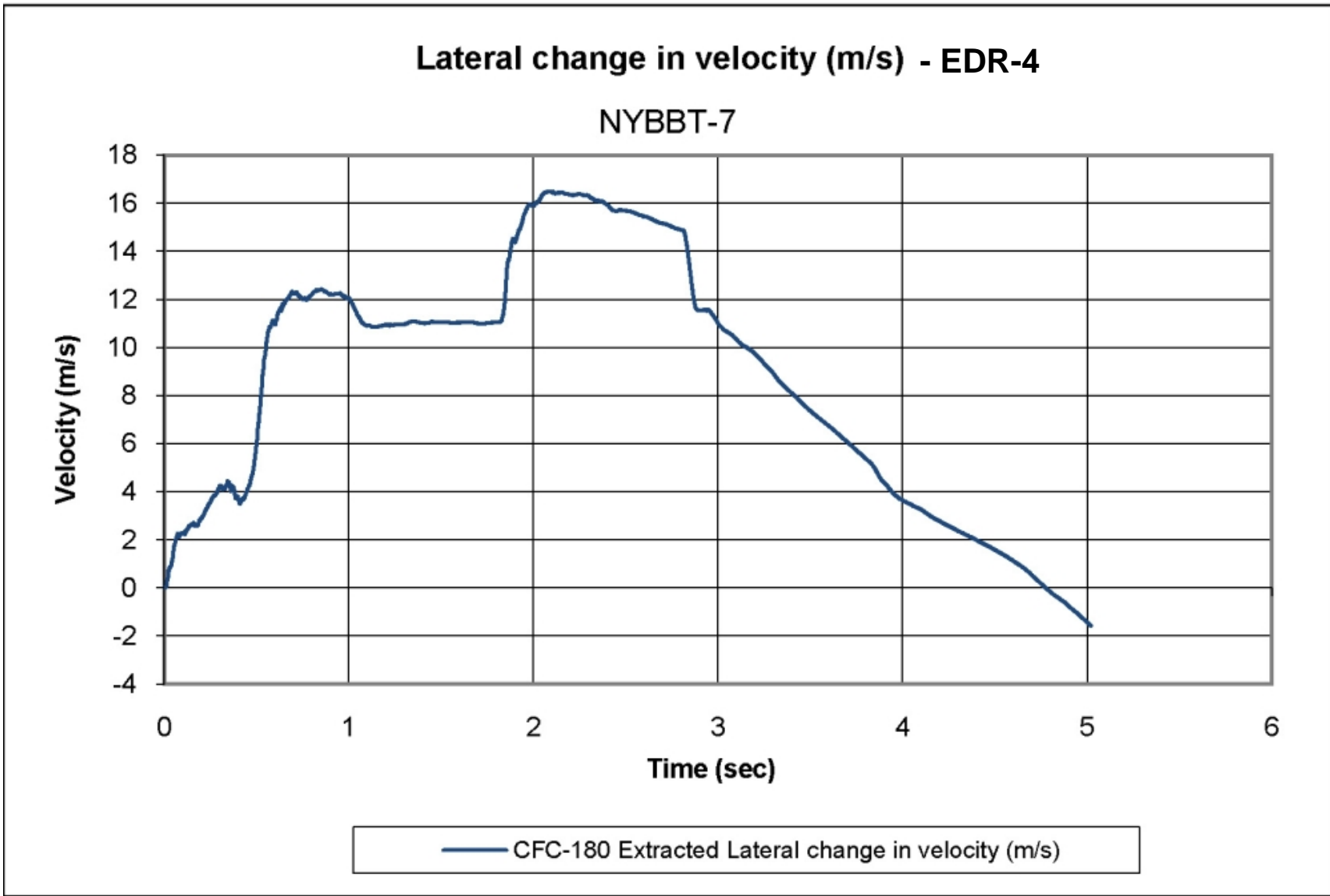


Figure R-12. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-7

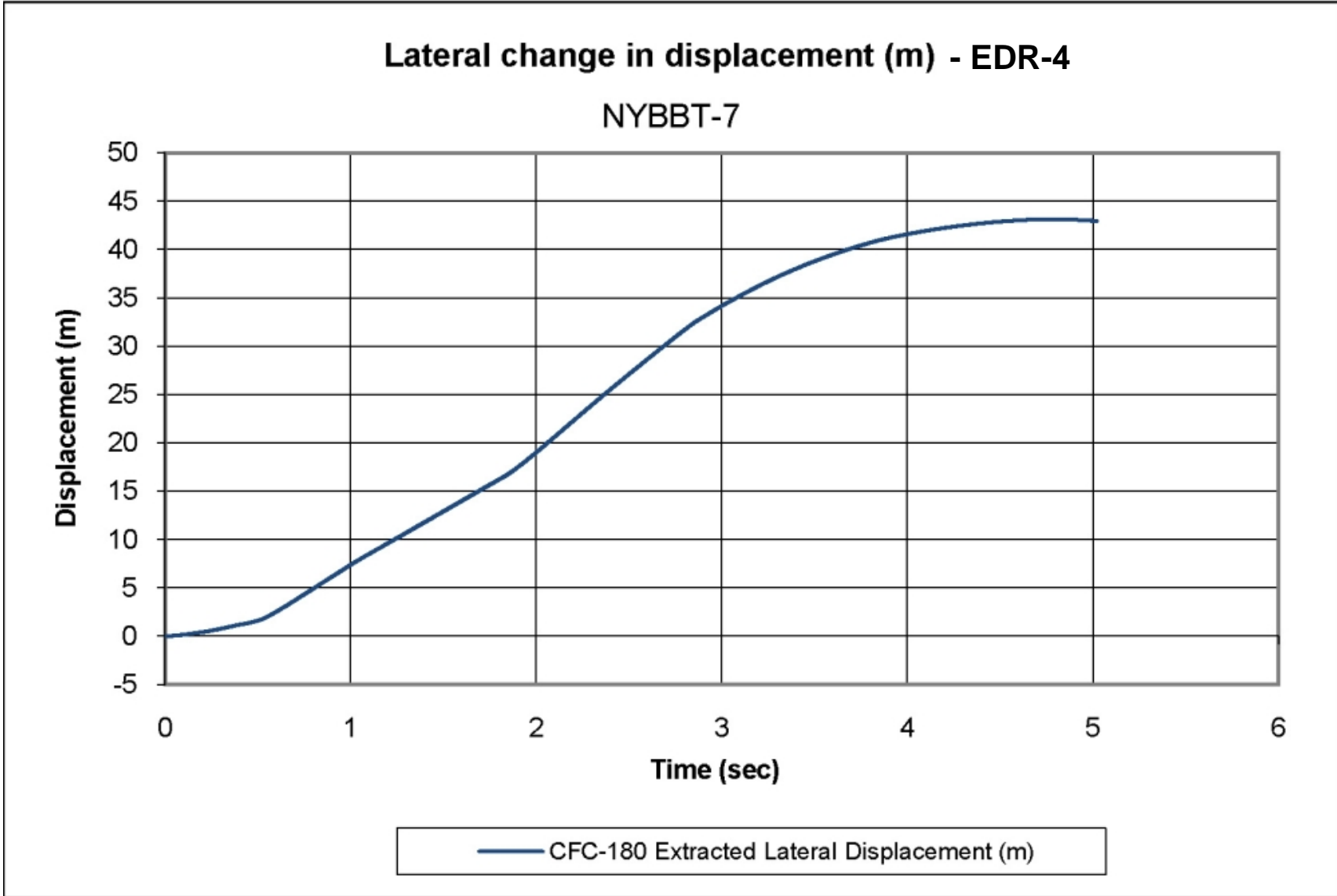


Figure R-13. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-7

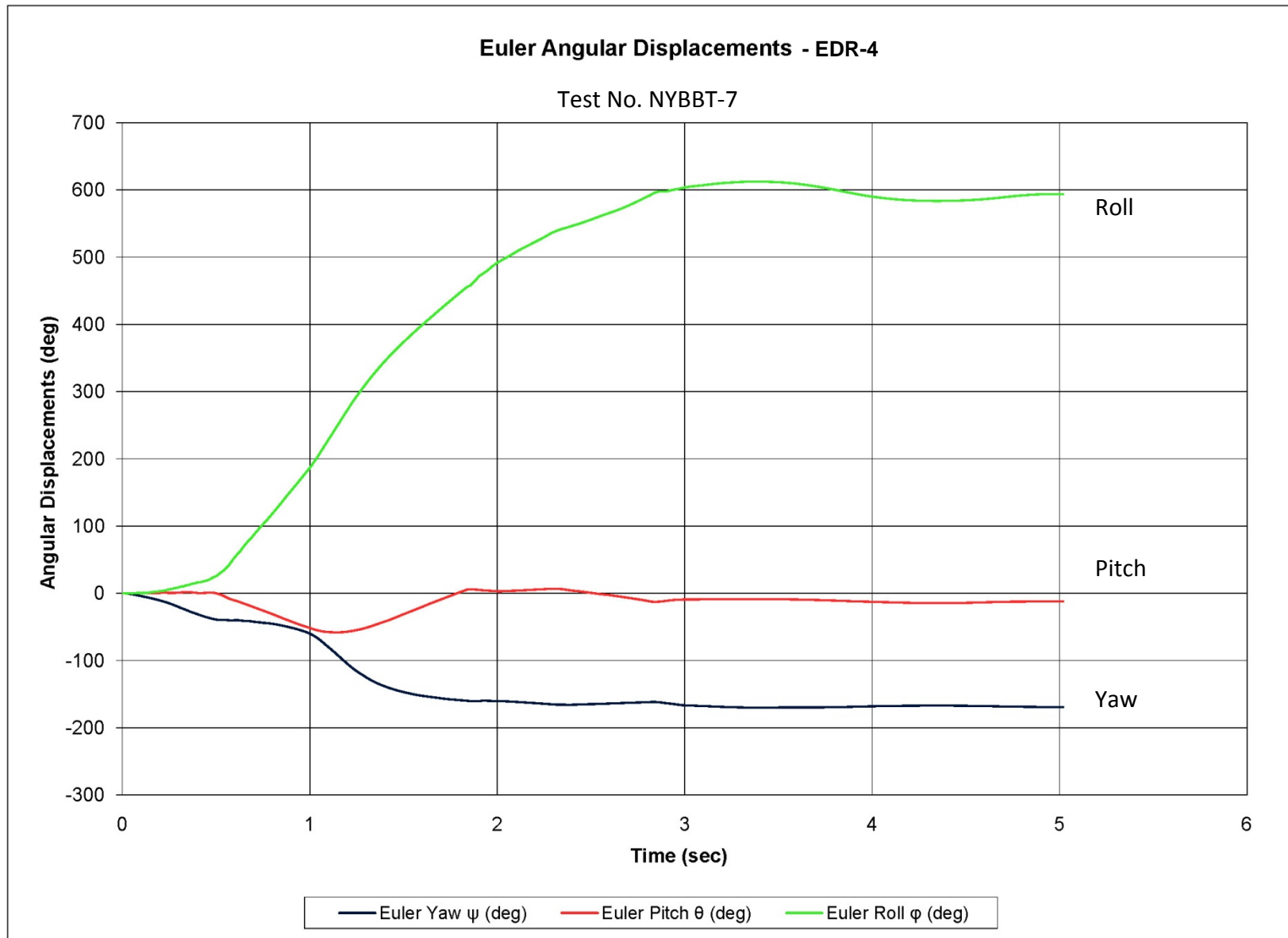


Figure R-14. Graph of Roll, Pitch, and Yaw Angular Displacement (EDR-4), Test No. NYBBT-7

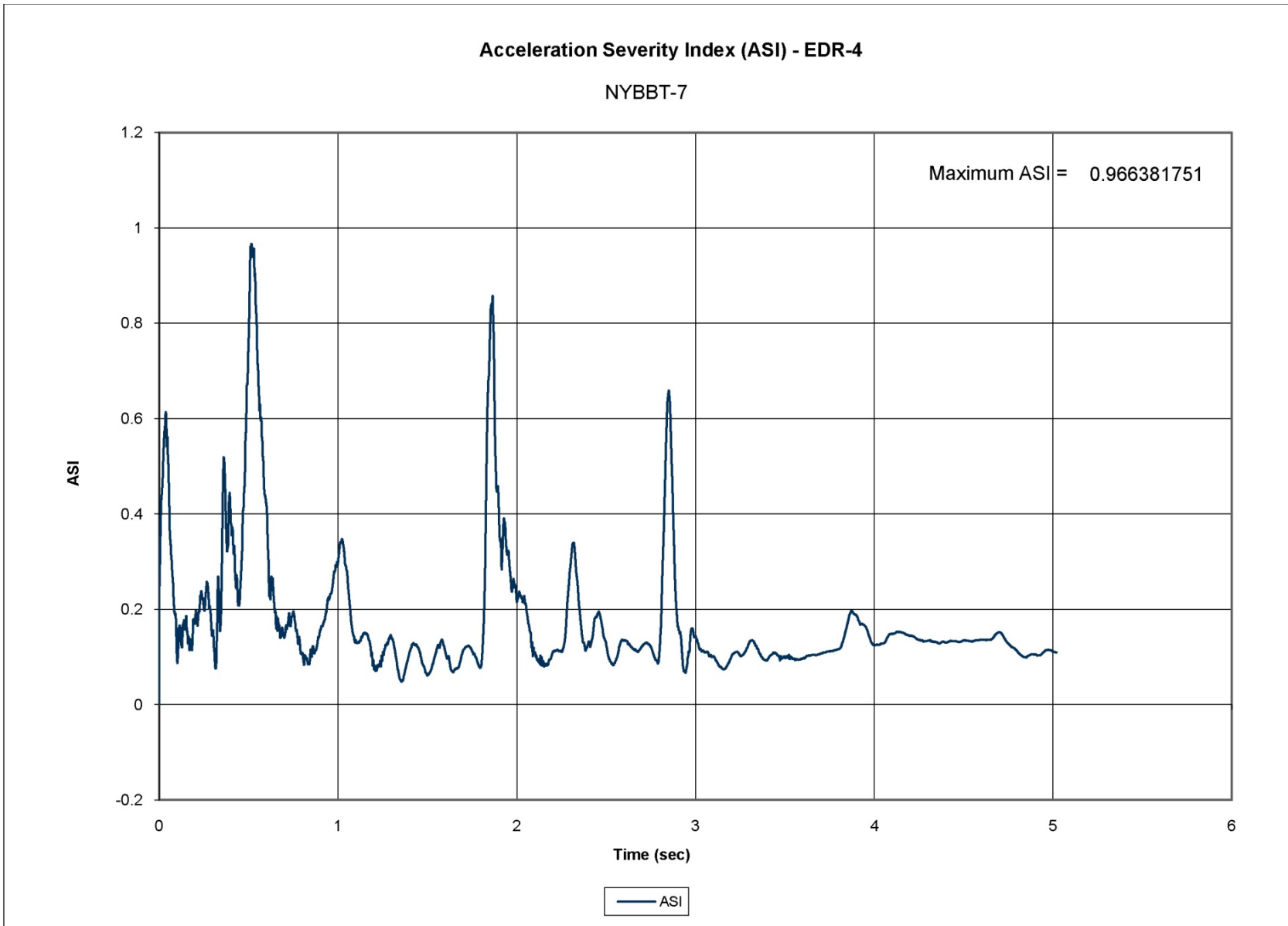


Figure R-15. Graph of Acceleration Severity Index (EDR-4), Test No. NYBBT-7



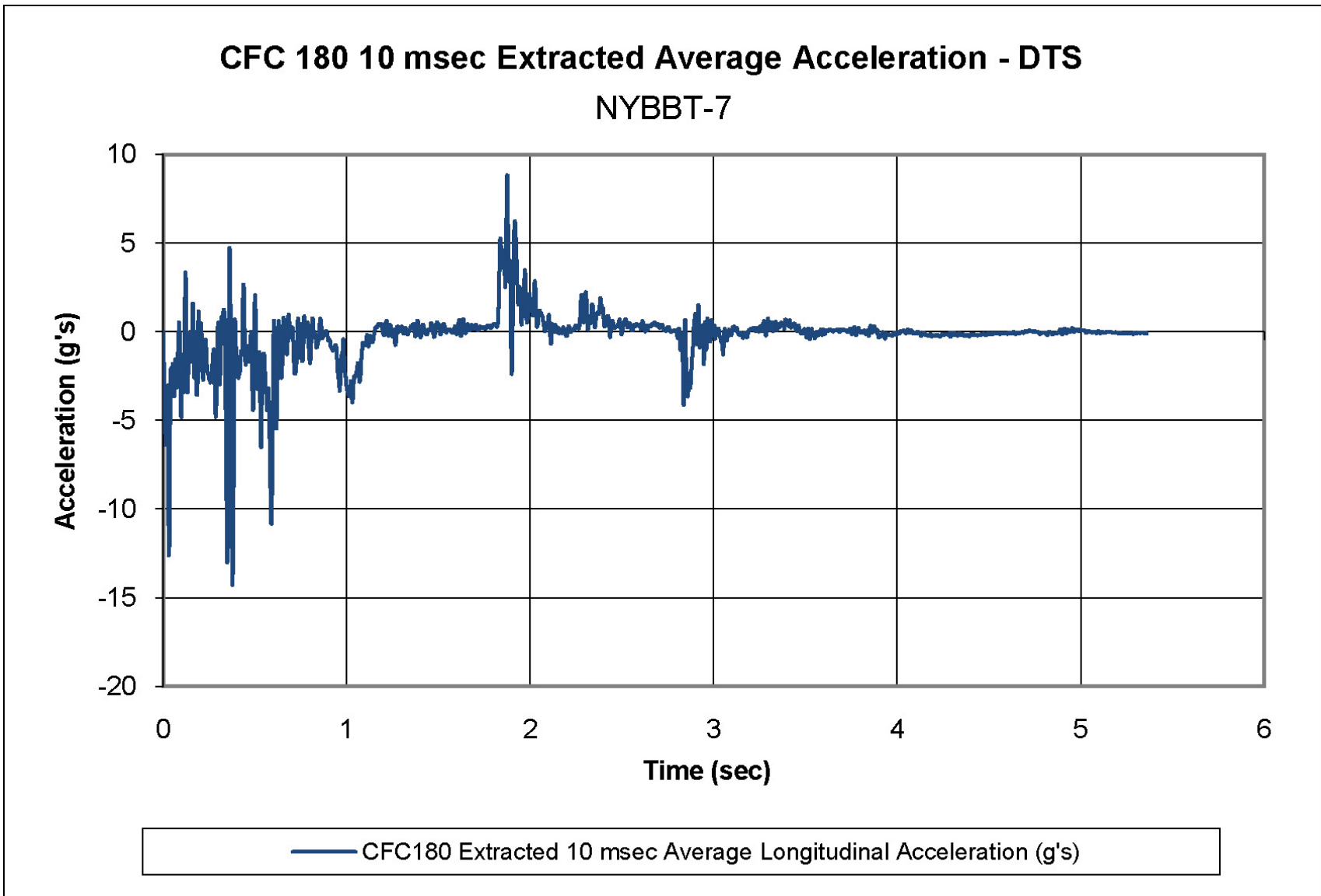


Figure R-16. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-7

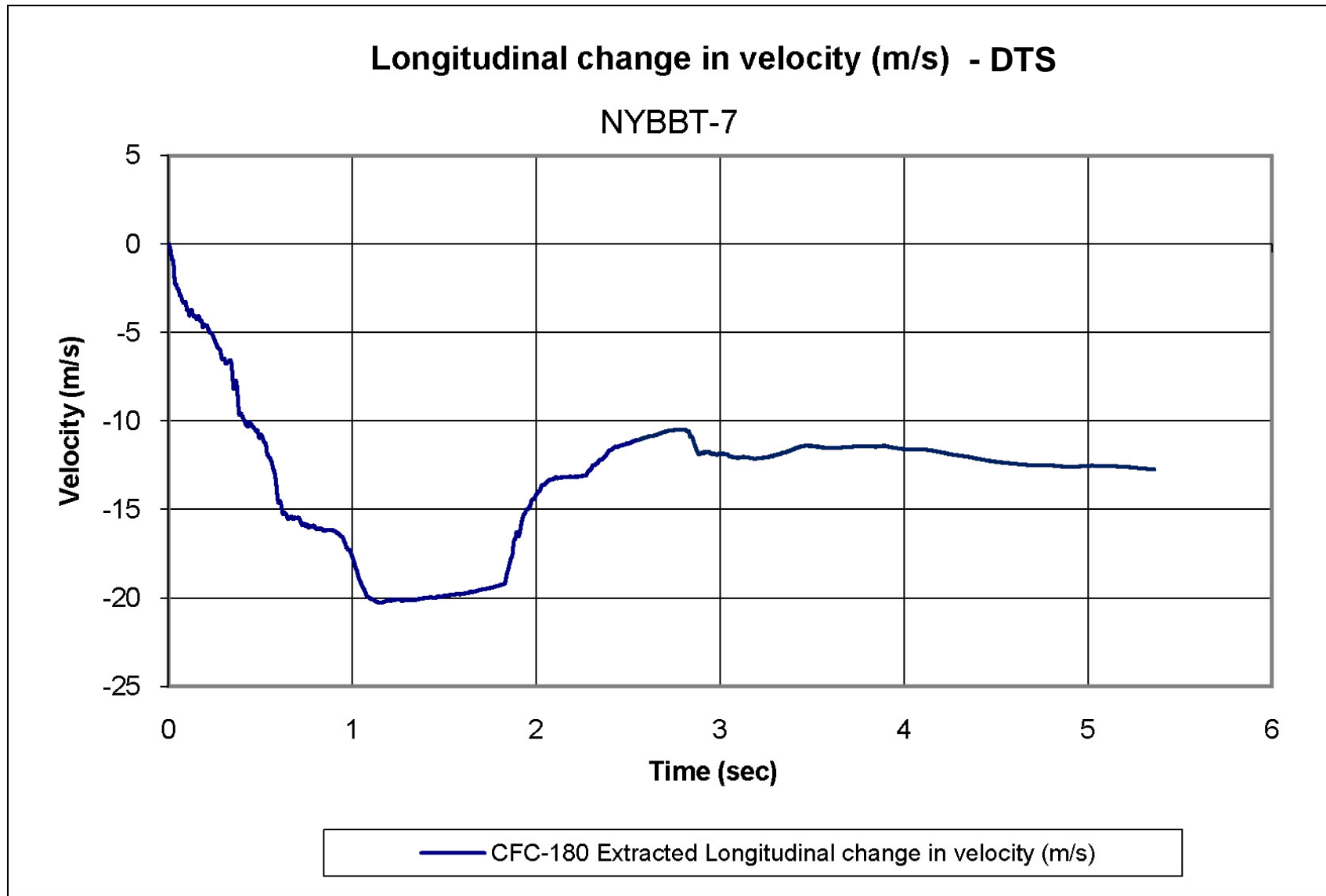


Figure R-17. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-7

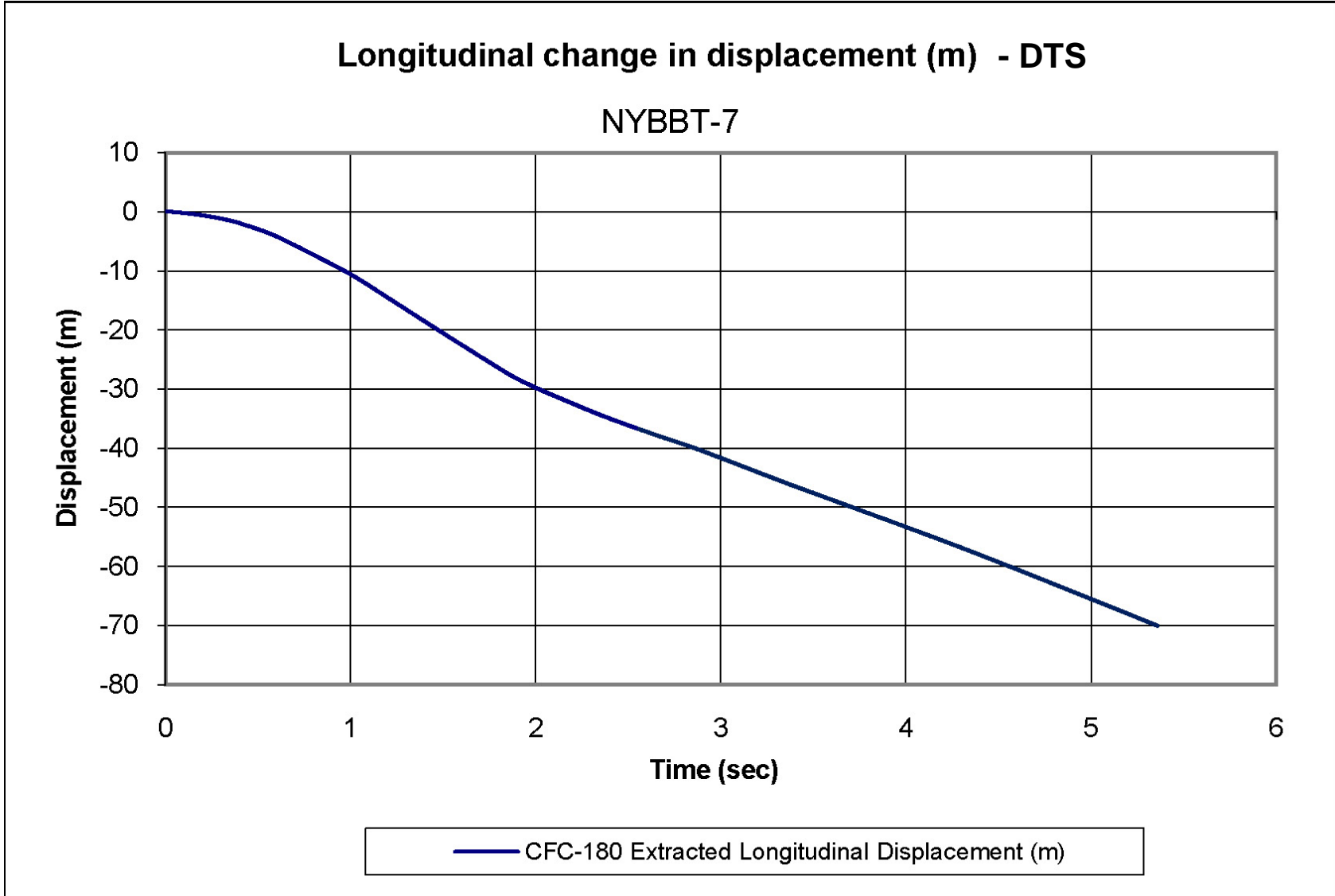


Figure R-18. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-7

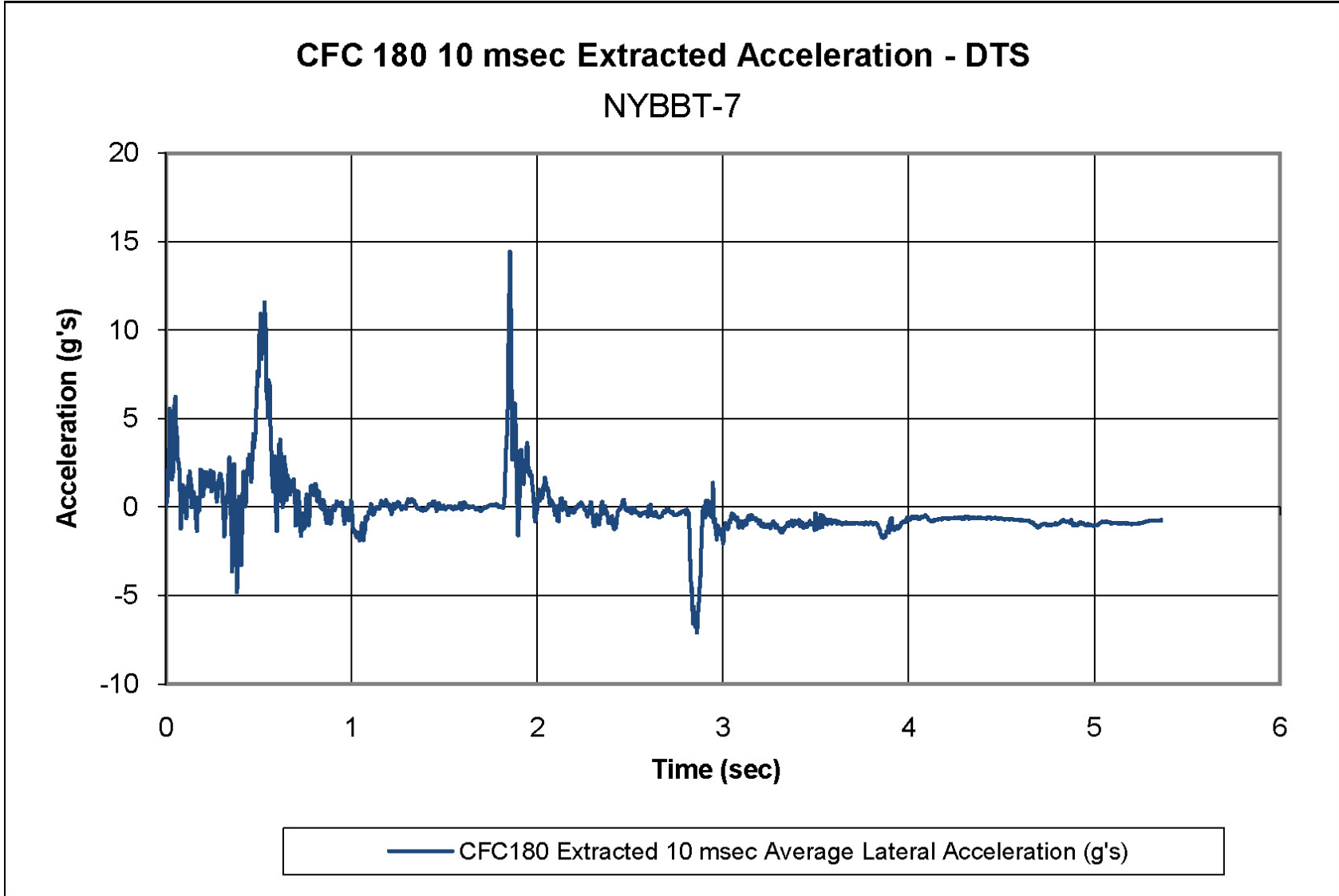


Figure R-19. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-7

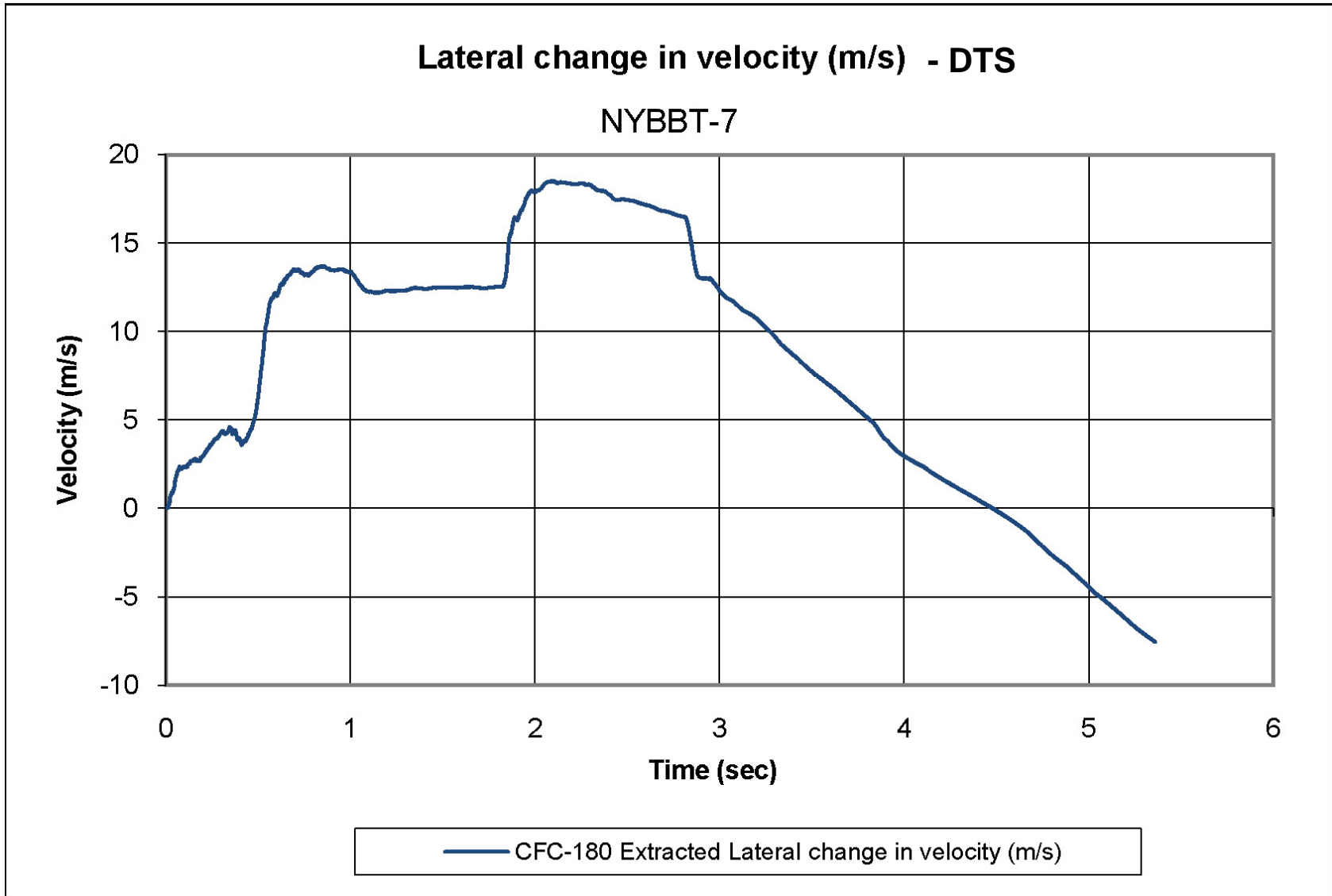


Figure R-20. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-7

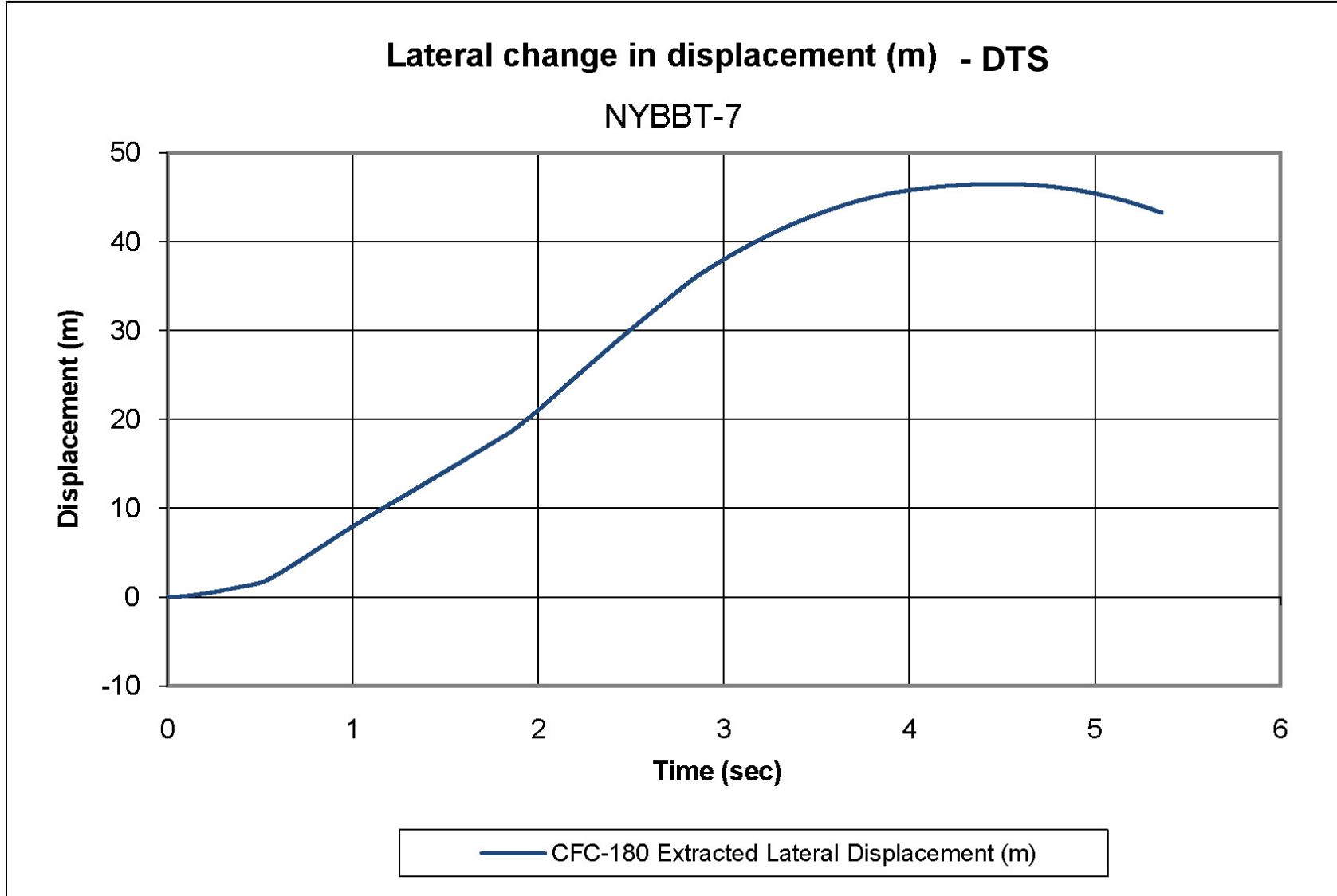


Figure R-21. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-7

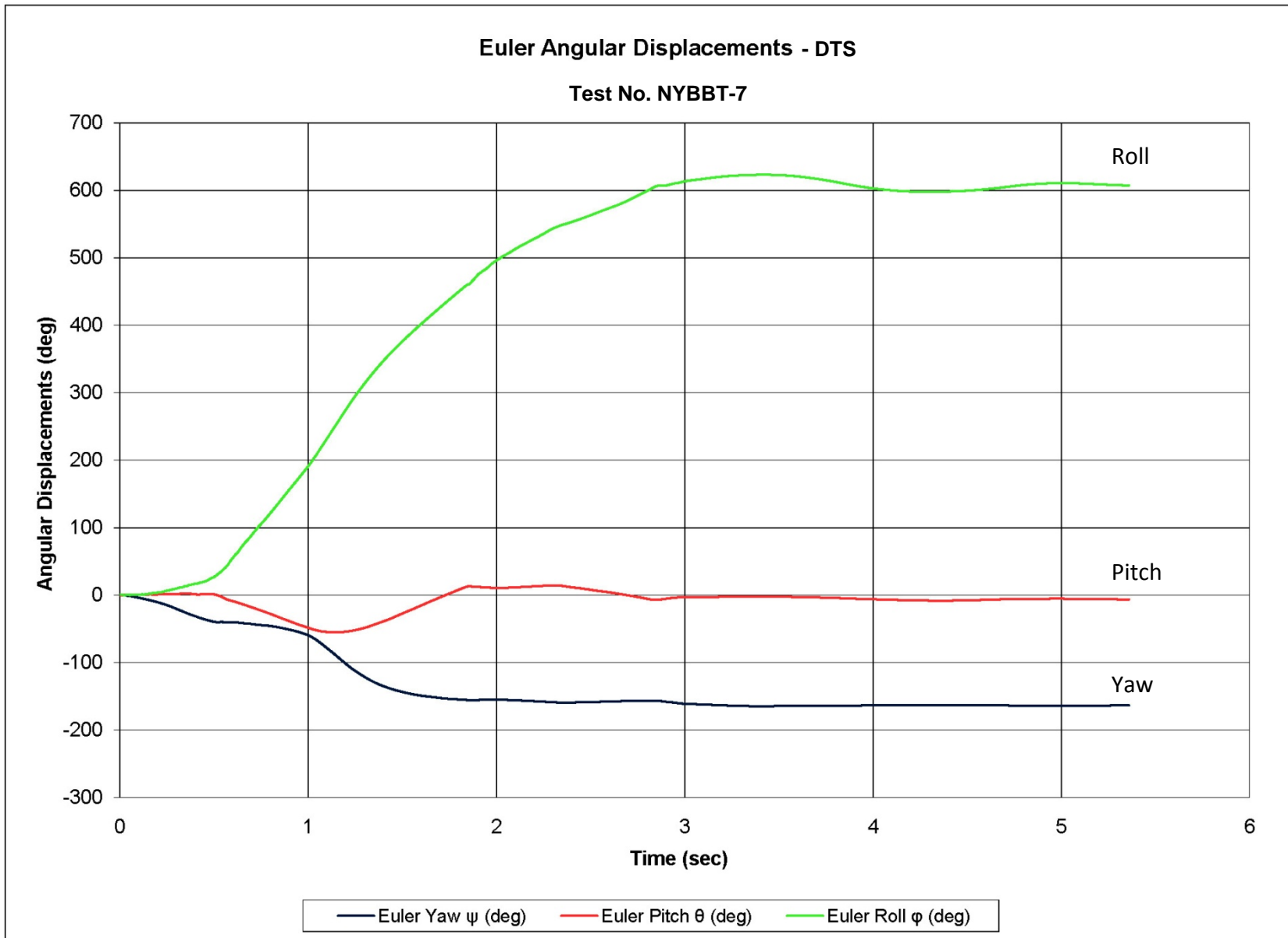


Figure R-22. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-7

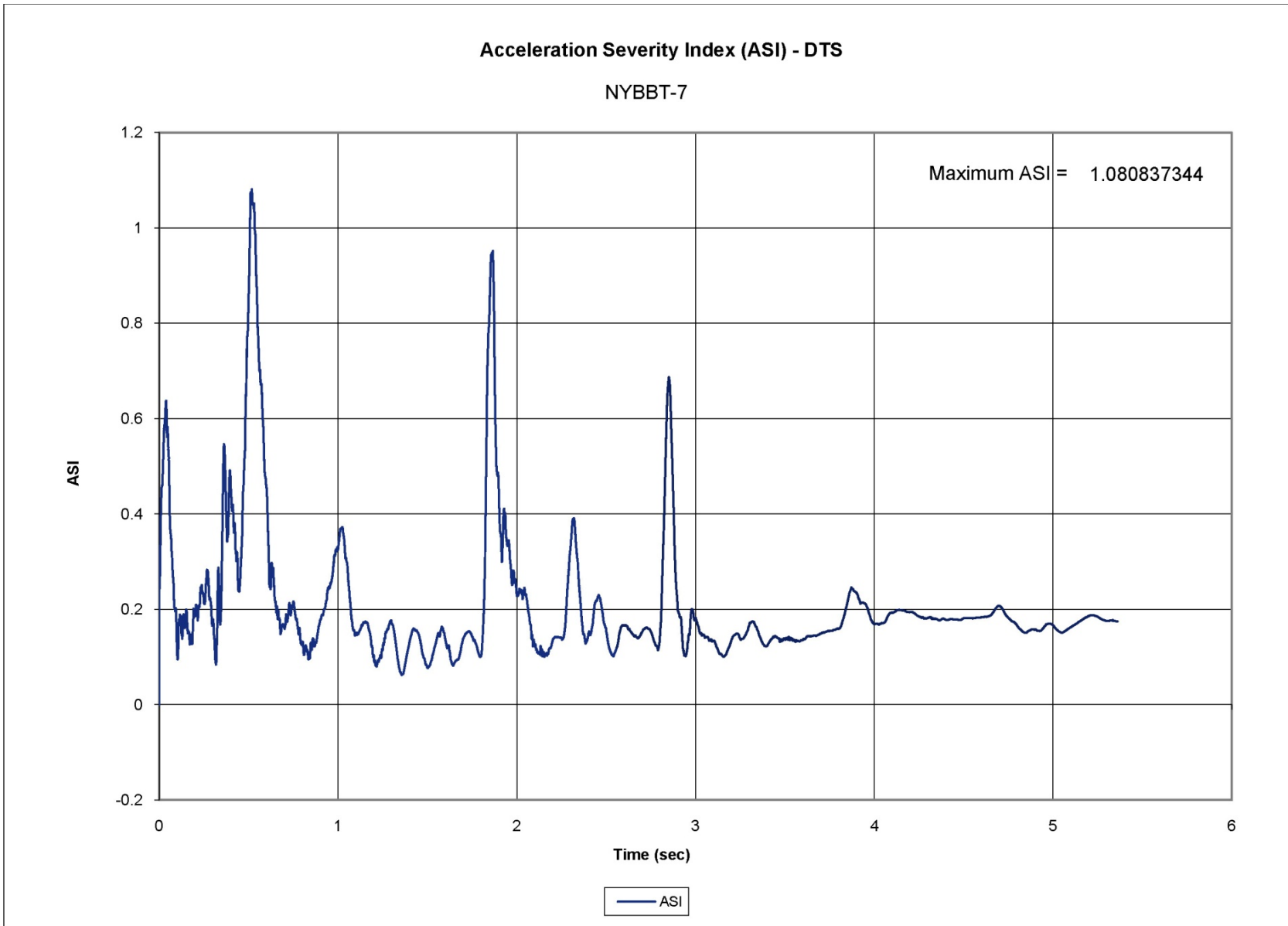


Figure R-23. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-7



**APPENDIX S Modified Type IIA Box Beam Terminal System Details -English Units, Test  
No. NYBBT-8**

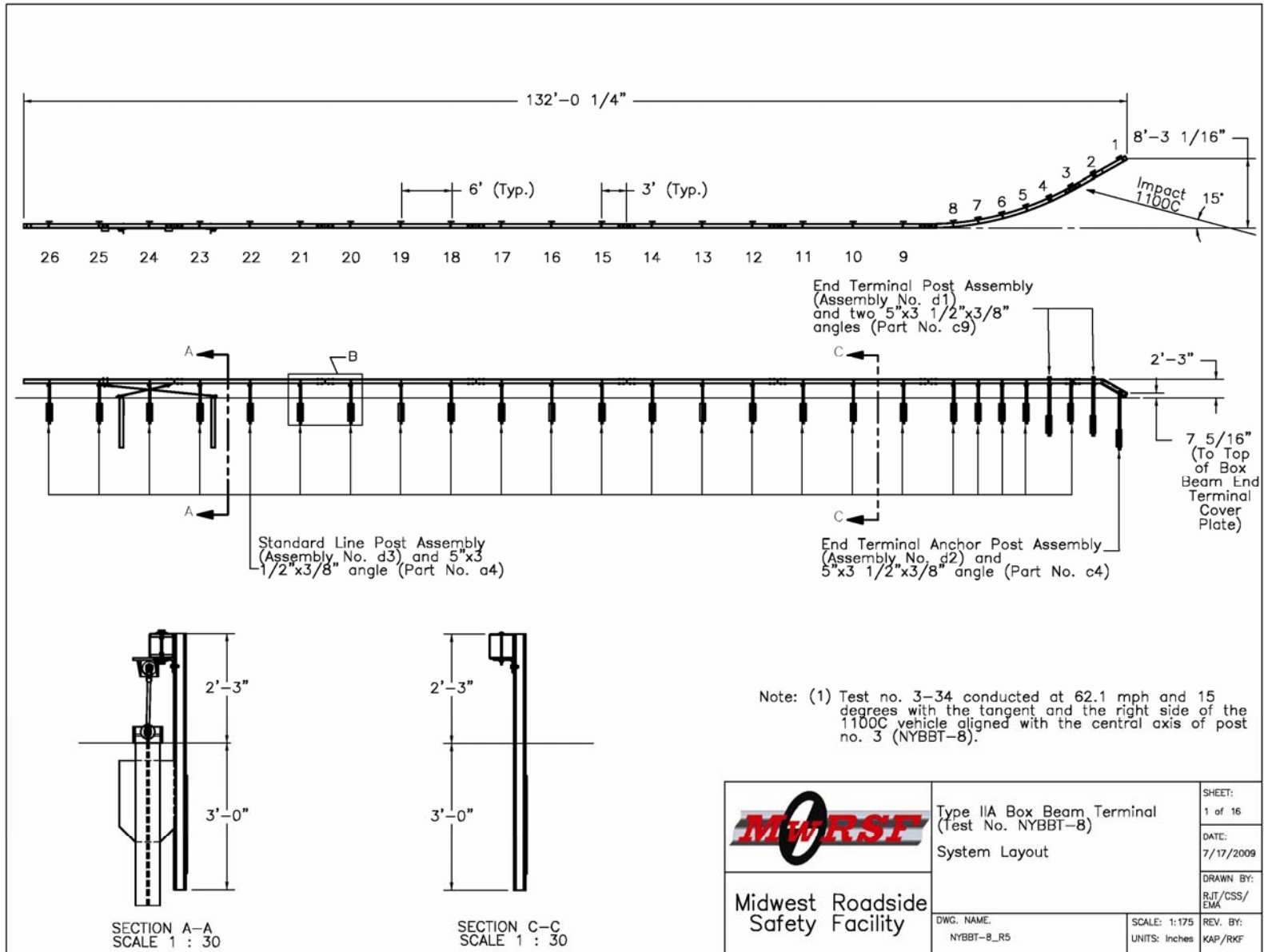


Figure S-1. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

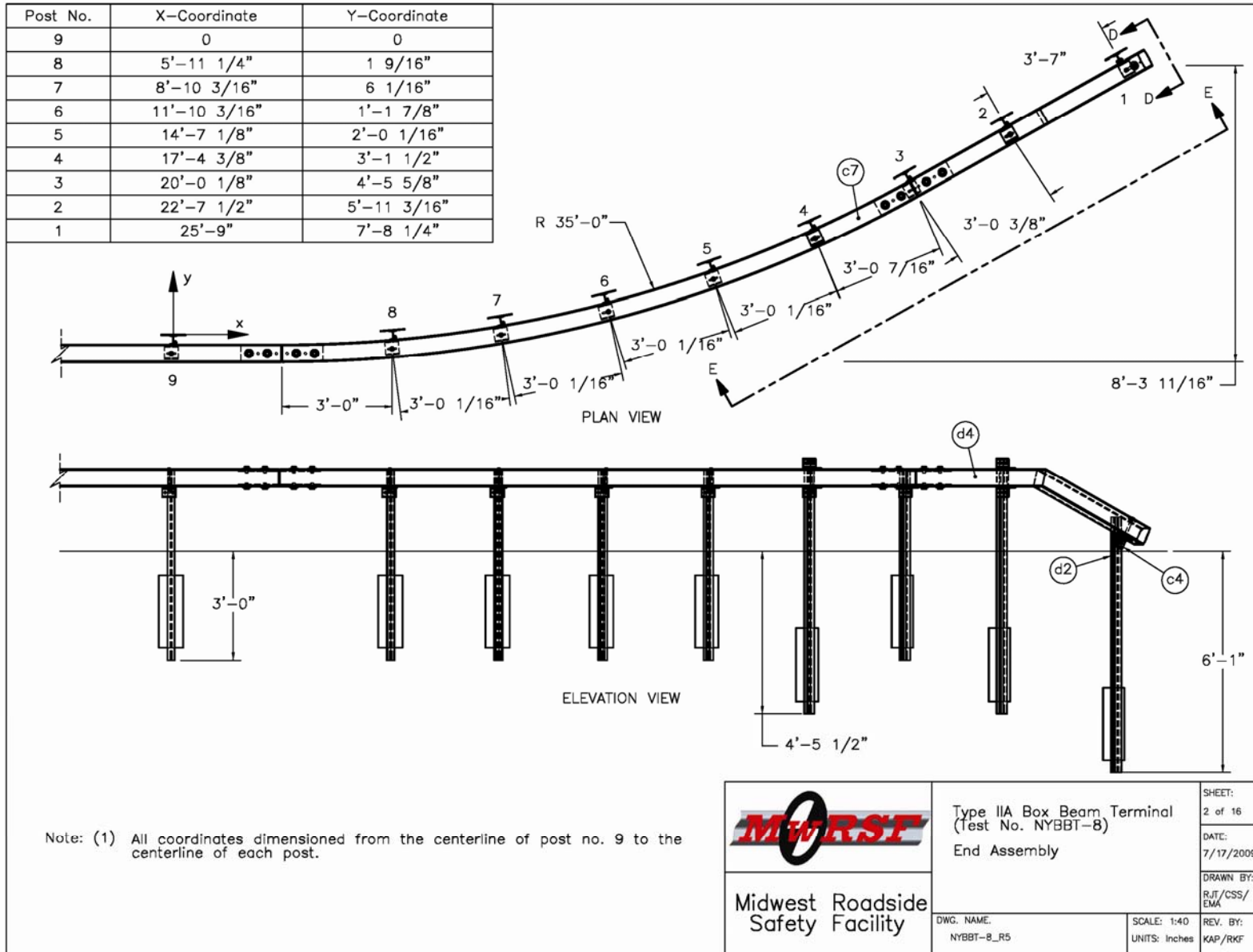


Figure S-2. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

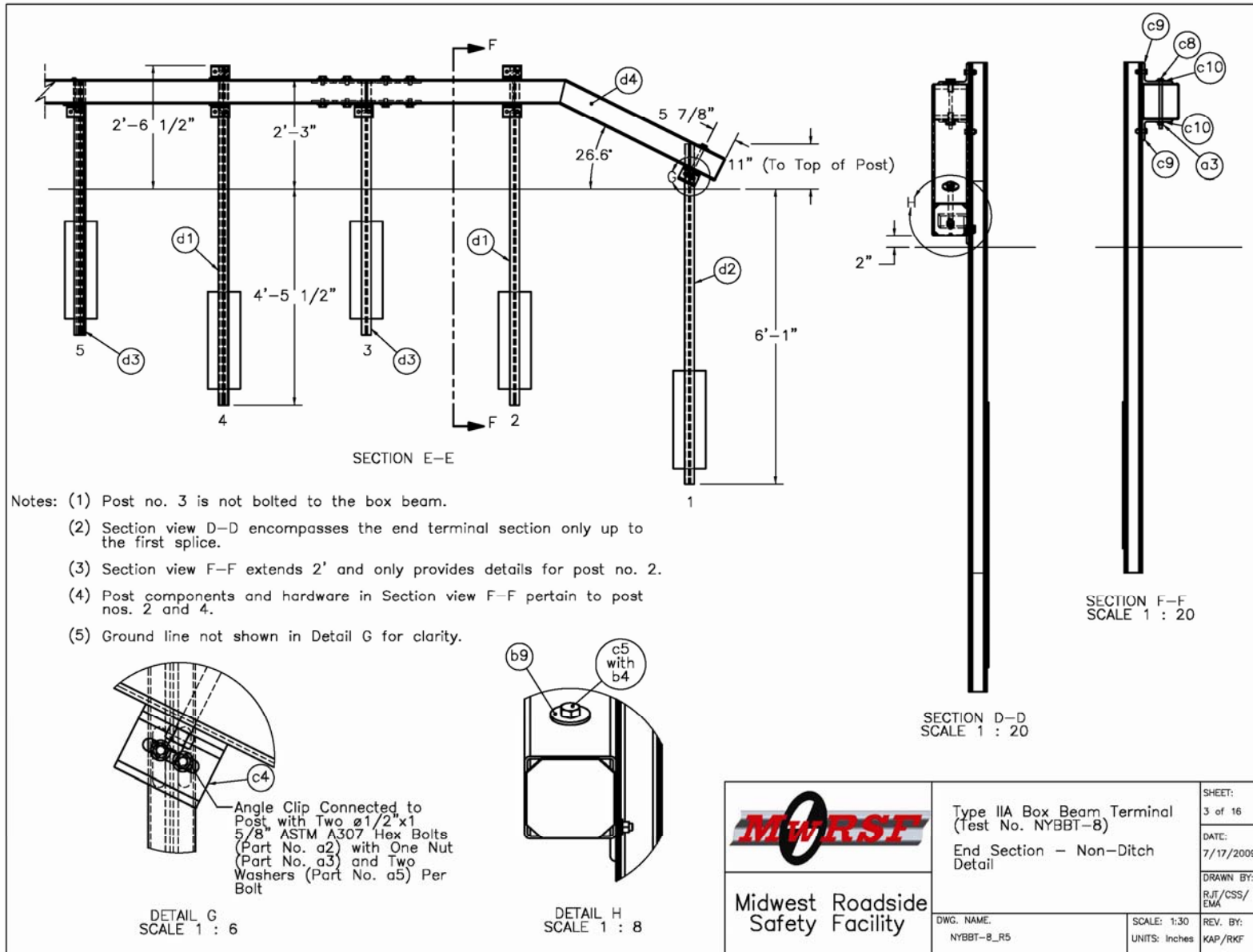


Figure S-3. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

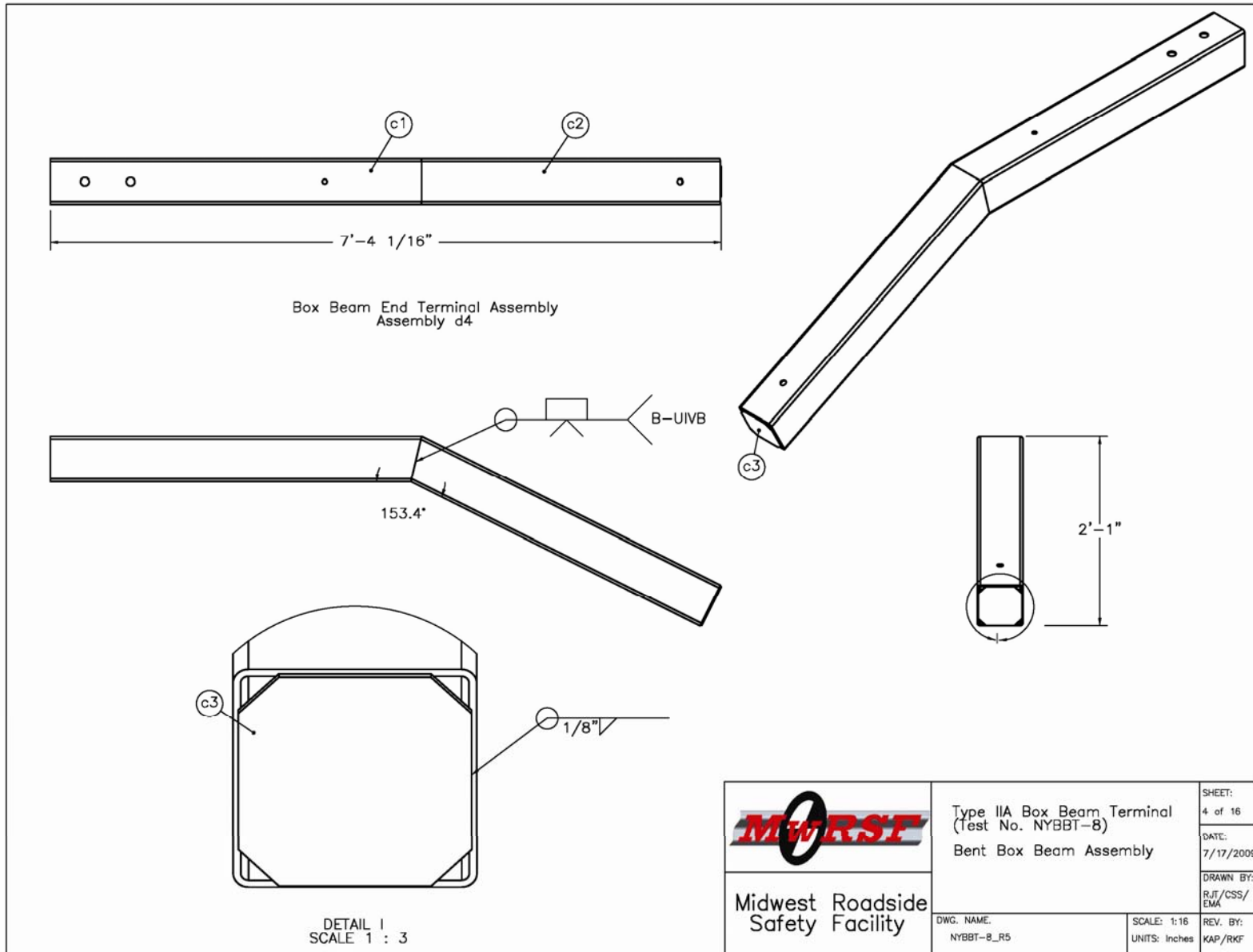


Figure S-4. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

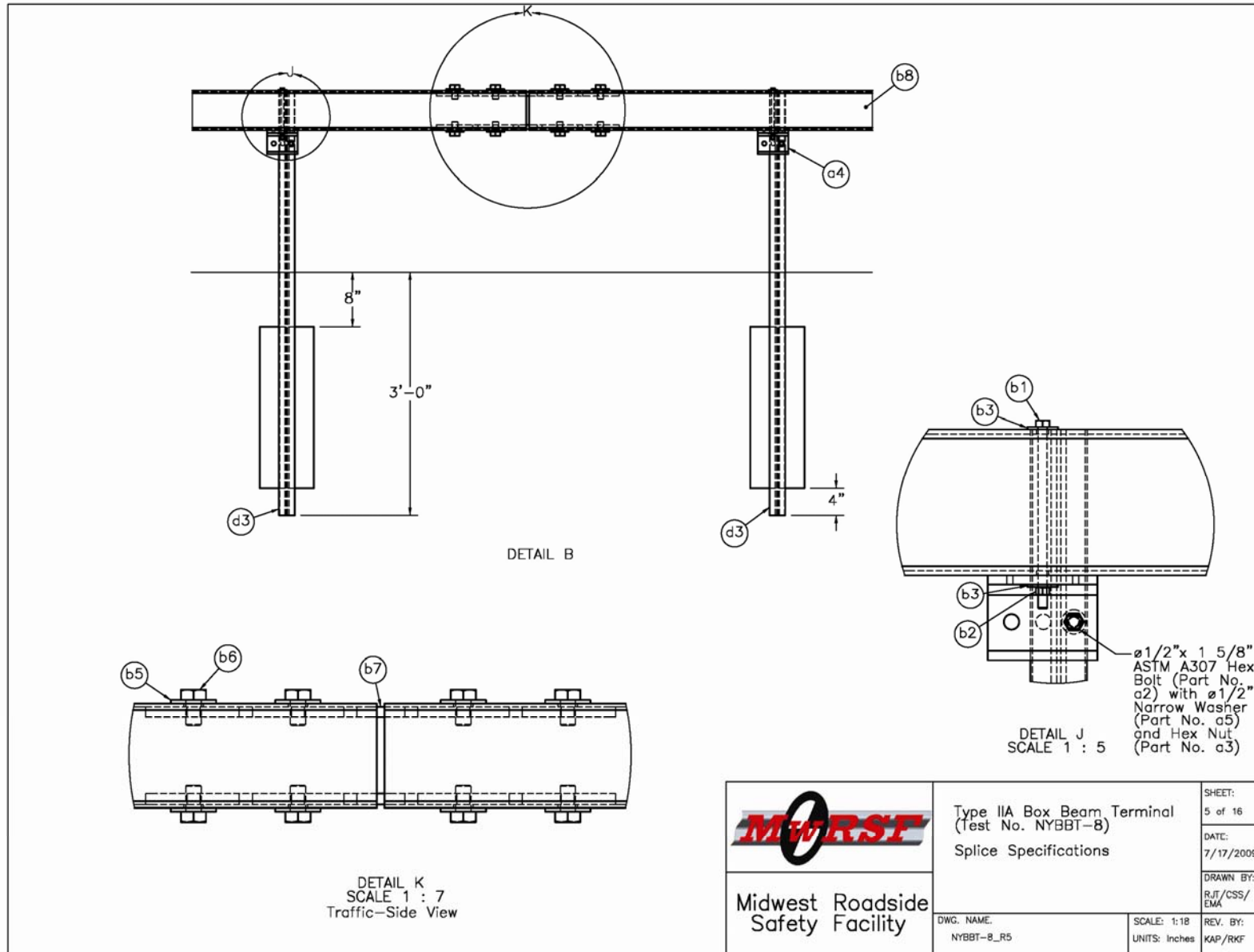


Figure S-5. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

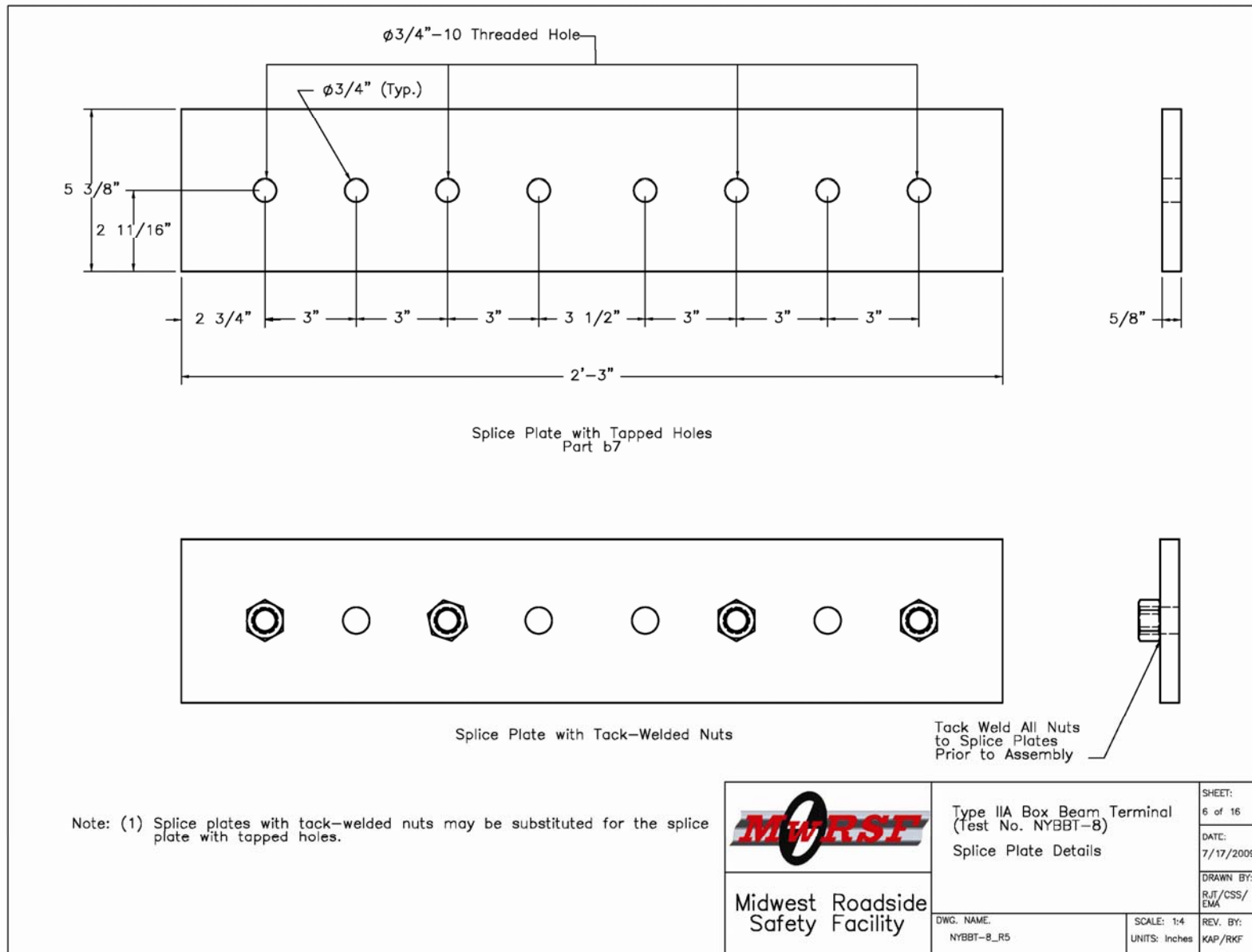


Figure S-6. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

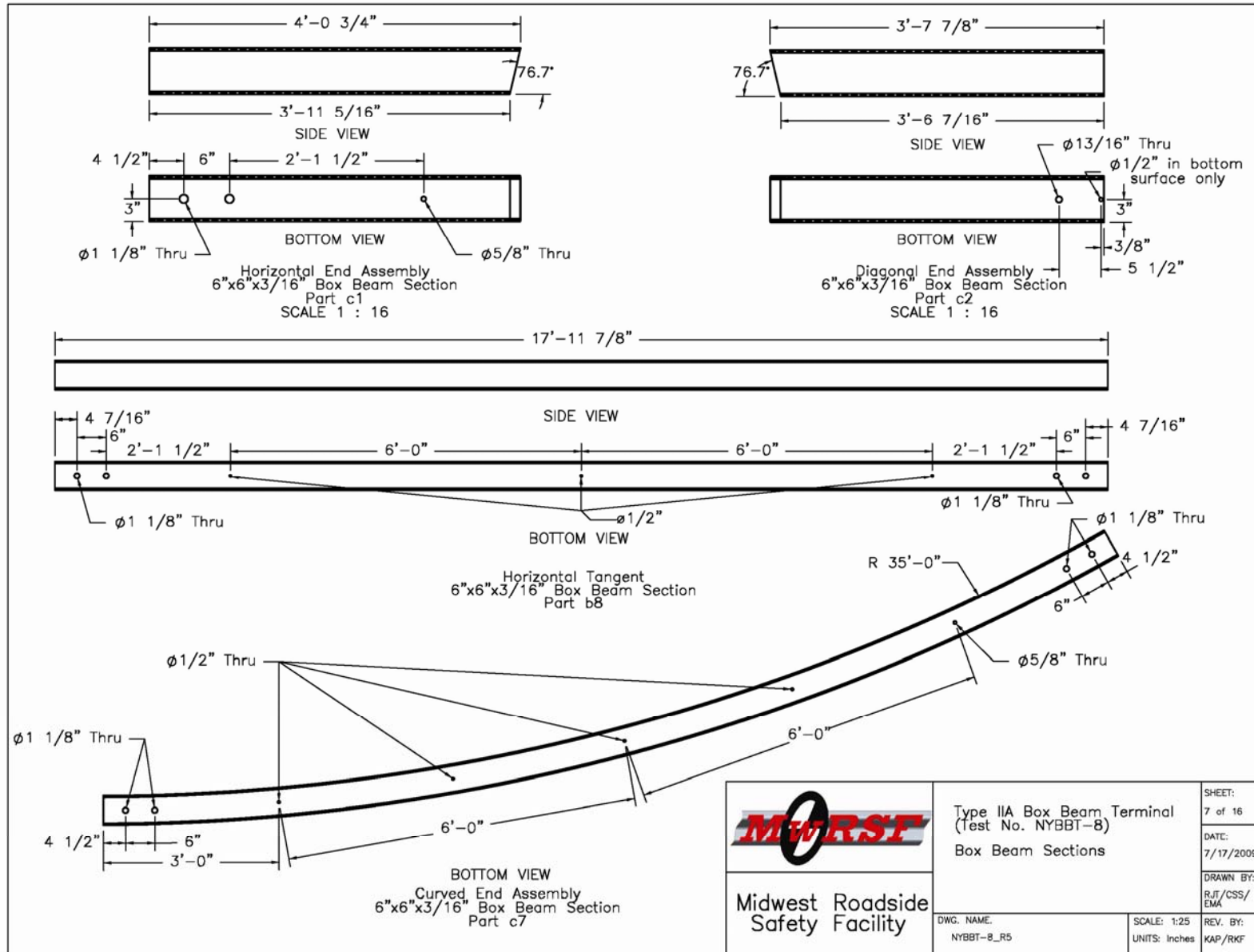



Figure S-7. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

 <b>Midwest Roadside Safety Facility</b>	Type IIA Box Beam Terminal (Test No. NYBBT-8) Box Beam Sections	SHEET: 7 of 16
	DWG. NAME: NYBBT-8_R5	DATE: 7/17/2009
UNITS: Inches	REV. BY: KAP/RKF	DRAWN BY: RJT/CSS/ EMA



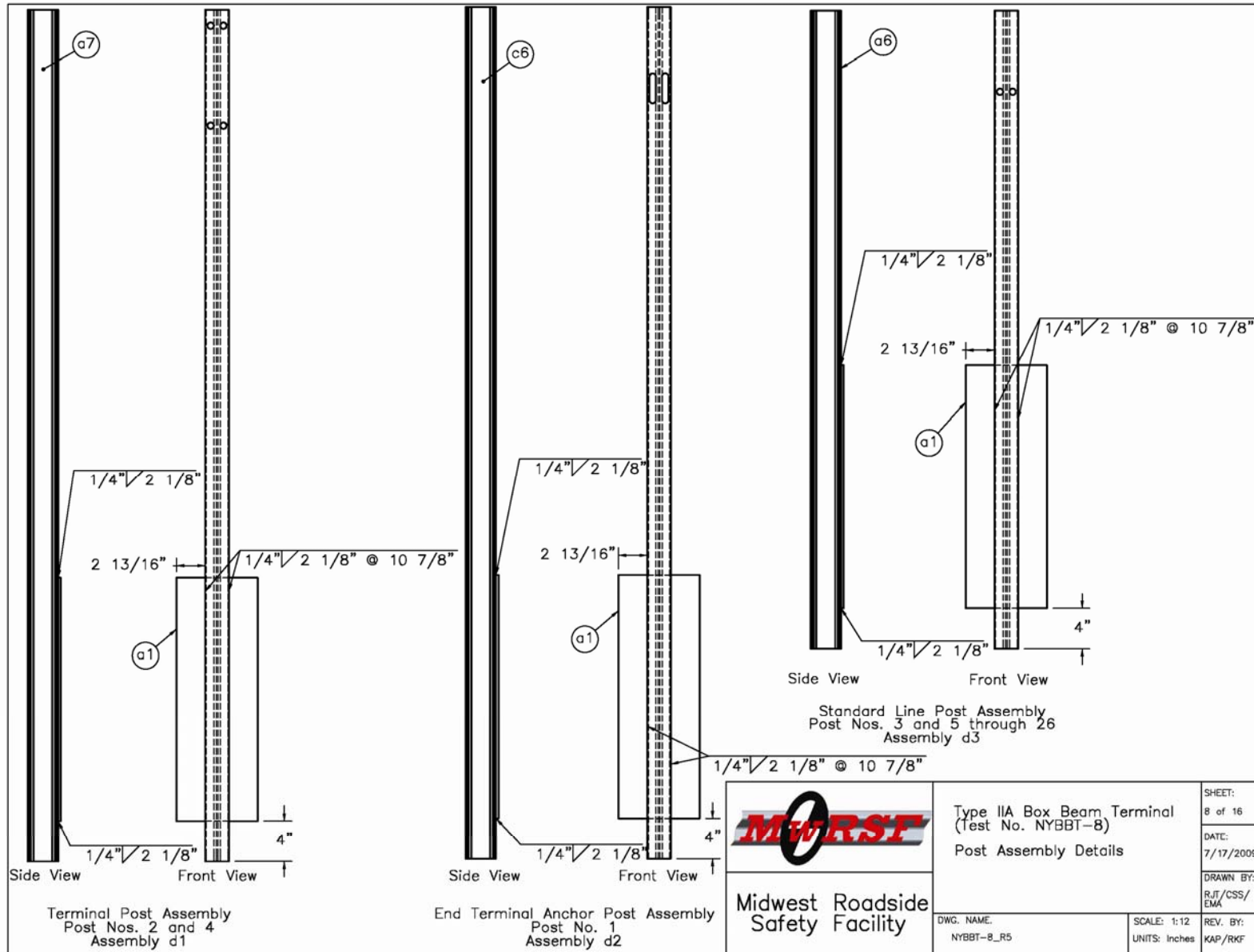


Figure S-8. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

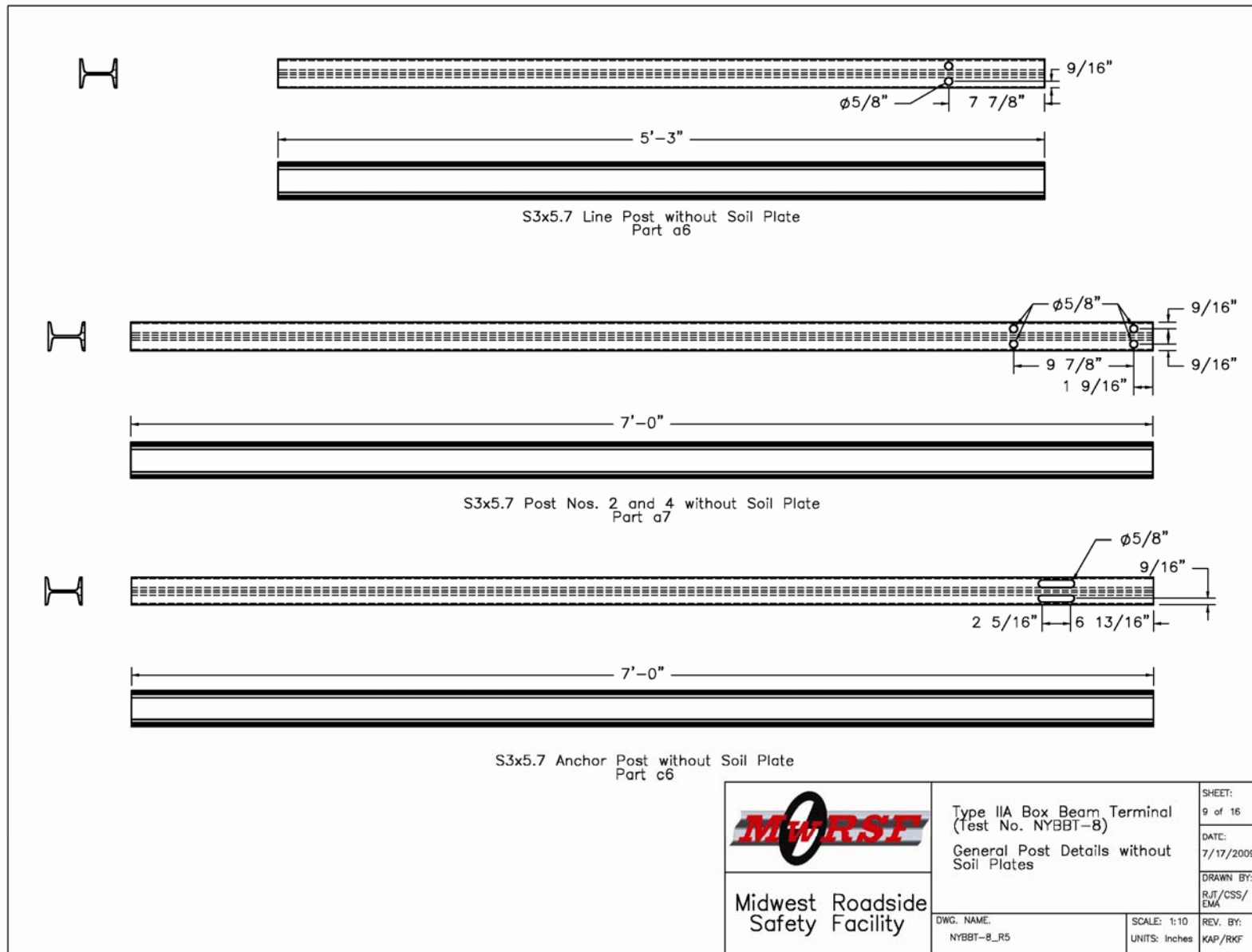


Figure S-9. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

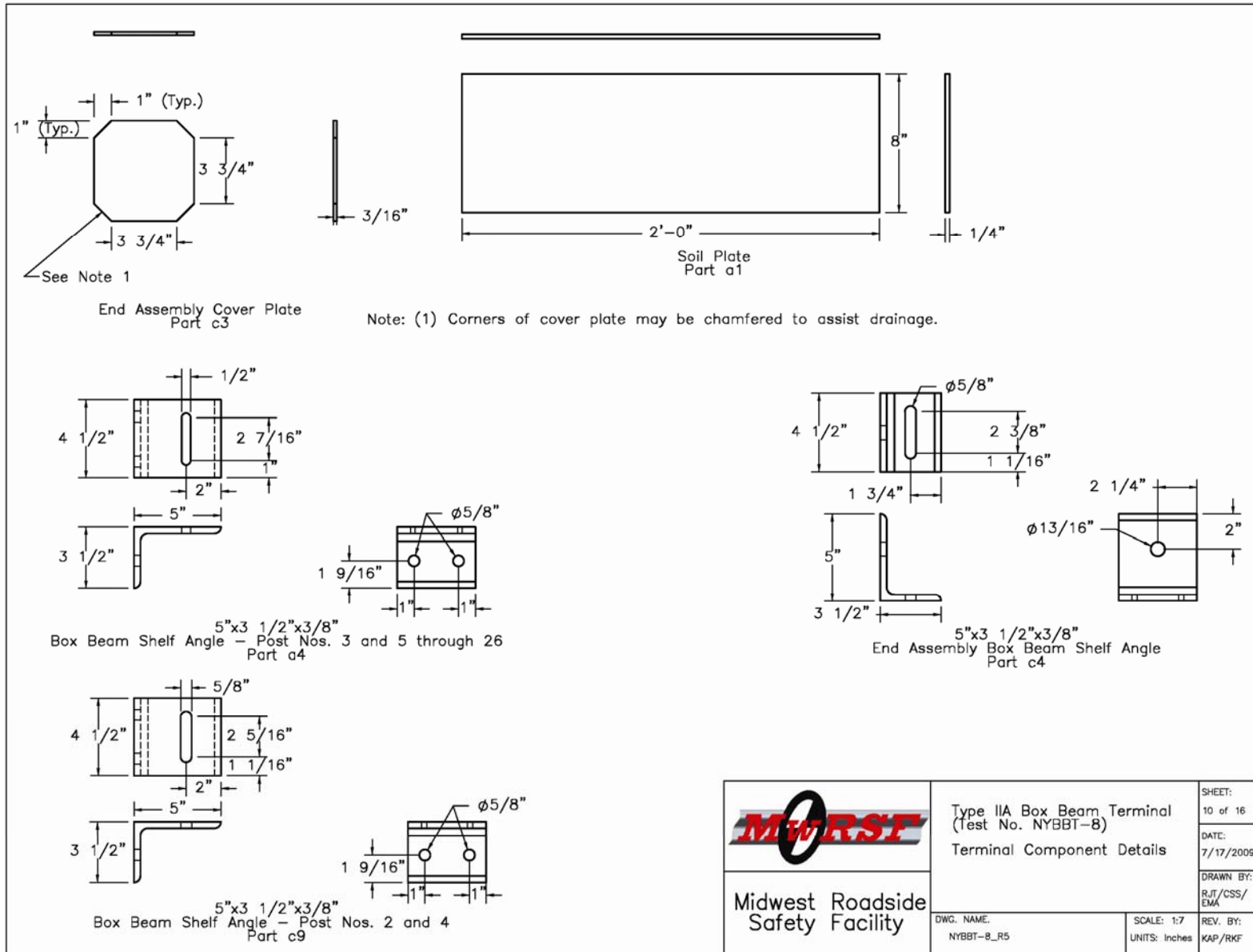


Figure S-10. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

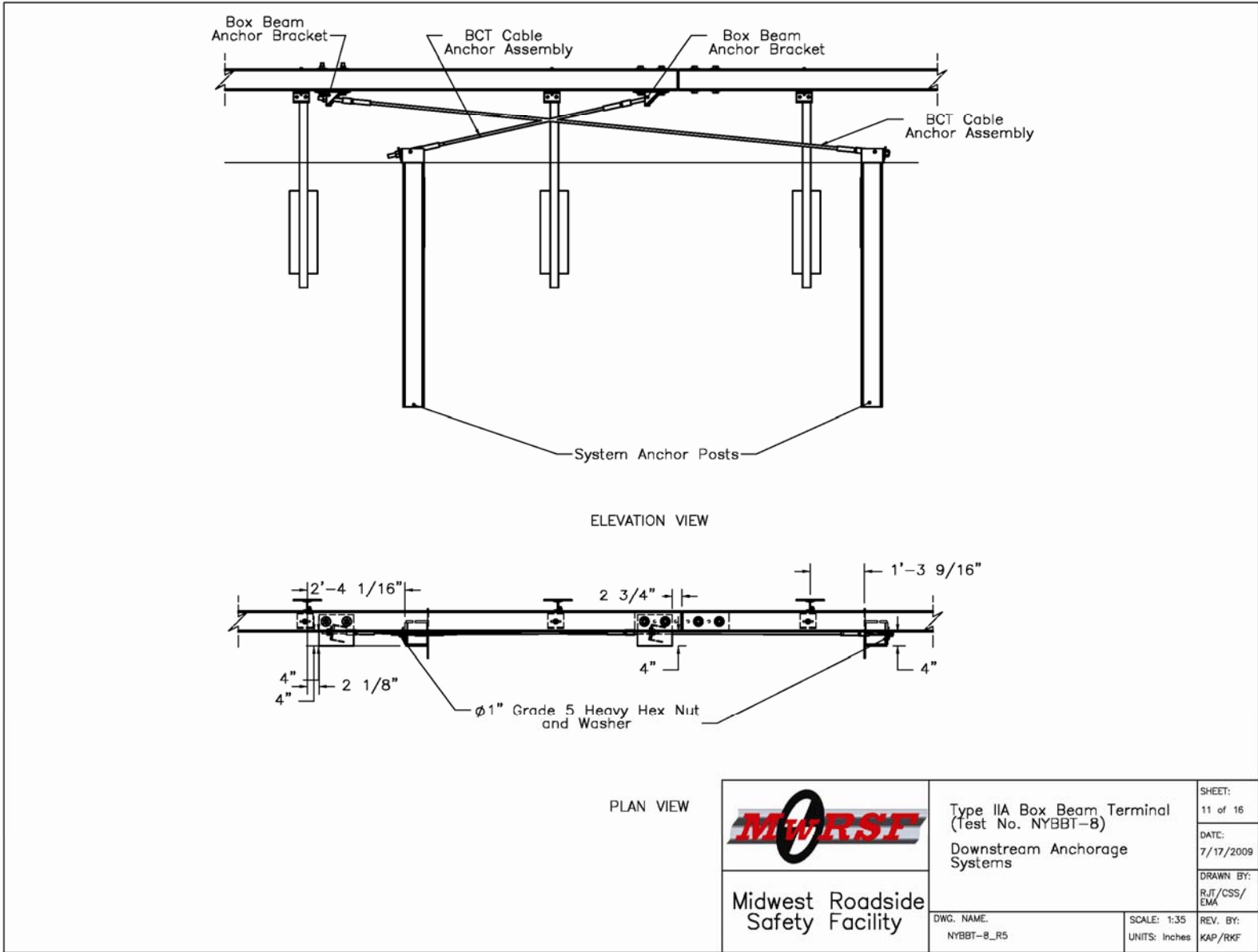


Figure S-11. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

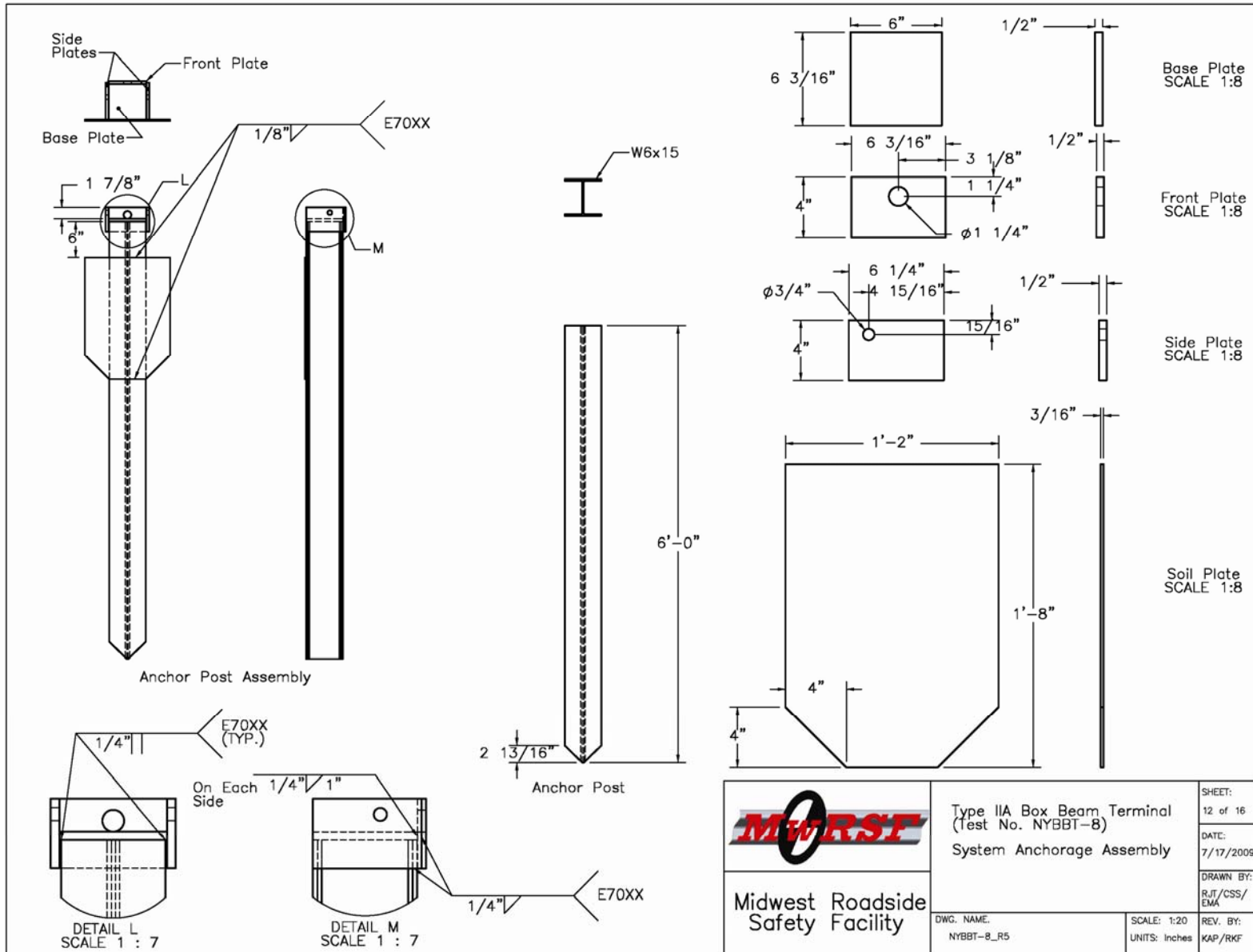


Figure S-12. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8



Test No. NYBBT-8			
Item No.	Quantity	Description	Material Specifications
a1	26	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	29	ø 1/2" coarse thread, 1 5/8" long hex bolt	ASTM A307
a3	31	ø 1/2" hex nut	ASTM A307
a4	23	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	31	ø 1/2" narrow washer	ASTM A307
a6	23	S3 x 5.7, 63" long post	A36 Steel
a7	2	S3 x 5.7, 84" long post	A36 Steel
b1	22	ø 3/8" coarse thread, 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	1	ø 3/4" hex nut	ASTM A307
b5	56	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread, 1 1/2" long hex bolt	ASTM A325
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" by 17'-11 7/8" long box beam	ASTM A500 Grade B
b9	1	ø 3/4" wide washer	ASTM A307
c1	1	End assembly bent 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam anchor post shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread, 8" long hex bolt	ASTM A307
c6	1	S3 x 5.7, 84" long post anchor post	A36 Steel
c7	1	6" x 6" x 3/16", R 35' Curved Box Beam	ASTM A500 Grade B
c8	2	ø 1/2" coarse thread, 8" long hex bolt	ASTM A307
c9	4	5" x 3 1/2" x 3/8" box beam shelf angle with ø 5/8" slot	A36 Steel
c10	4	ø 1/2" wide washer	ASTM A307
d1	2	Terminal Post Assembly	-
d2	1	Terminal Anchor Post Assembly	-
d3	23	Line Post Assembly	-
d4	1	Box Beam End Terminal Assembly	-

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (Test No. NYBBT-8) Bill of Materials	SHEET: 14 of 16 DATE: 7/17/2009 DRAWN BY: RJT/CSS/ EMA
	DWG. NAME: NYBBT-8_R5	SCALE: None UNITS: Inches

Figure S-14. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

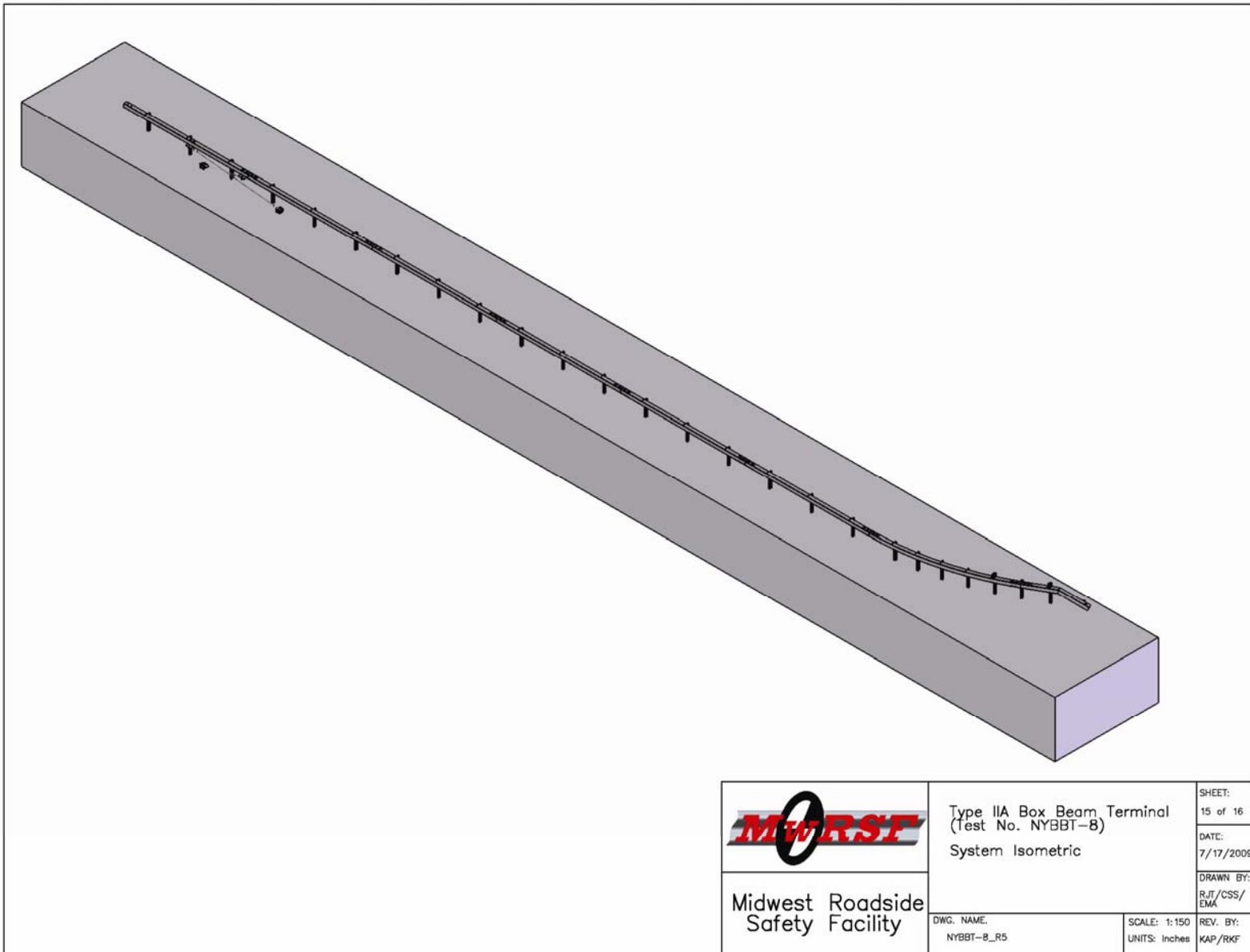
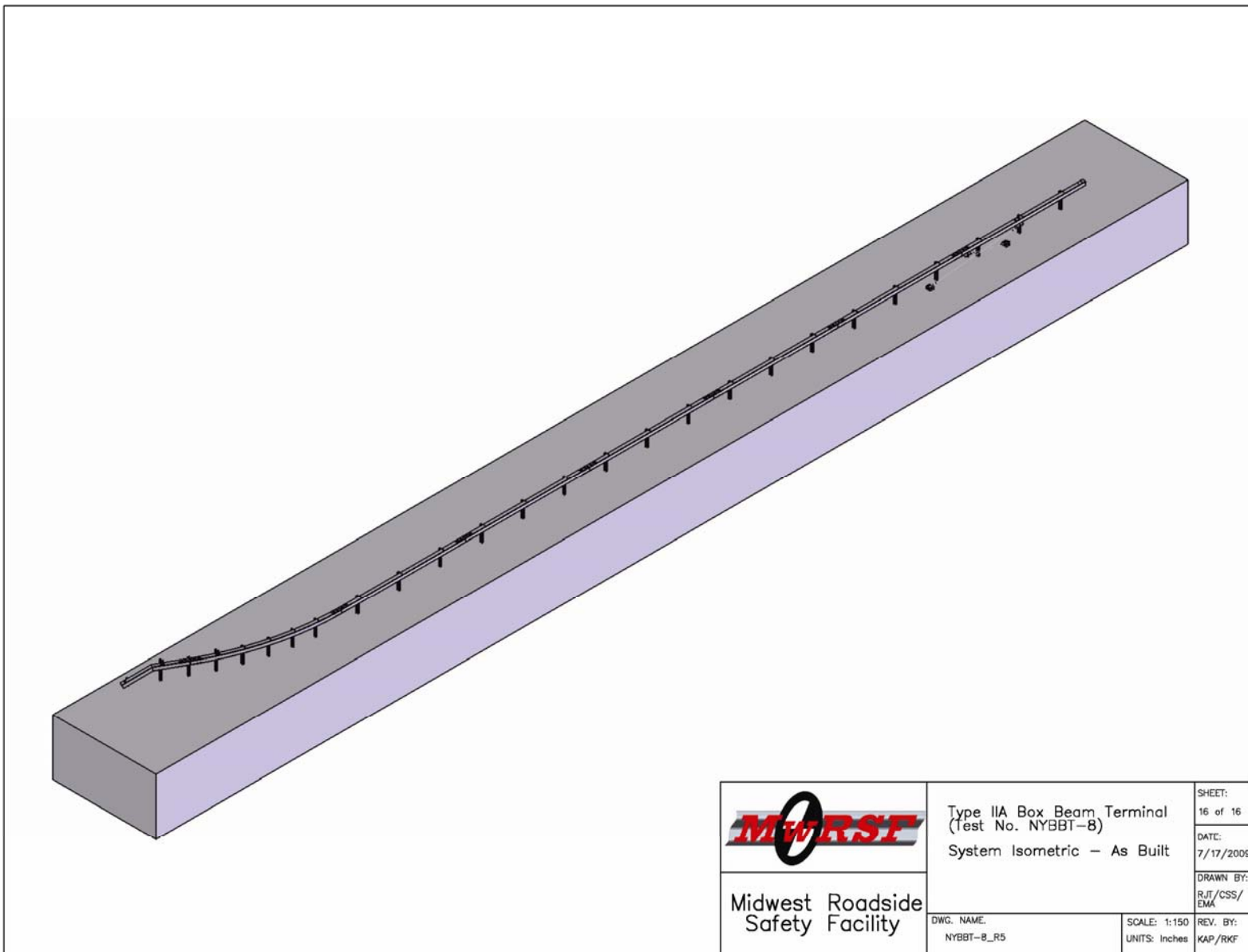


Figure S-15. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8






 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (Test No. NYBBT-8) System Isometric - As Built		SHEET: 16 of 16
	DWG. NAME: NYBBT-8_R5		DATE: 7/17/2009
		SCALE: 1:150 UNITS: Inches	DRAWN BY: RJT/CSS/ EMA  REV. BY: KAP/RKF

Figure S-16. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-8

**APPENDIX T Modified Type IIA Box Beam Terminal System Details - Metric and English Units, Test No. NYBBT-9**

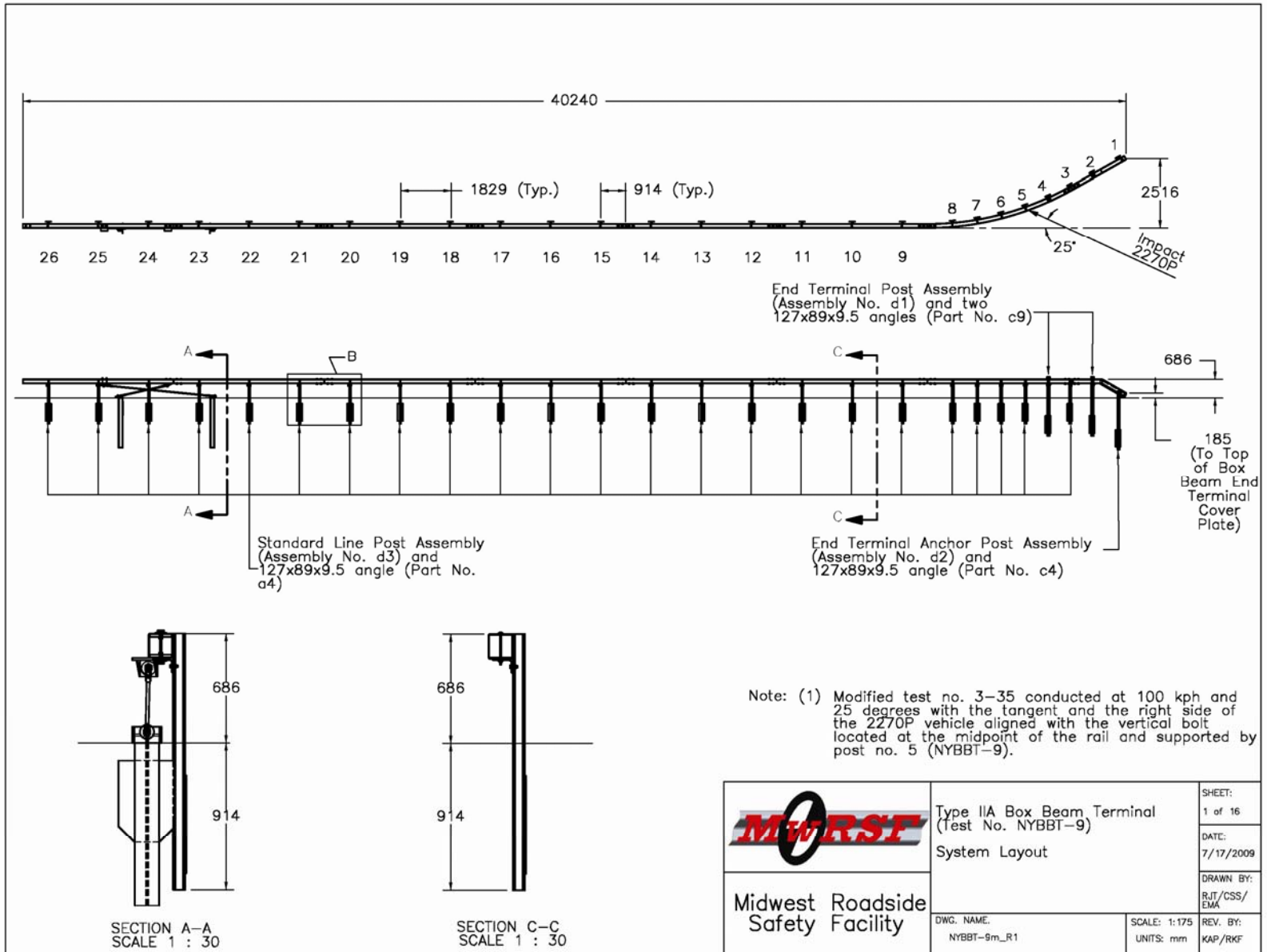


Figure T-1. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

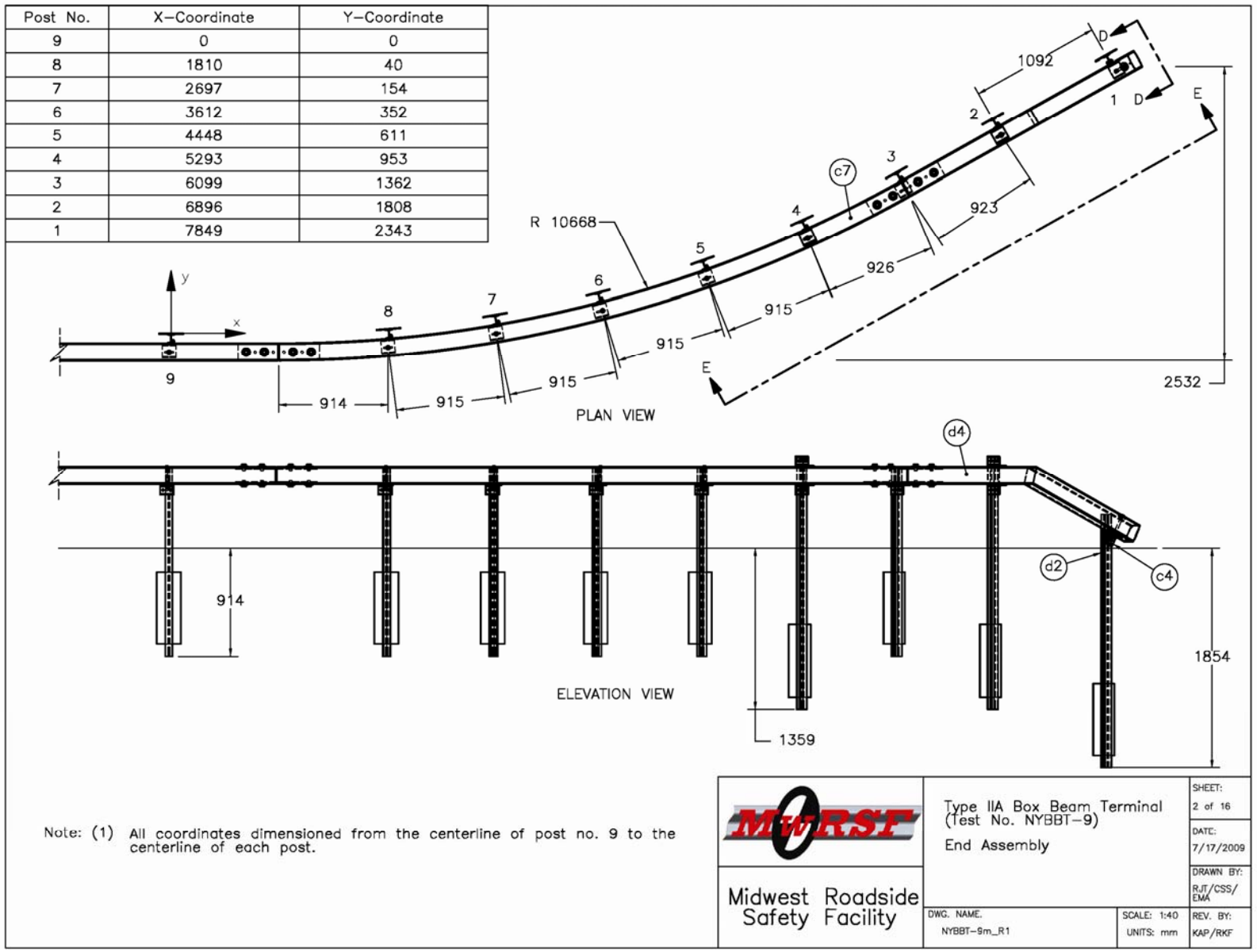


Figure T-2. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

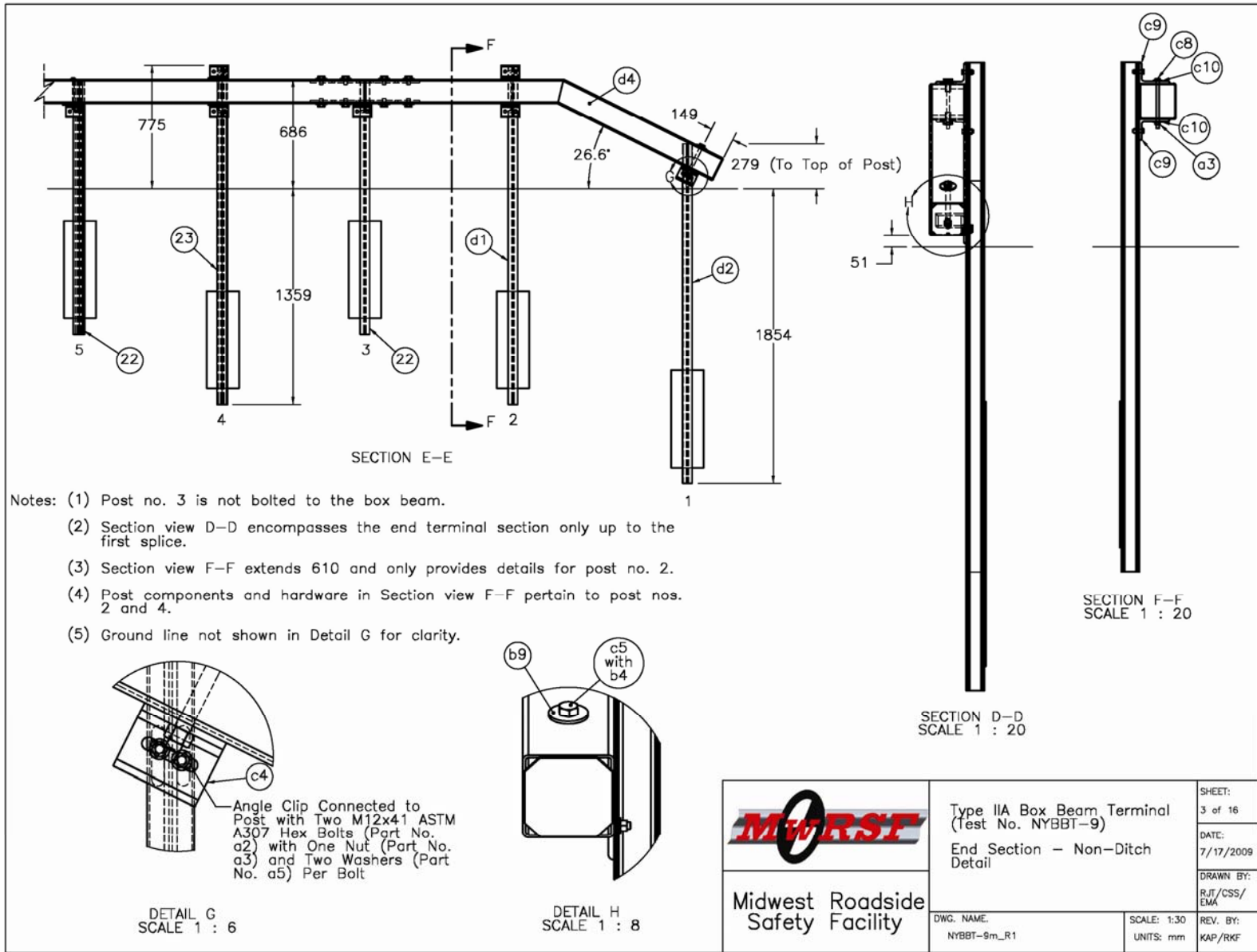


Figure T-3. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

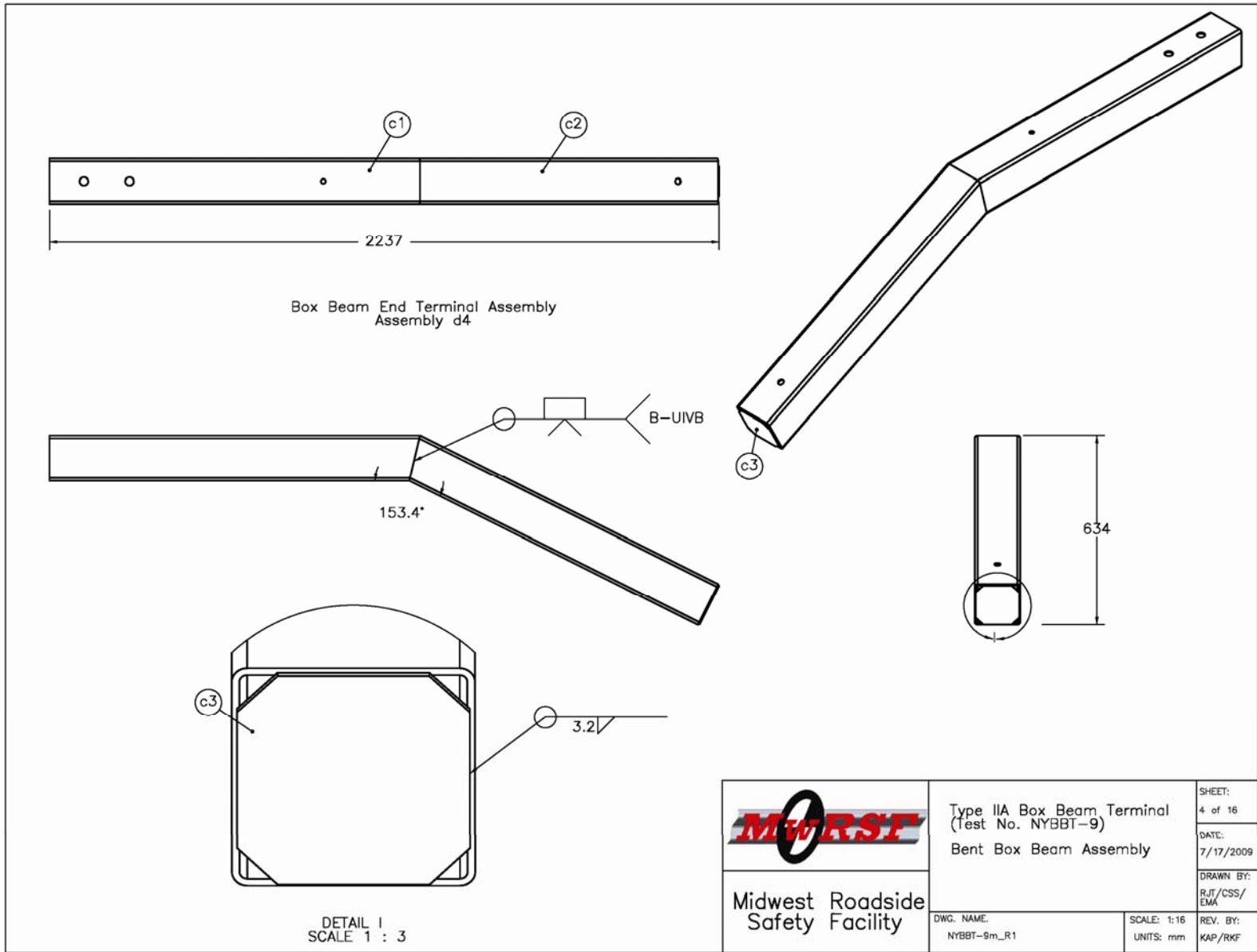


Figure T-4. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

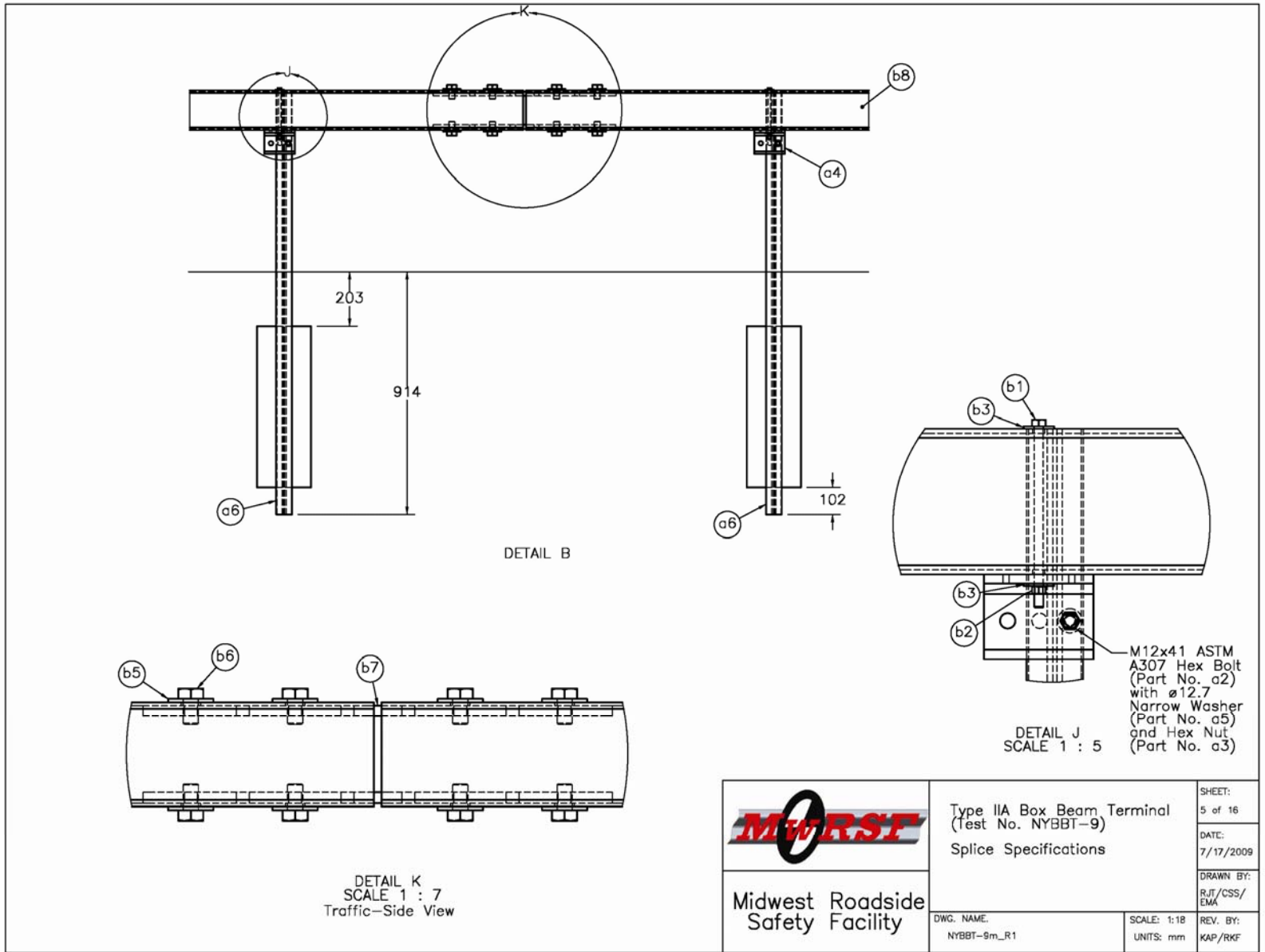


Figure T-5. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

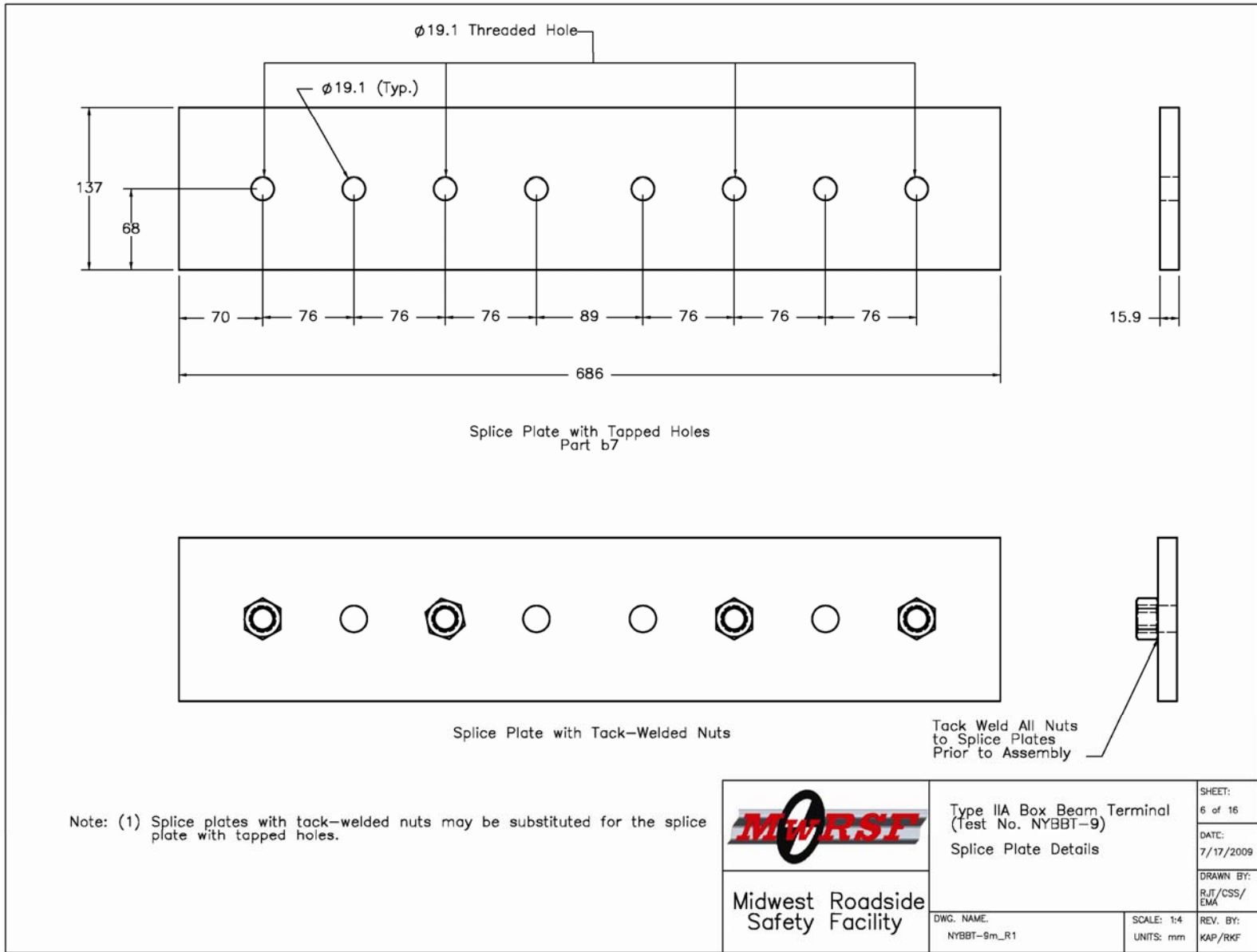


Figure T-6. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9



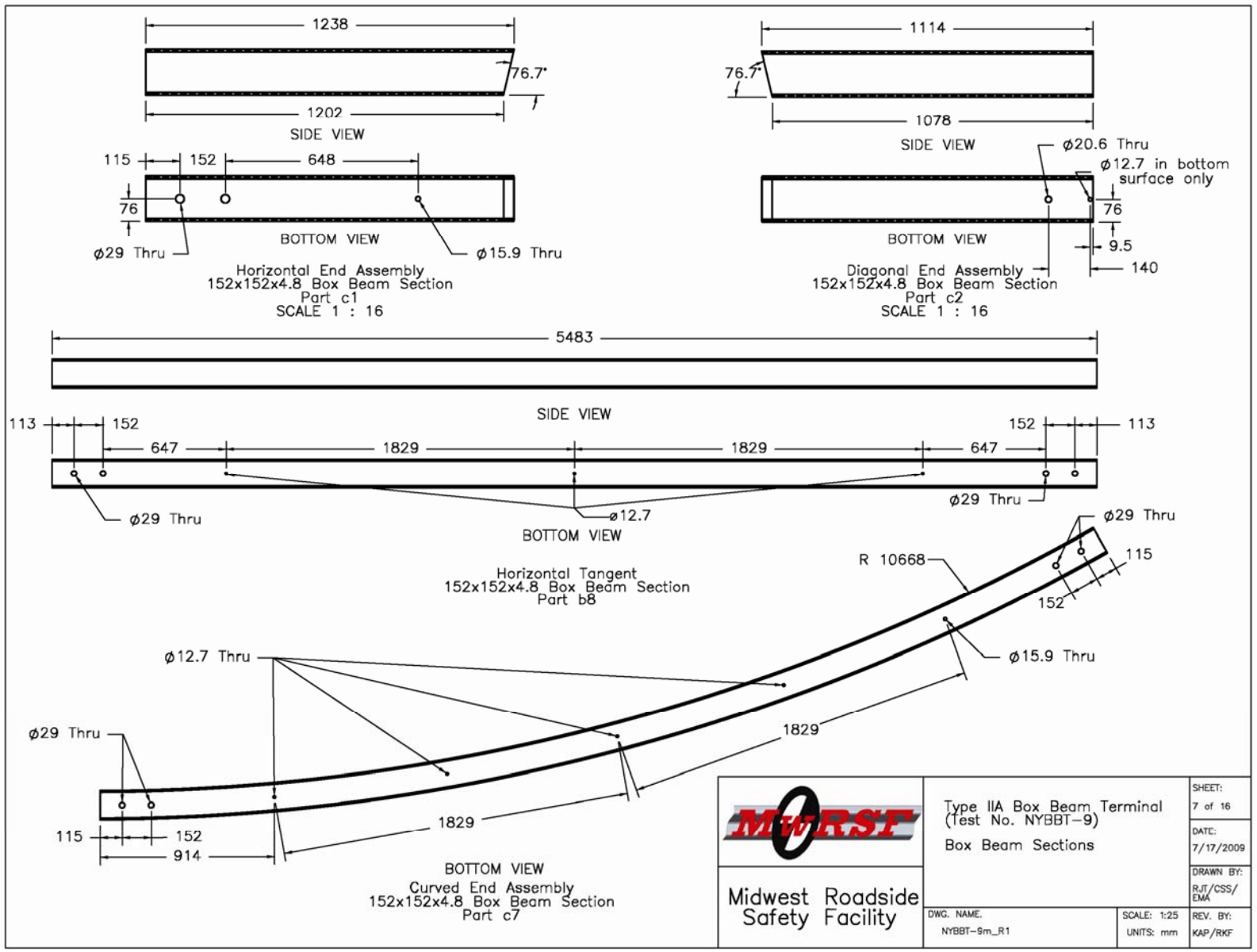


Figure T-7. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

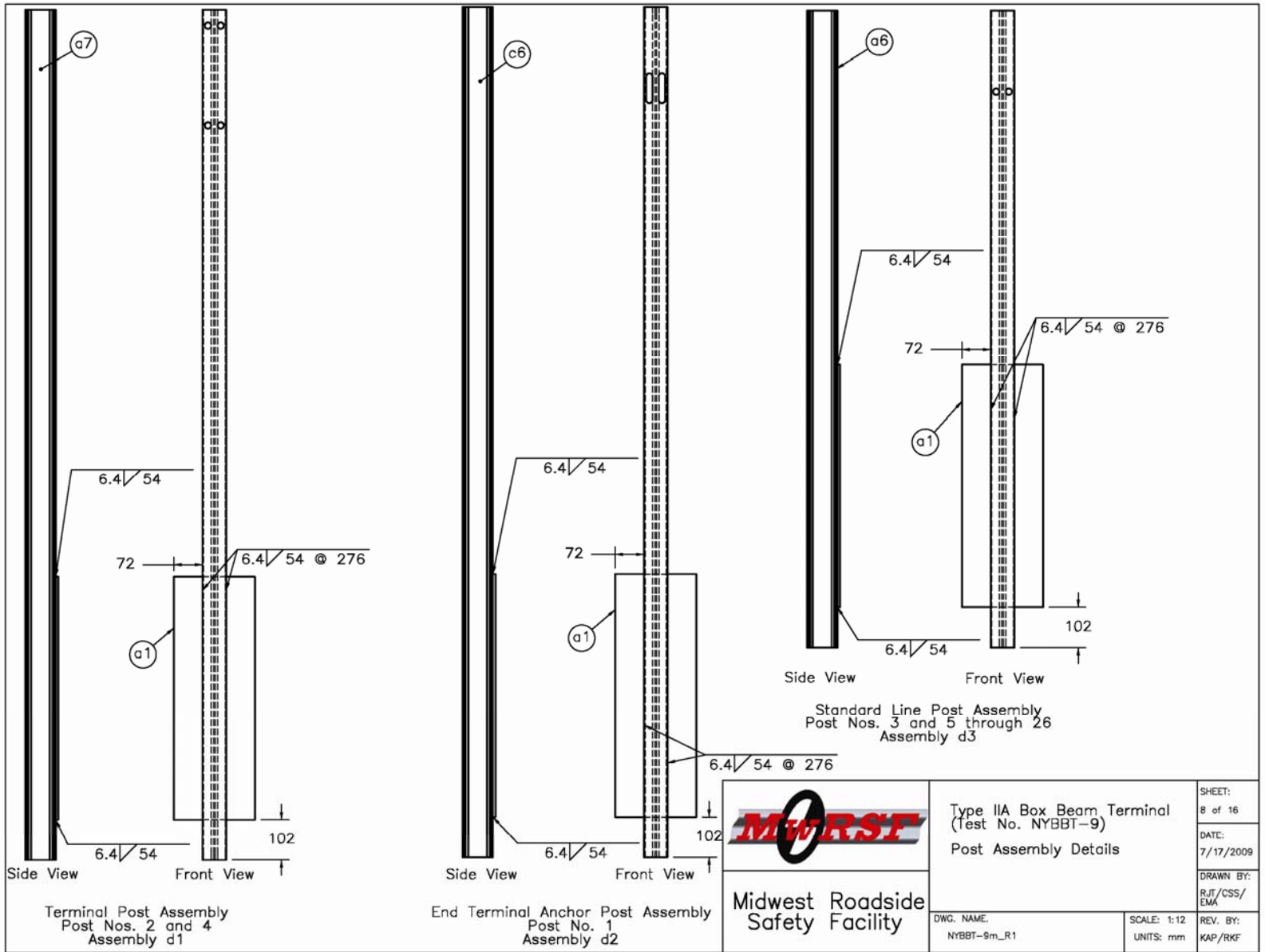


Figure T-8. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

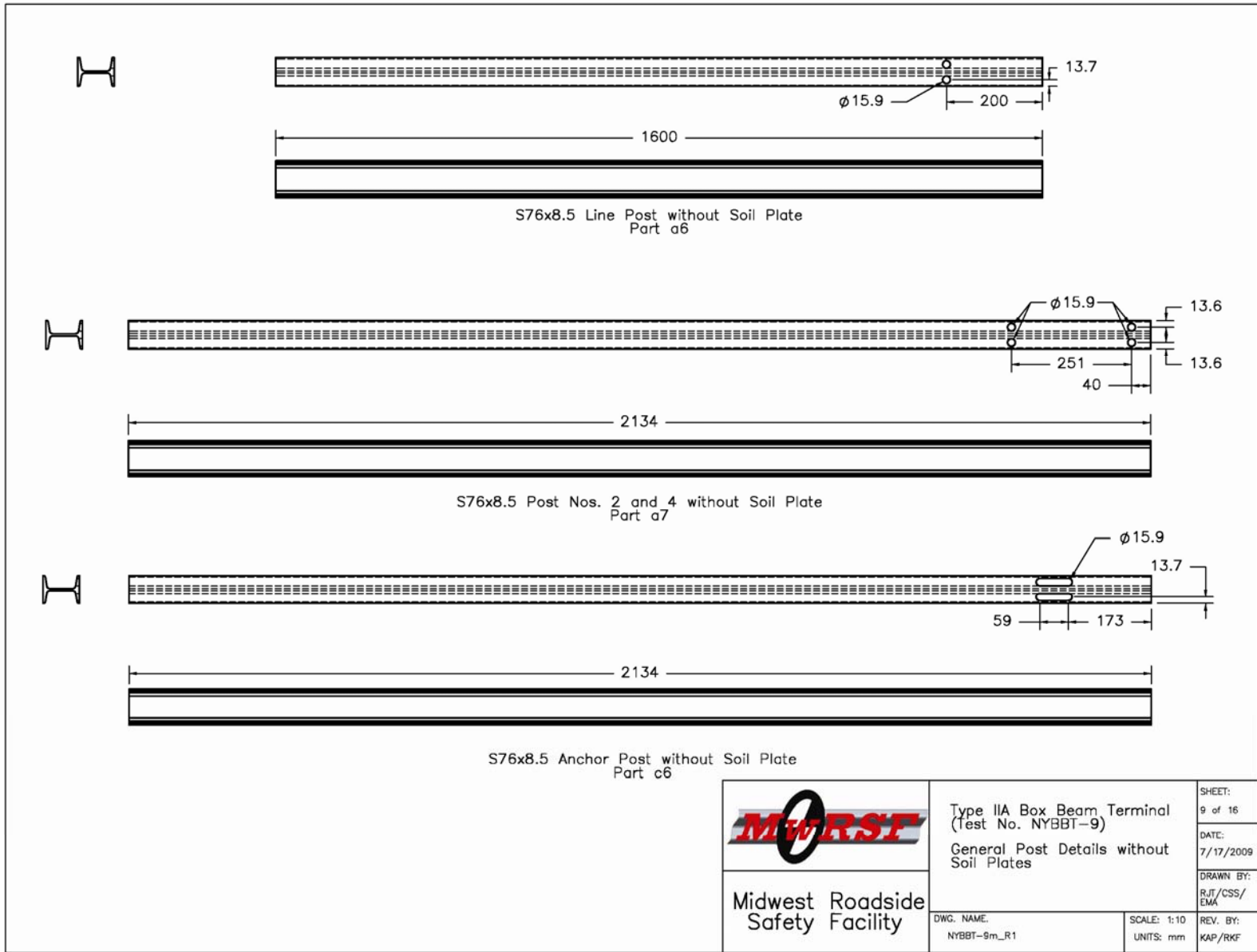


Figure T-9. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9



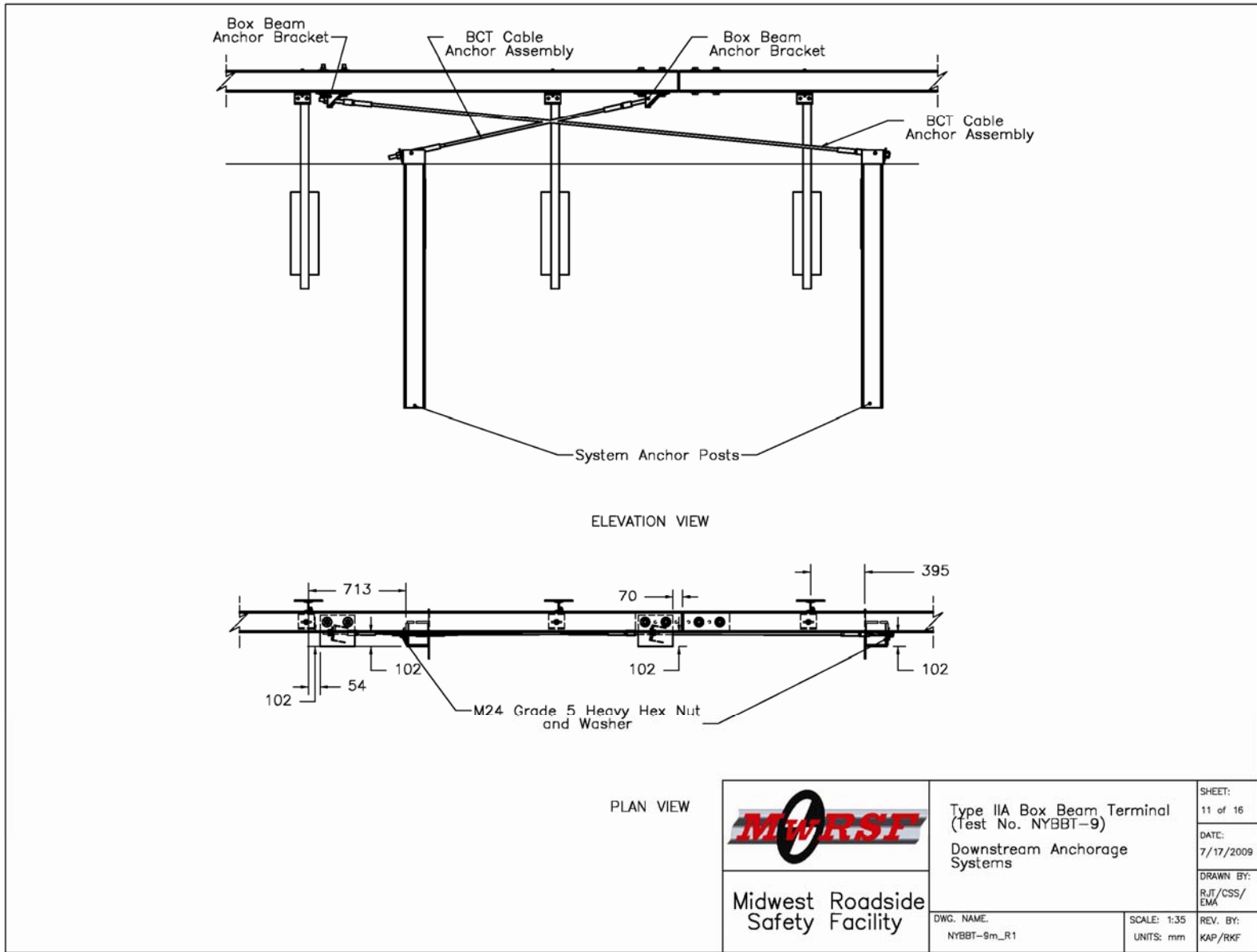


Figure T-11. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

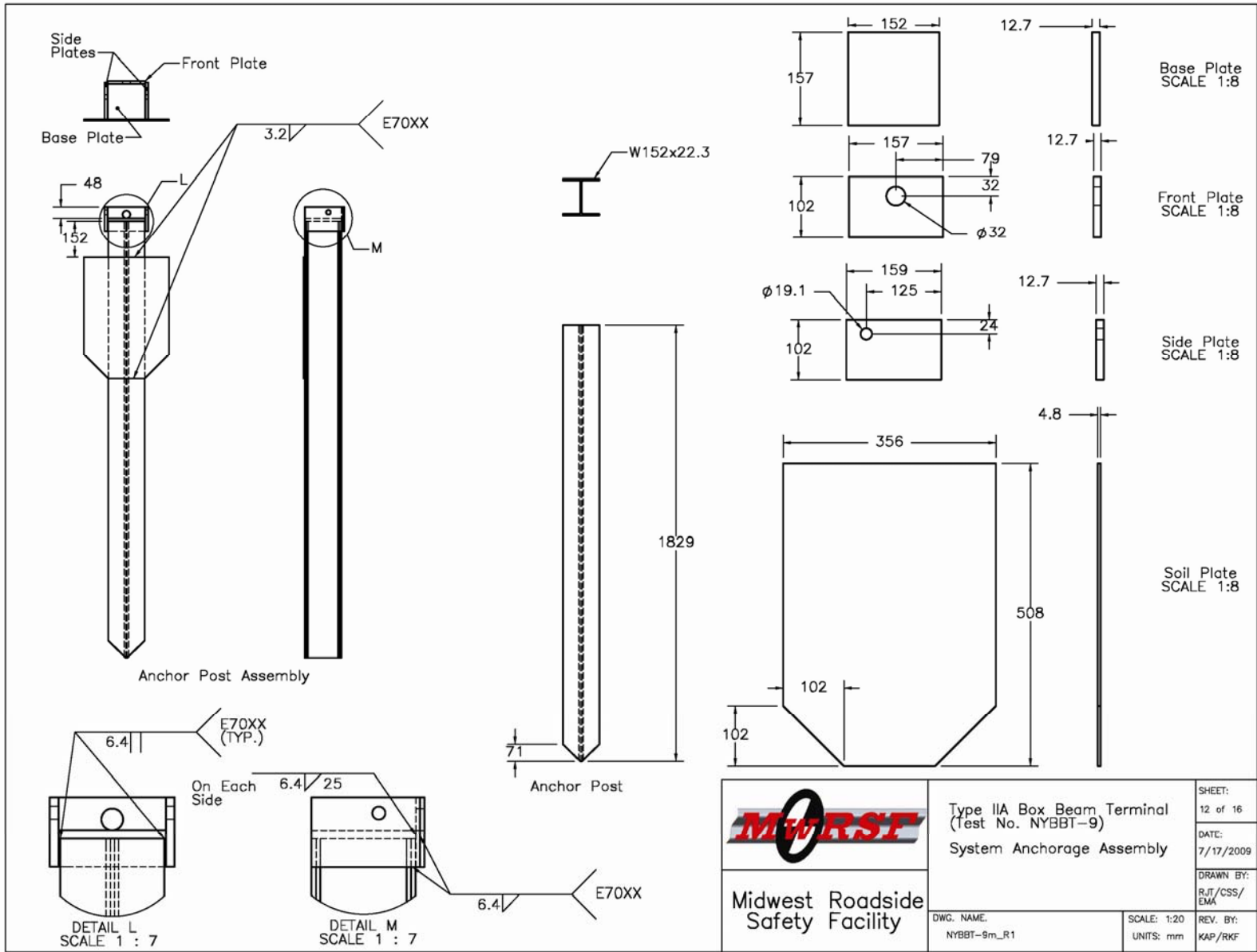


Figure T-12. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

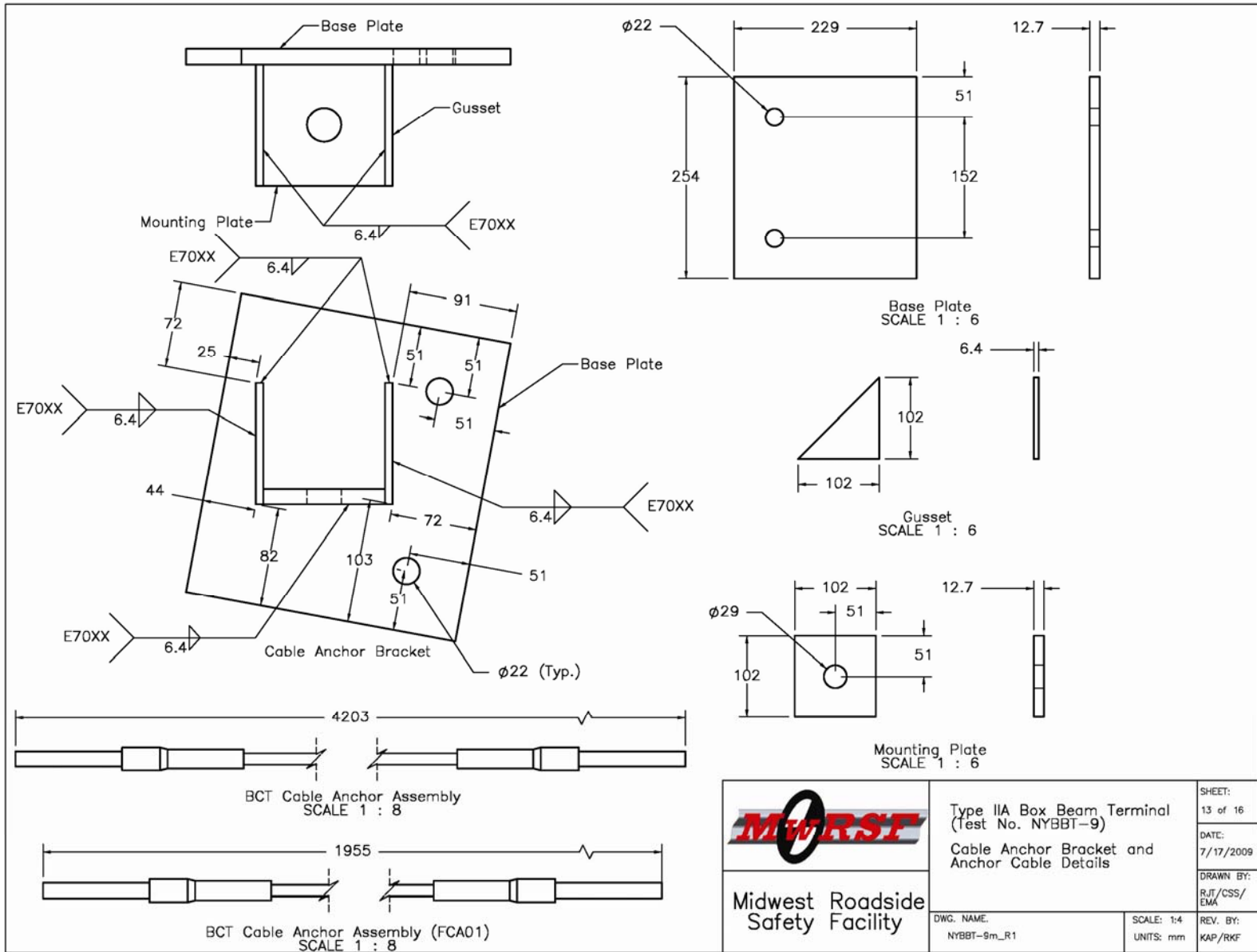


Figure T-13. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

Test No. NYBBT-9			
Item No.	Quantity	Description	Material Specifications
a1	26	6.4 x 203 x 610 steel soil plate	A36 Steel
a2	29	M12 coarse thread, 41 long hex bolt	ASTM A307
a3	31	M12 hex nut	ASTM A307
a4	23	127 x 89 x 9.5 box beam shelf angle	A36 Steel
a5	31	M12 narrow washer	ASTM A307
a6	23	S76 x 8.5, 1600 long post	A36 Steel
a7	2	S76 x 8.5, 2134 long post	A36 Steel
b1	22	M10 coarse thread, 191 long hex bolt	ASTM A307
b2	22	M10 hex nut	ASTM A307
b3	44	M10 wide washer	ASTM A307
b4	1	M20 hex nut	ASTM A307
b5	56	M20 wide washer	ASTM A325
b6	56	M20 coarse thread, 38 long hex bolt	ASTM A325
b7	14	686 x 137 x 15.9 splice plate	A36 Steel
b8	6	152 x 152 x 4.8 by 5483 long box beam	ASTM A500 Grade B
b9	1	M20 wide washer	ASTM A307
c1	1	End assembly bent 152 x 152 x 4.8 box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 152 x 152 x 4.8 box beam	ASTM A500 Grade B
c3	1	End assembly 4.8 thick cover plate	A36 Steel
c4	1	127 x 89 x 9.5 box beam anchor post shelf angle	A36 Steel
c5	1	M20 coarse thread, 203 long hex bolt	ASTM A307
c6	1	S76 x 8.5, 2134 long post anchor post	A36 Steel
c7	1	152 x 152 x 4.8, R 10668 Curved Box Beam	ASTM A500 Grade B
c8	2	M12 coarse thread, 203 long hex bolt	ASTM A307
c9	4	127 x 89 x 9.5 box beam shelf angle with ø15.9 slot	A36 Steel
c10	4	M12 wide washer	ASTM A307
d1	2	Terminal Post Assembly	-
d2	1	Terminal Anchor Post Assembly	-
d3	23	Line Post Assembly	-
d4	1	Box Beam End Terminal Assembly	-


 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (Test No. NYBBT-9) Bill of Materials		SHEET: 14 of 16
	DWG. NAME: NYBBT-9m_R1	SCALE: None UNITS: mm	DATE: 7/17/2009
		DRAWN BY: R/JT/CSS/ EMA	REV. BY: KAP/RKF

Figure T-14. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9



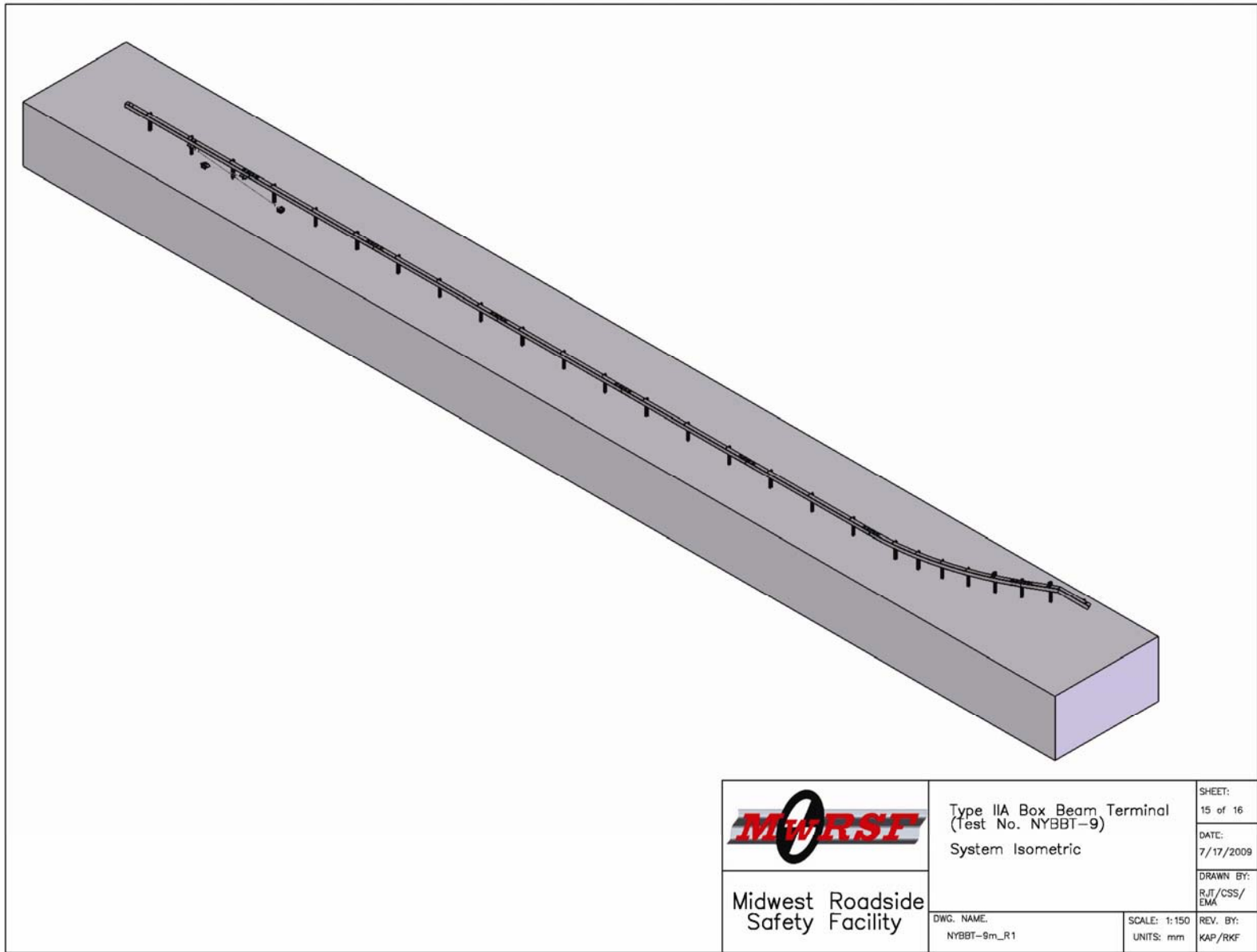


Figure T-15. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

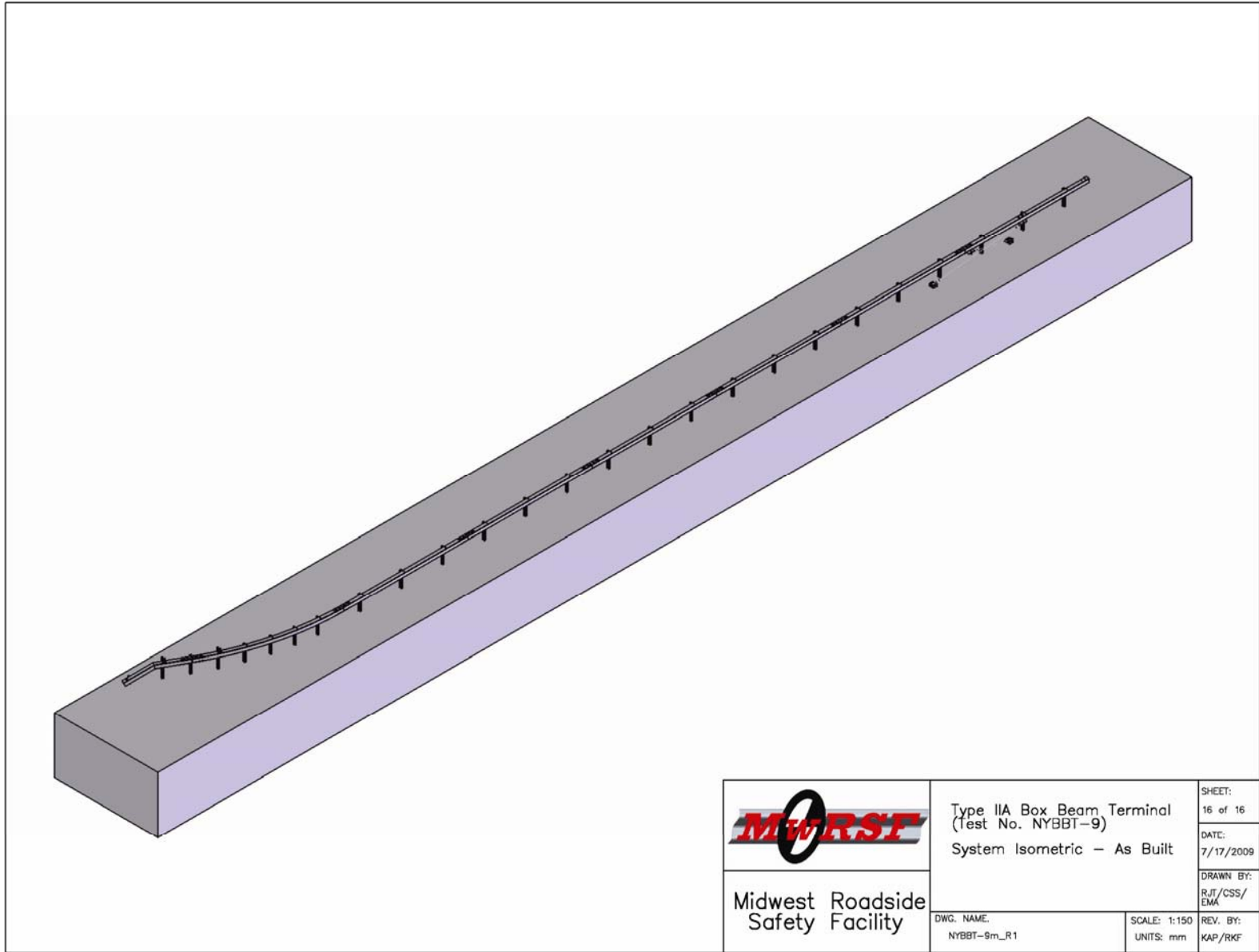


Figure T-16. Modified Type IIA Box Beam Terminal System Details (Metric), Test No. NYBBT-9

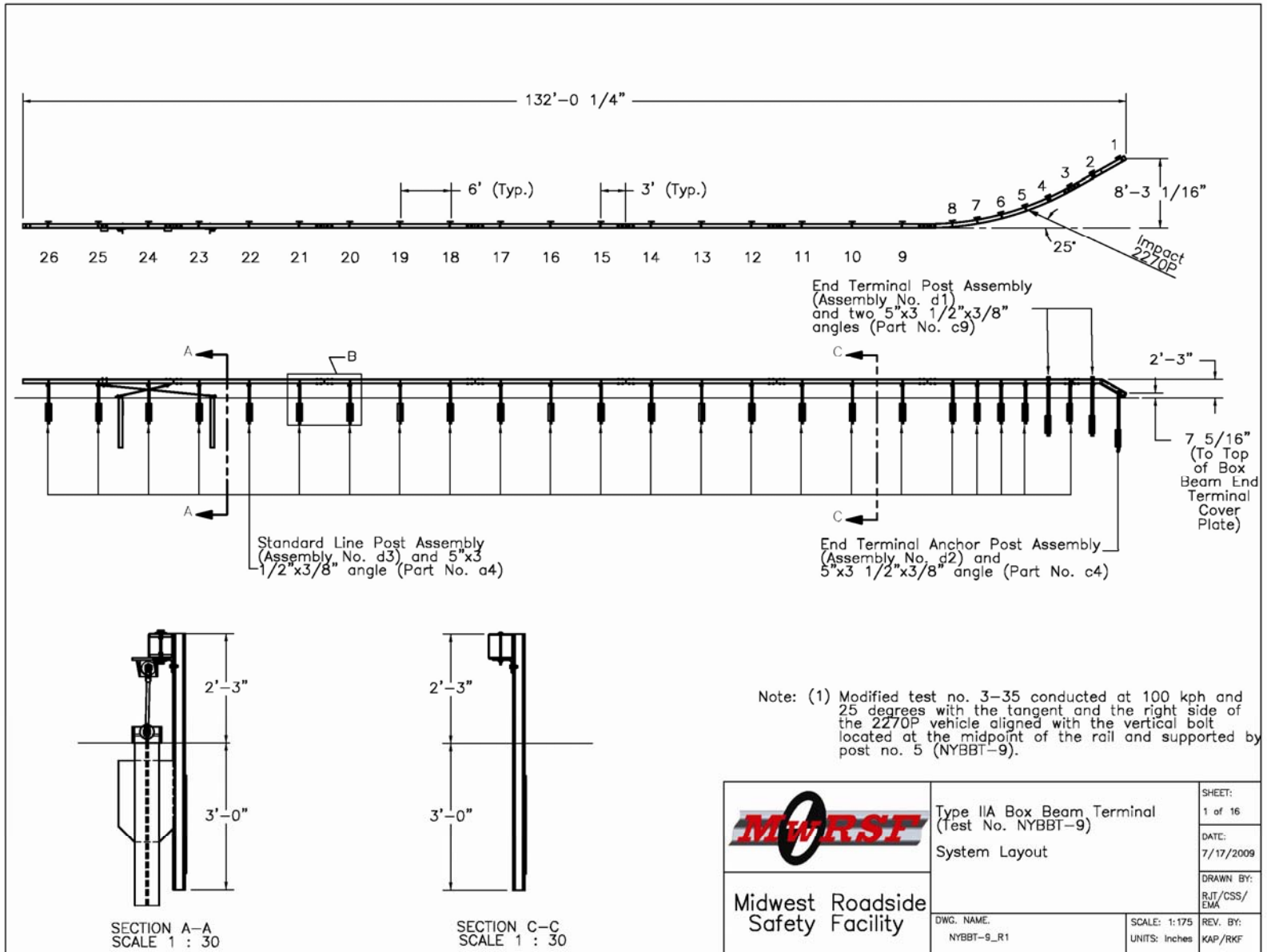


Figure T-17. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

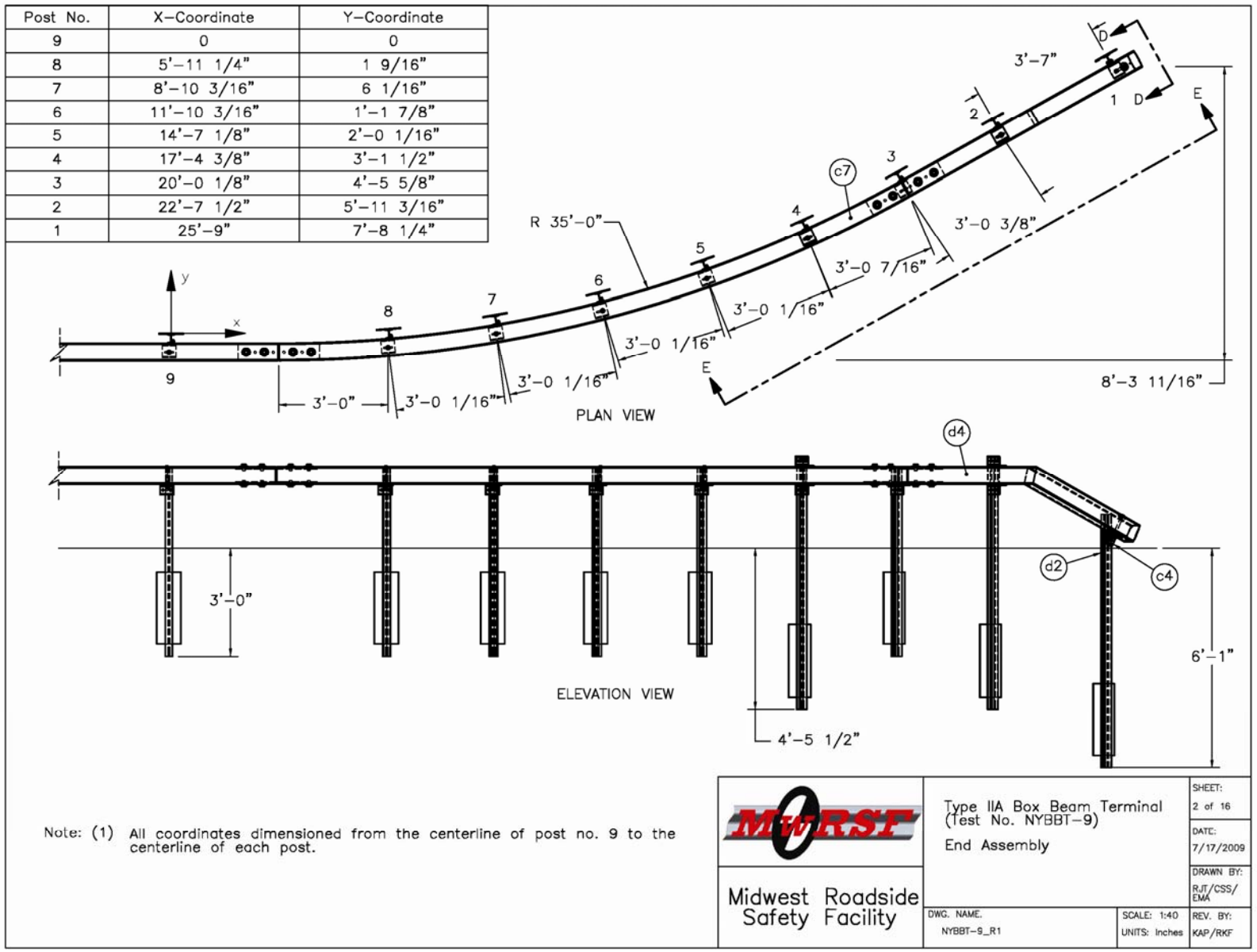


Figure T-18. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

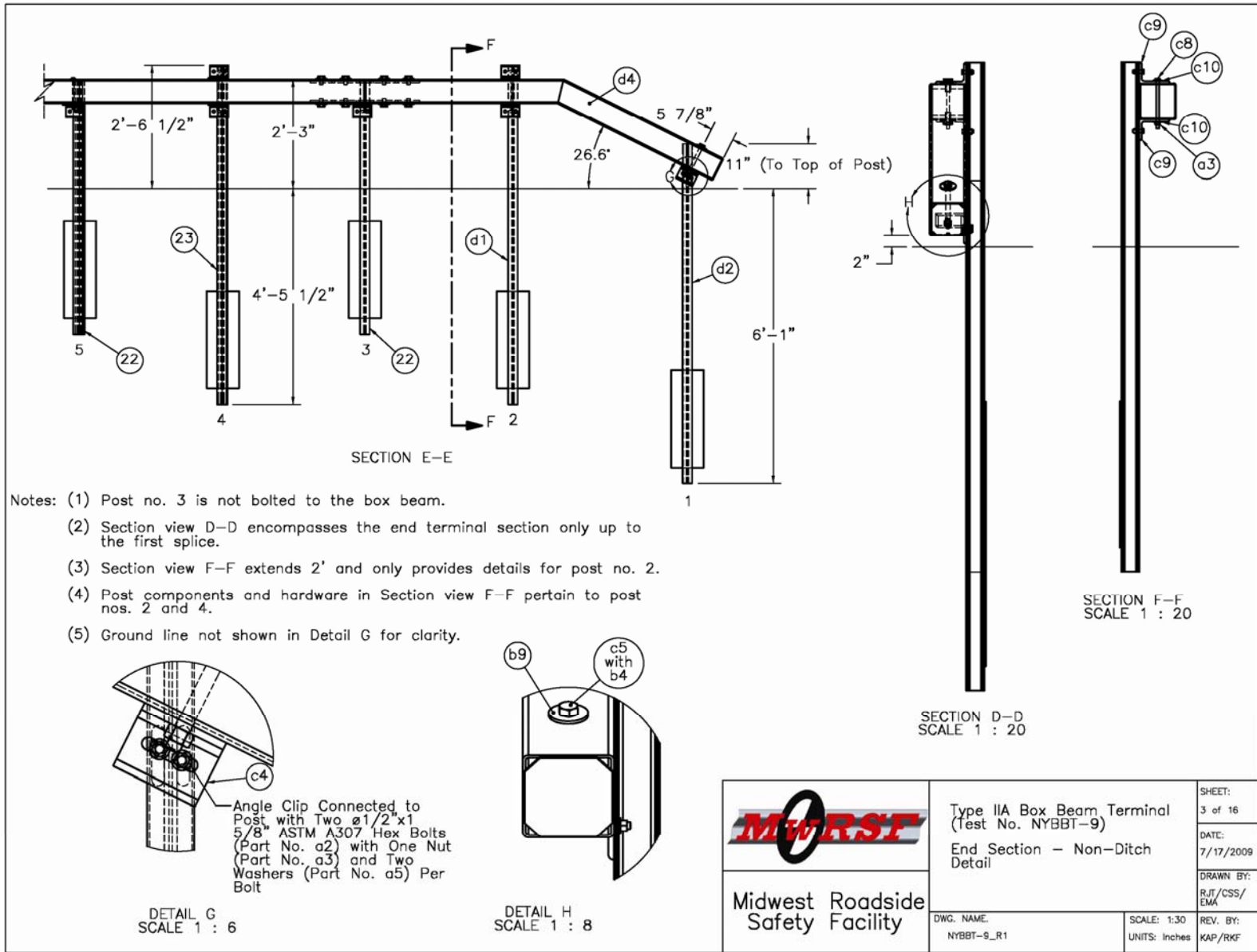


Figure T-19. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

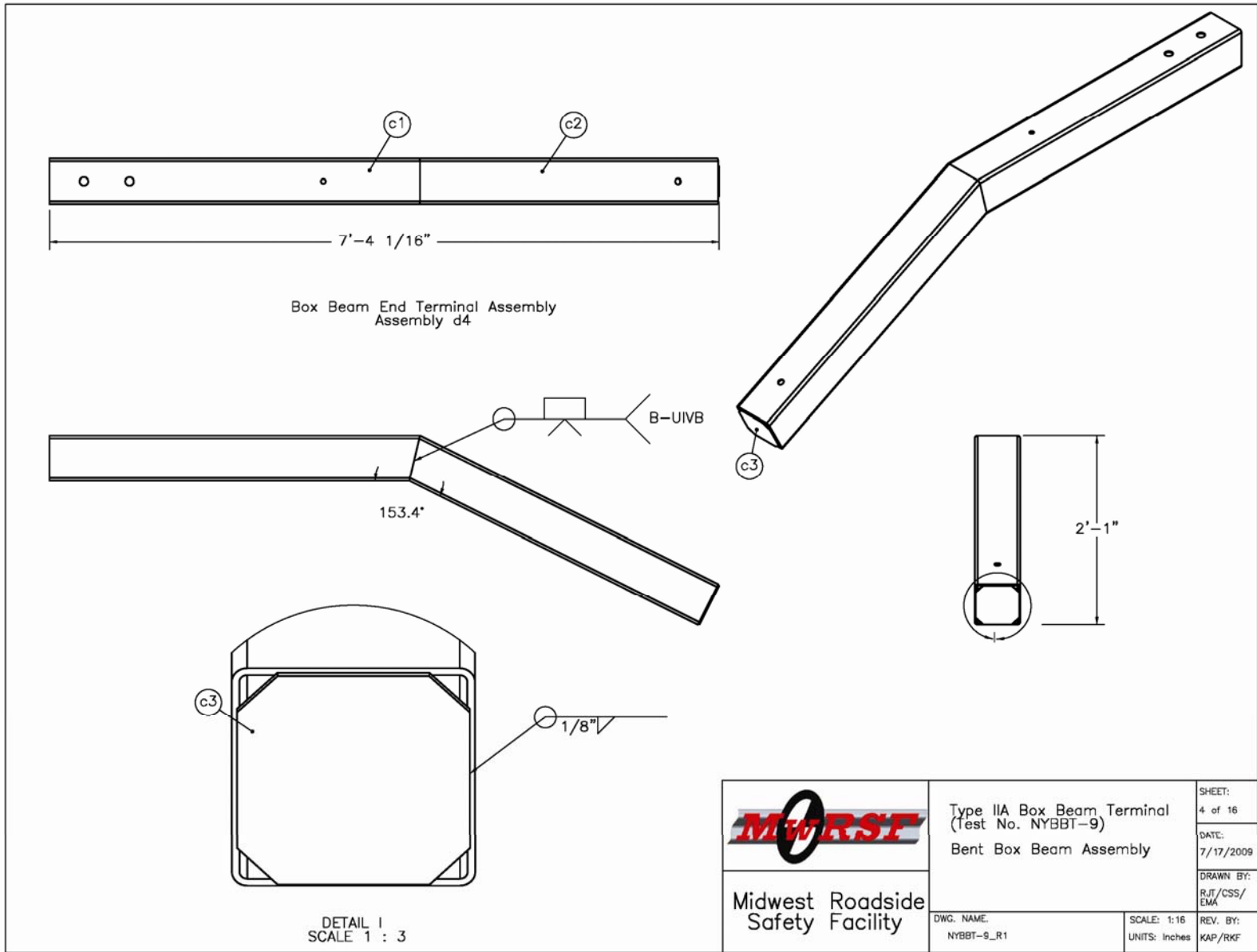


Figure T-20. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

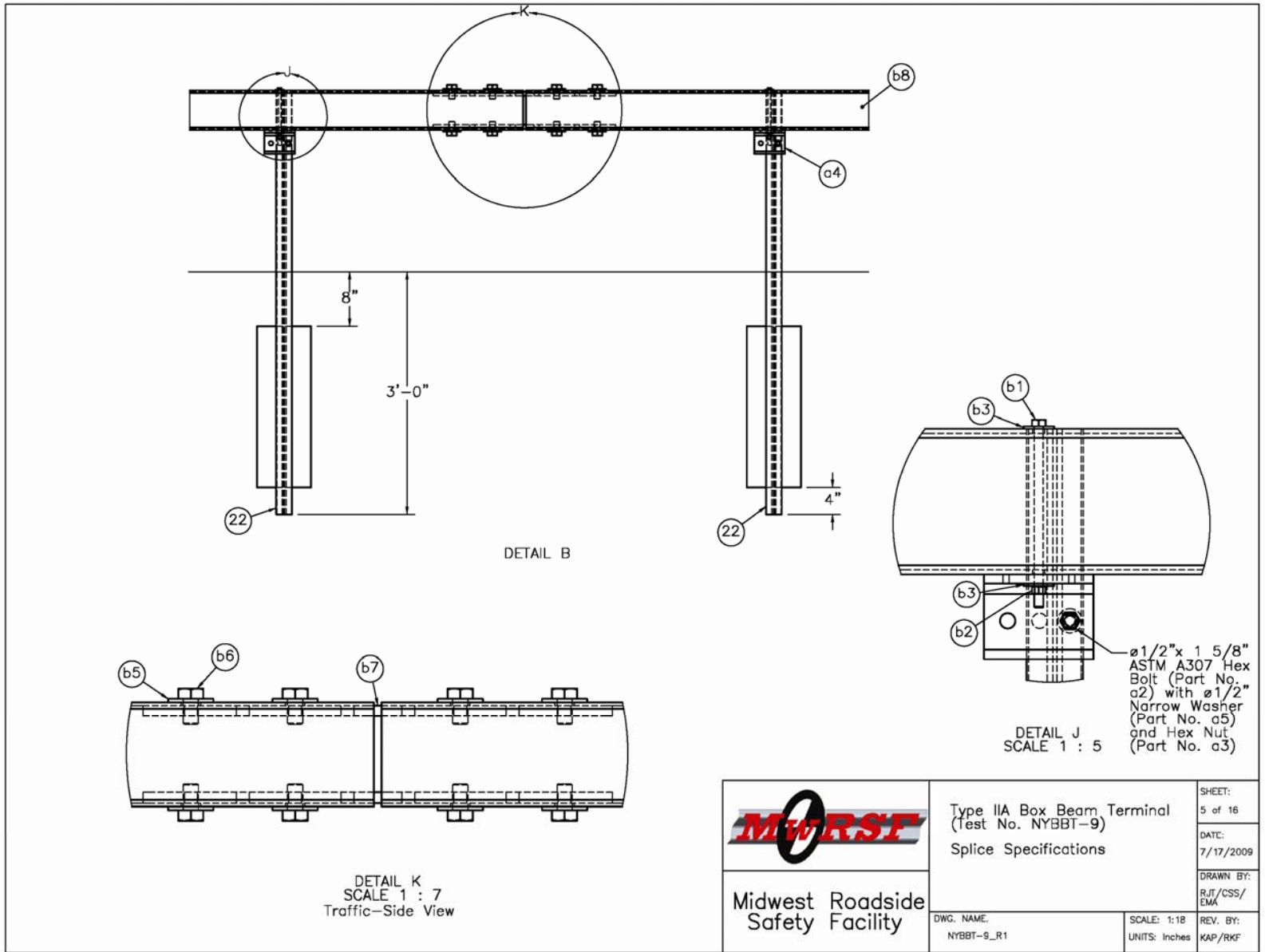


Figure T-21. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

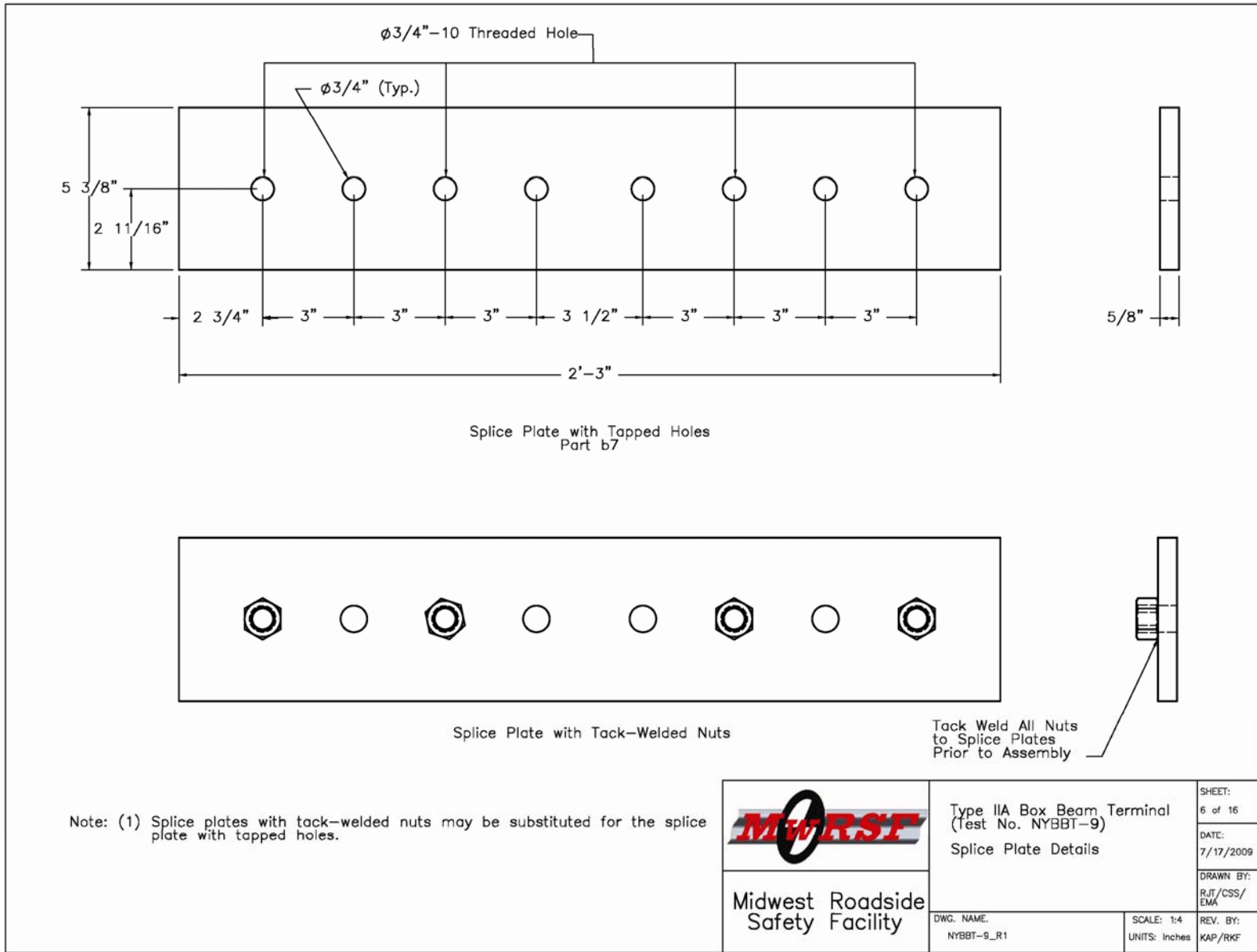


Figure T-22. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9



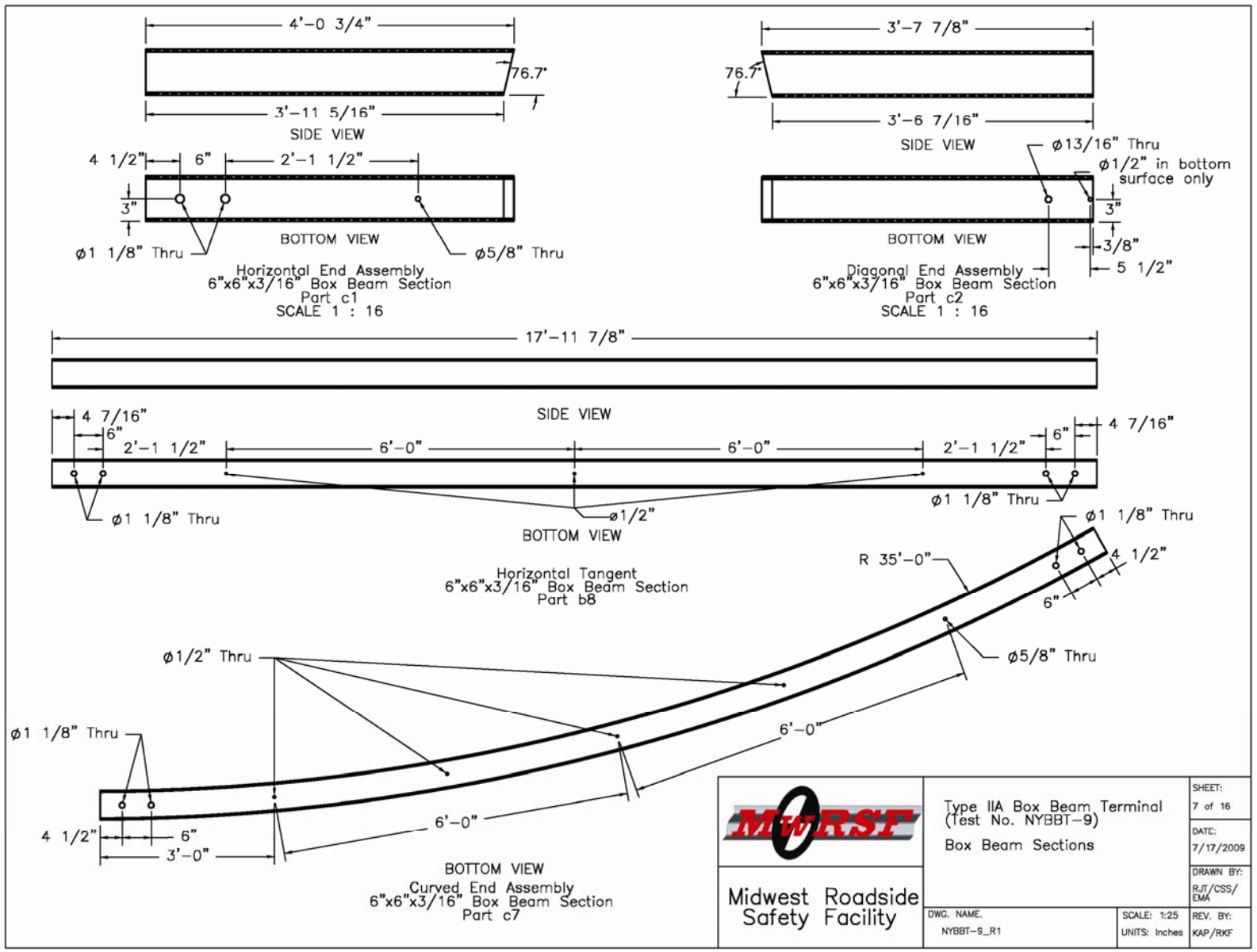


Figure T-23. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

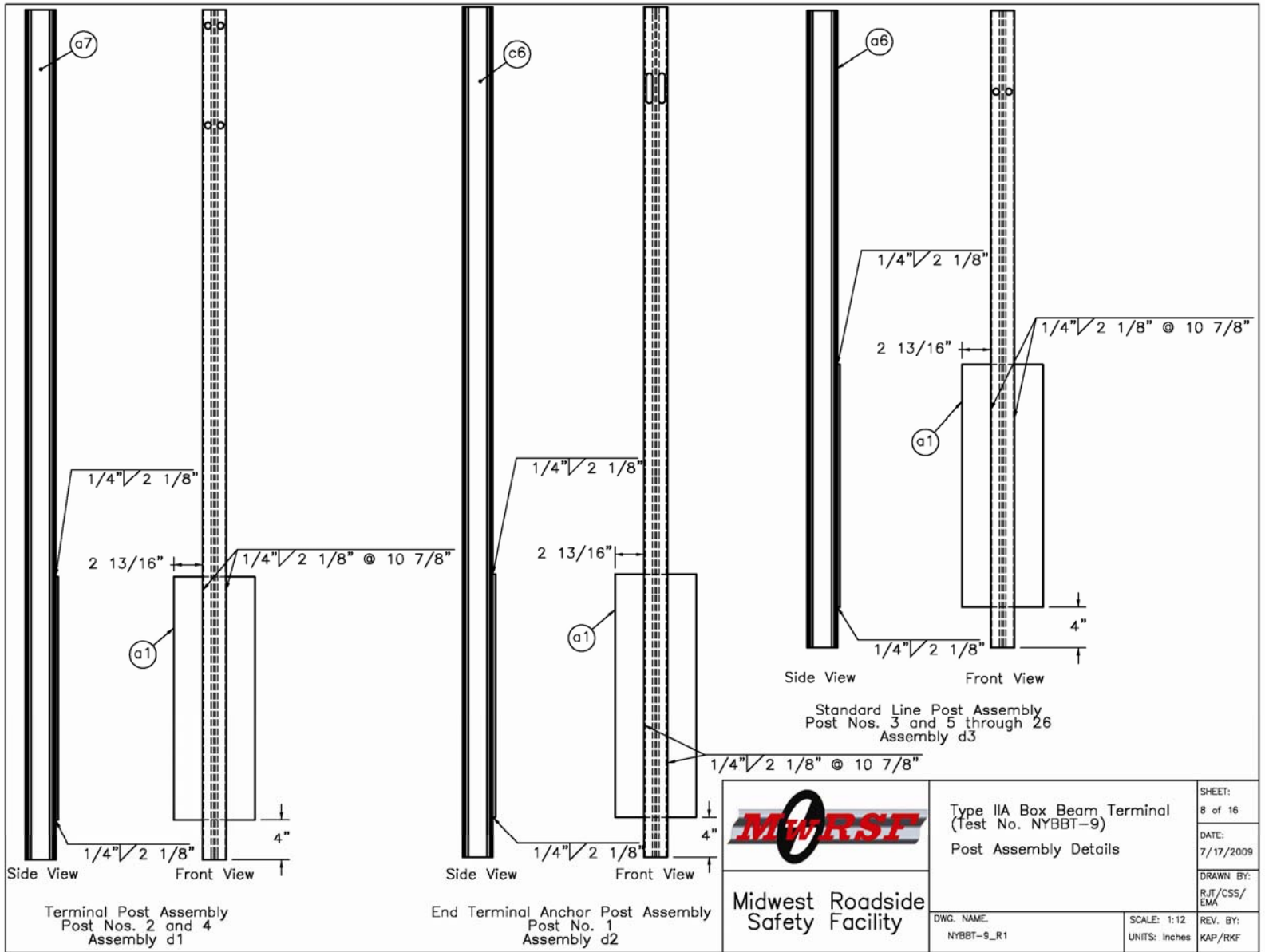


Figure T-24. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

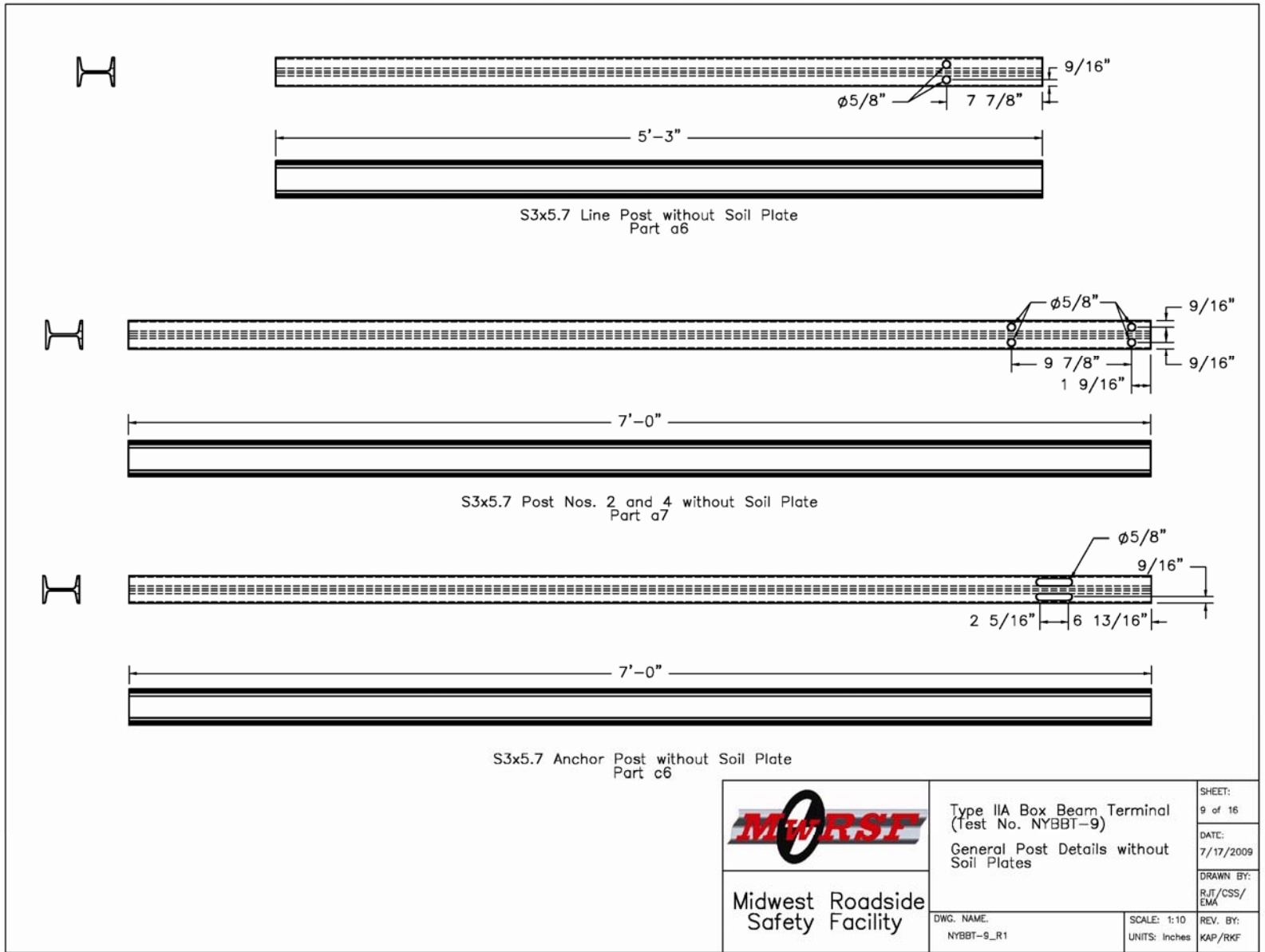


Figure T-25. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

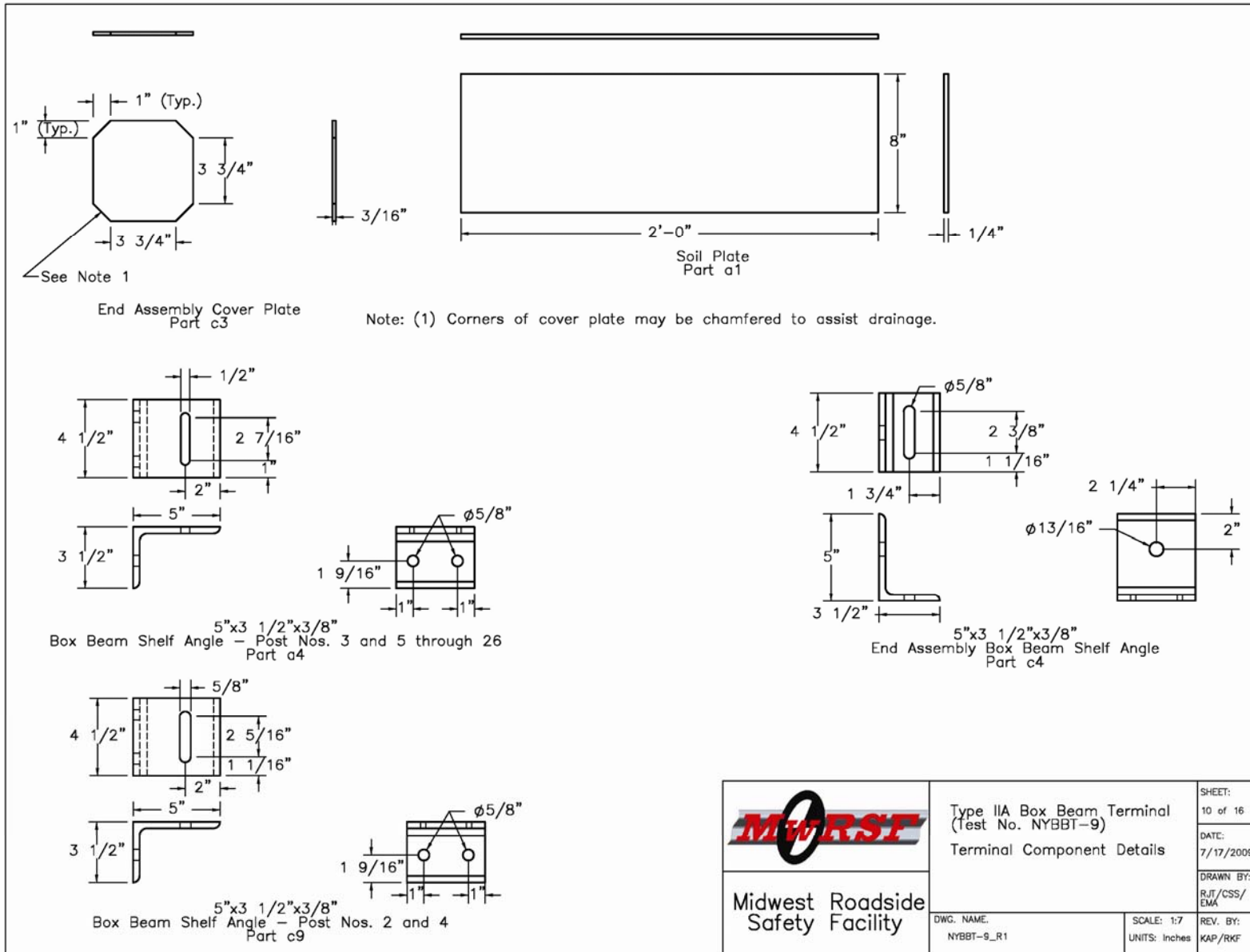


Figure T-26. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

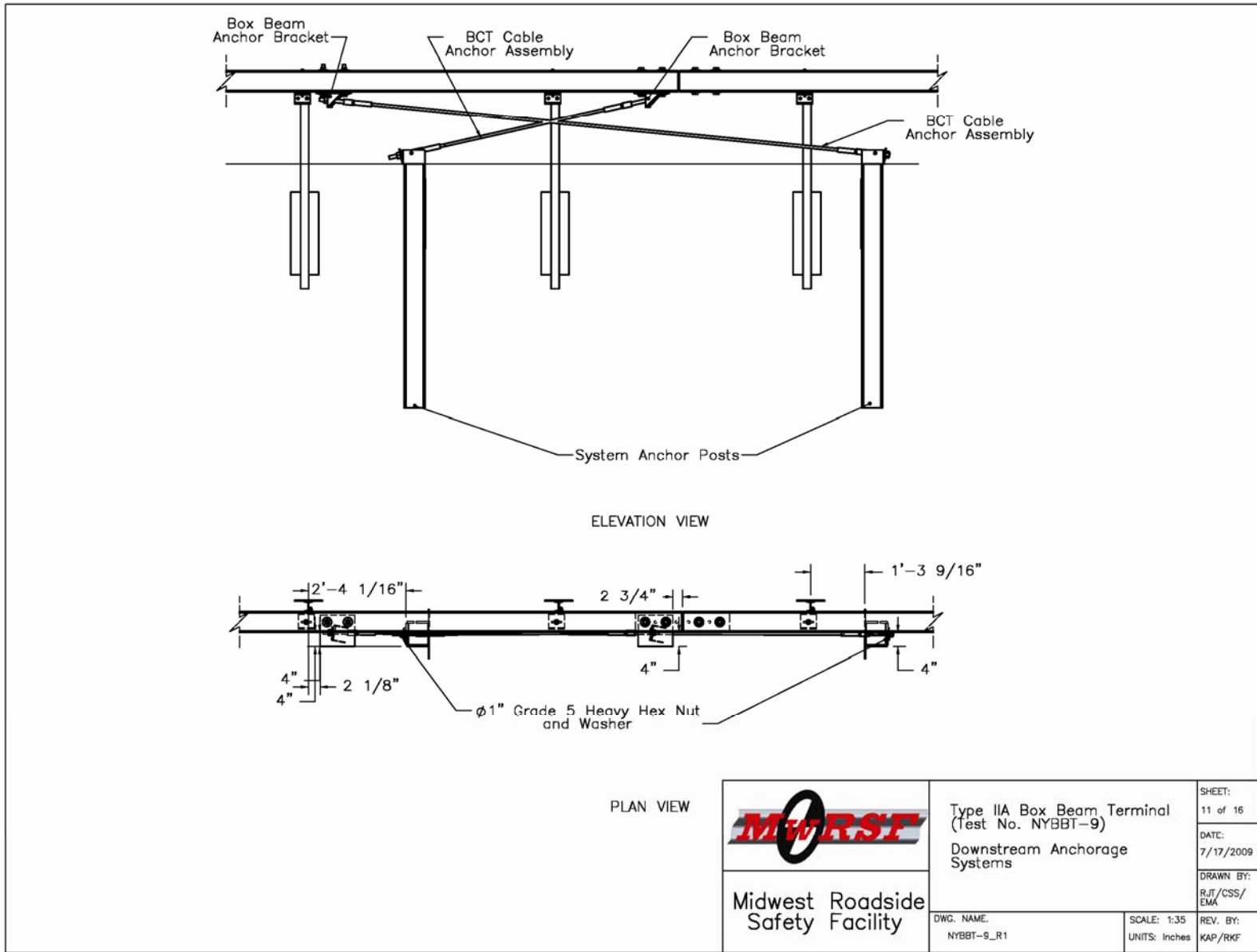


Figure T-27. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

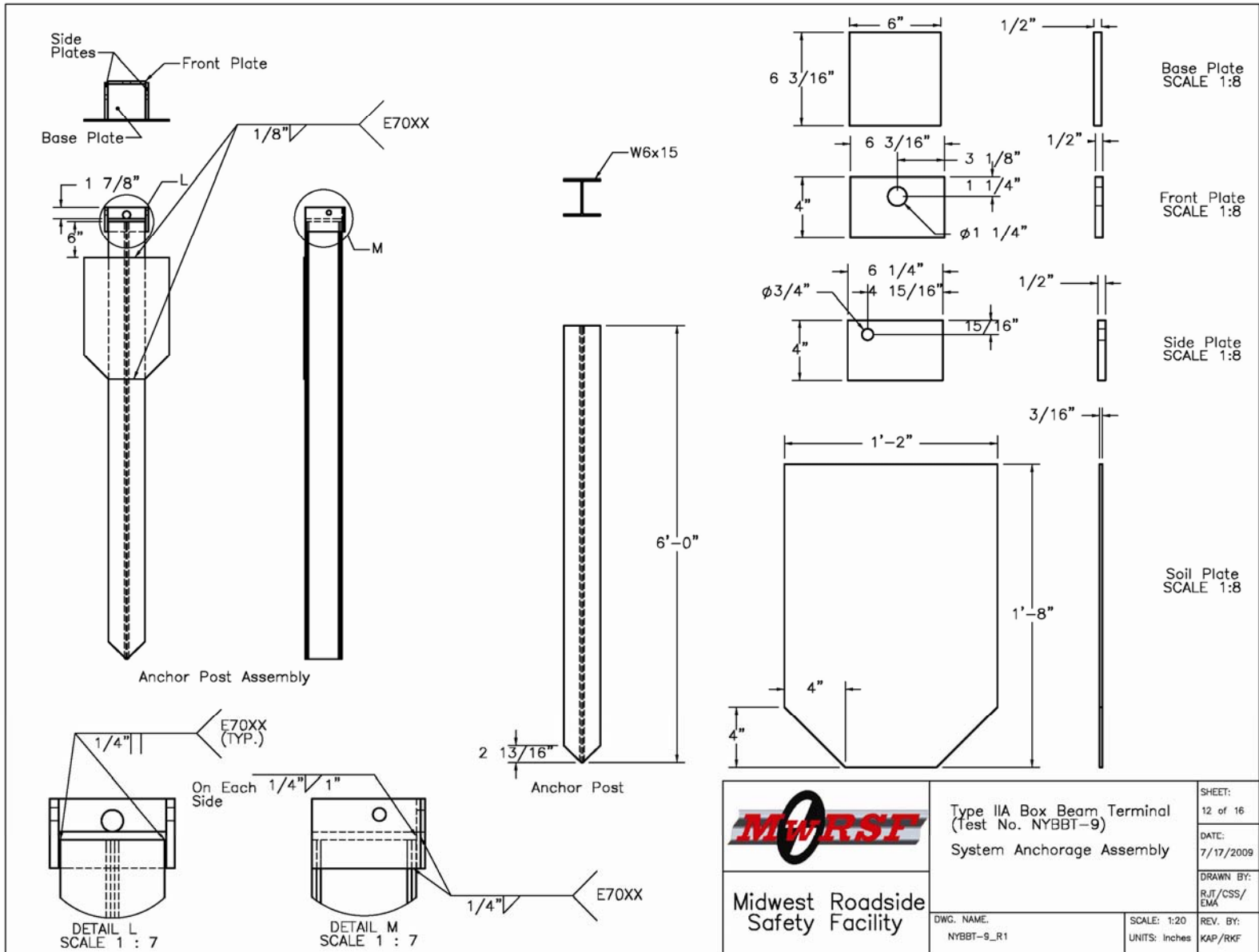


Figure T-28. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

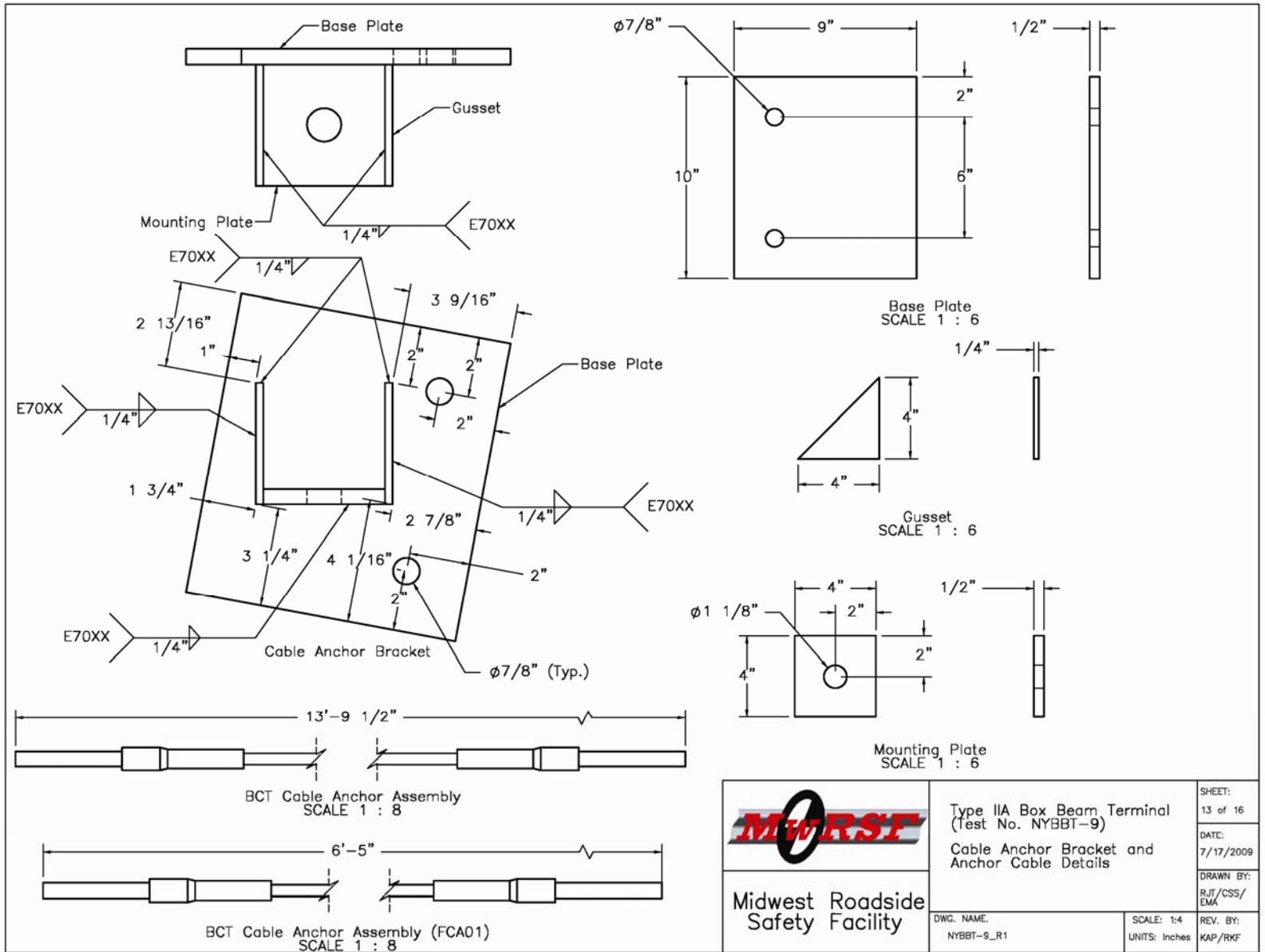


Figure T-29. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

Test No. NYBBT-9			
Item No.	Quantity	Description	Material Specifications
a1	26	1/4" x 8" x 2' steel soil plate	A36 Steel
a2	29	ø 1/2" coarse thread, 1 5/8" long hex bolt	ASTM A307
a3	31	ø 1/2" hex nut	ASTM A307
a4	23	5" x 3 1/2" x 3/8" box beam shelf angle	A36 Steel
a5	31	ø 1/2" narrow washer	ASTM A307
a6	23	S3 x 5.7, 63" long post	A36 Steel
a7	2	S3 x 5.7, 84" long post	A36 Steel
b1	22	ø 3/8" coarse thread, 7 1/2" long hex bolt	ASTM A307
b2	22	ø 3/8" hex nut	ASTM A307
b3	44	ø 3/8" wide washer	ASTM A307
b4	1	ø 3/4" hex nut	ASTM A307
b5	56	ø 3/4" wide washer	ASTM A325
b6	56	ø 3/4" coarse thread, 1 1/2" long hex bolt	ASTM A325
b7	14	27" x 5 3/8" x 5/8" splice plate	A36 Steel
b8	6	6" x 6" x 3/16" by 17'-11 7/8" long box beam	ASTM A500 Grade B
b9	1	ø 3/4" wide washer	ASTM A307
c1	1	End assembly bent 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c2	1	End assembly diagonal 6" x 6" x 3/16" box beam	ASTM A500 Grade B
c3	1	End assembly 3/16" thick cover plate	A36 Steel
c4	1	5" x 3 1/2" x 3/8" box beam anchor post shelf angle	A36 Steel
c5	1	ø 3/4" coarse thread, 8" long hex bolt	ASTM A307
c6	1	S3 x 5.7, 84" long post anchor post	A36 Steel
c7	1	6" x 6" x 3/16", R 35' Curved Box Beam	ASTM A500 Grade B
c8	2	ø 1/2" coarse thread, 8" long hex bolt	ASTM A307
c9	4	5" x 3 1/2" x 3/8" box beam shelf angle with ø 5/8" slot	A36 Steel
c10	4	ø 1/2" wide washer	ASTM A307
d1	2	Terminal Post Assembly	-
d2	1	Terminal Anchor Post Assembly	-
d3	23	Line Post Assembly	-
d4	1	Box Beam End Terminal Assembly	-

 Midwest Roadside Safety Facility	Type IIA Box Beam Terminal (Test No. NYBBT-9) Bill of Materials	SHEET: 14 of 16 DATE: 7/17/2009 DRAWN BY: R/J/CSS/ EMA
	DWG. NAME: NYBBT-9_R1	SCALE: None UNITS: Inches

Figure T-30. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9



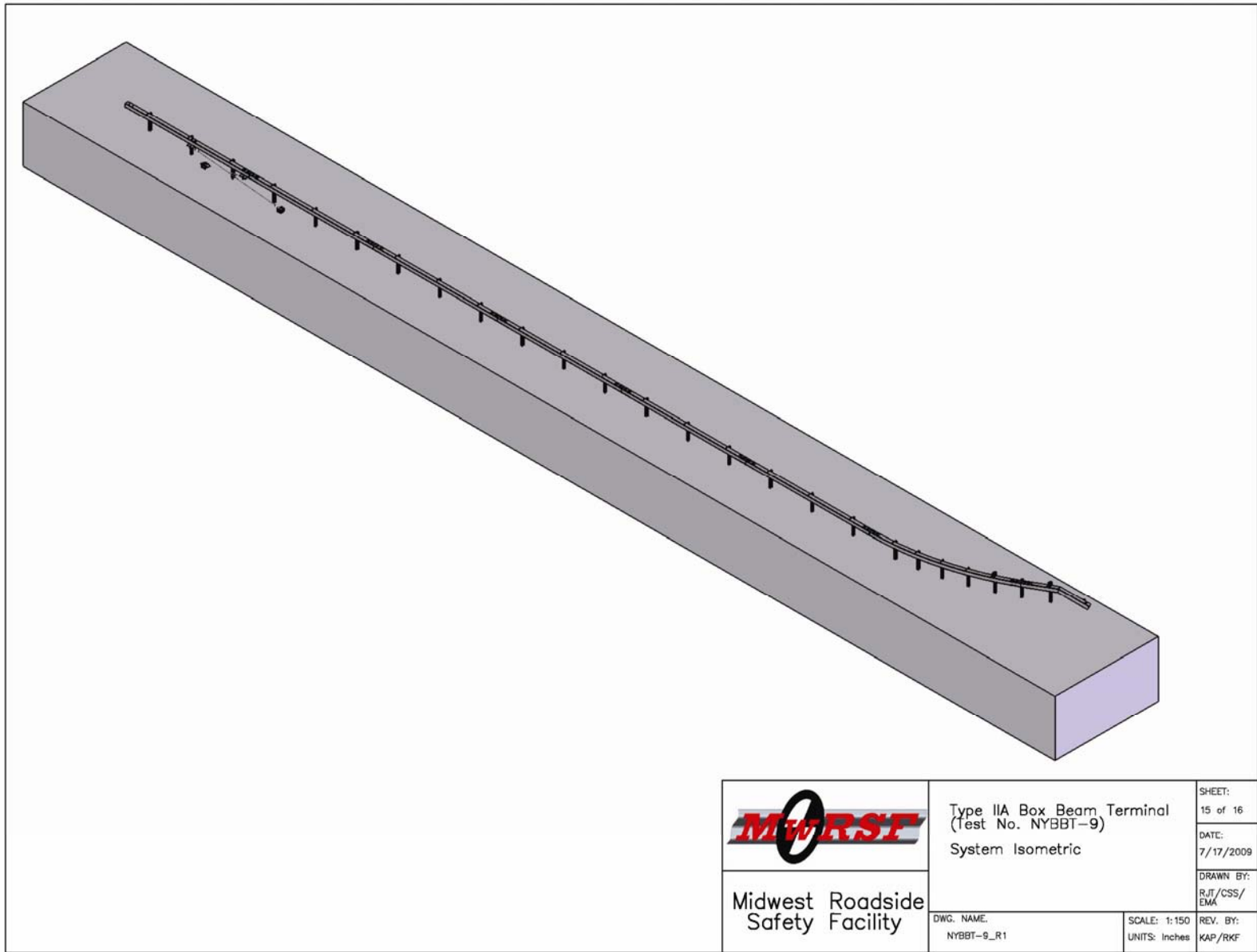


Figure T-31. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

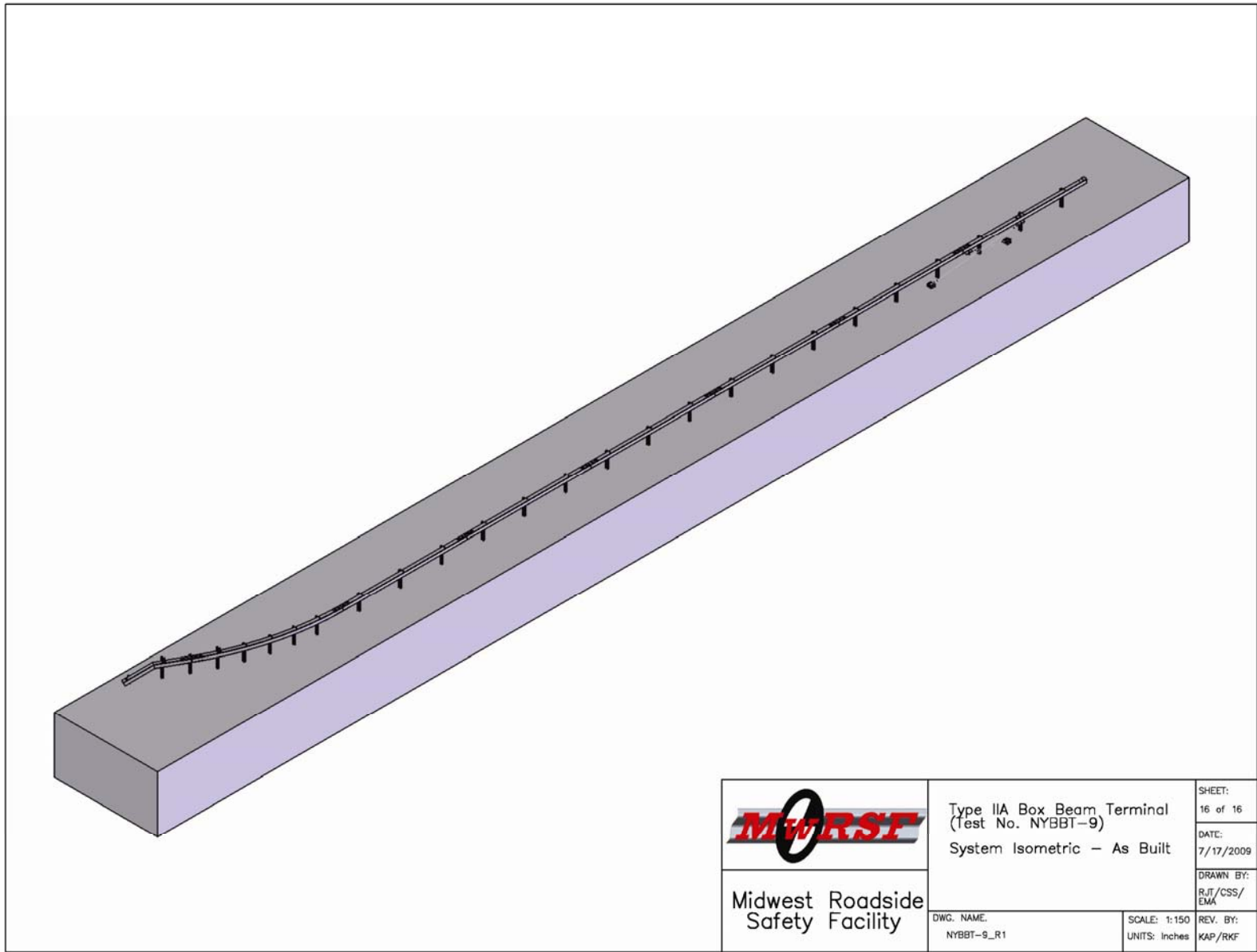


Figure T-32. Modified Type IIA Box Beam Terminal System Details (English), Test No. NYBBT-9

**APPENDIX U Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-8**

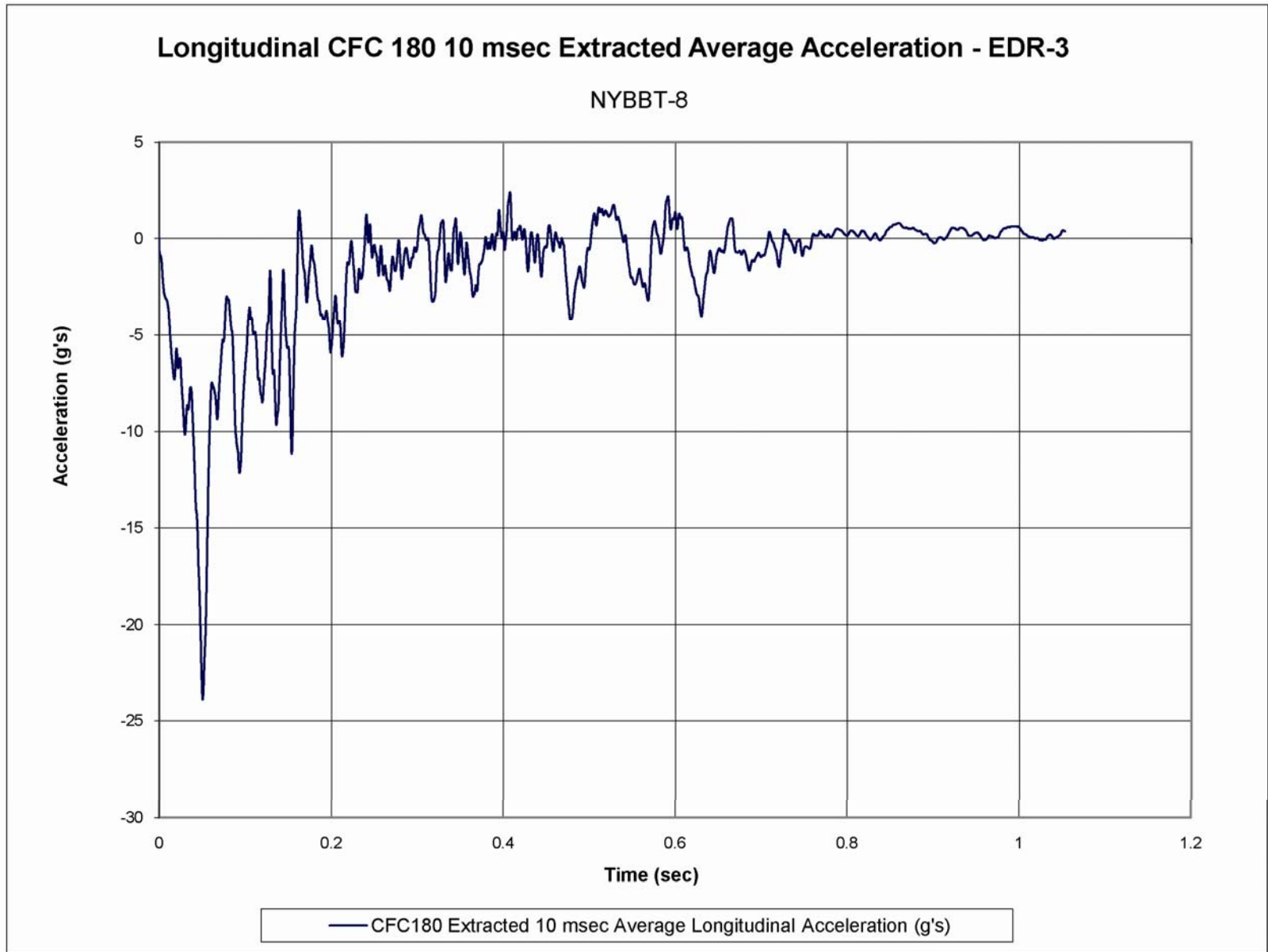


Figure U-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-8

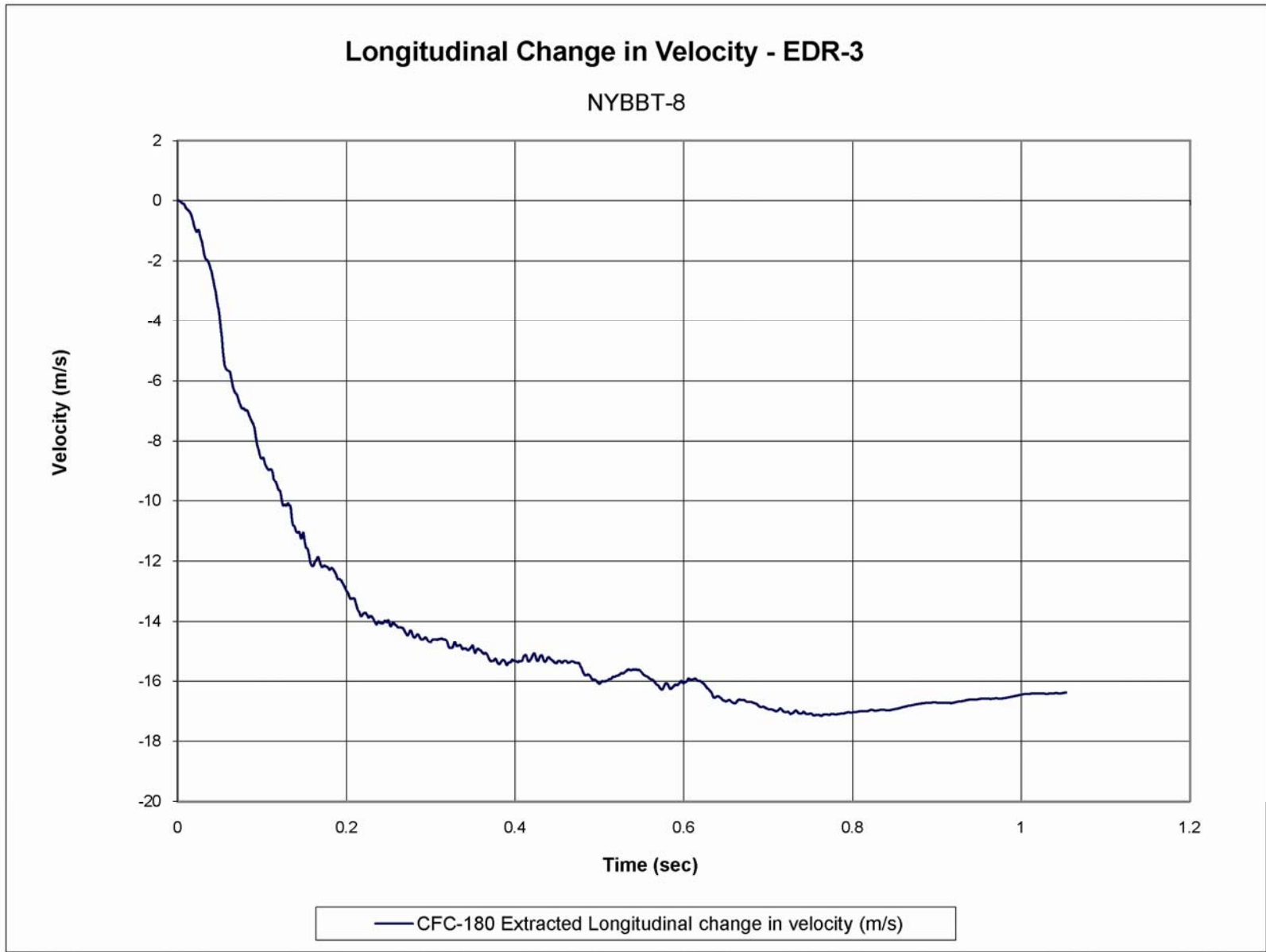


Figure U-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-8



Figure U-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-8

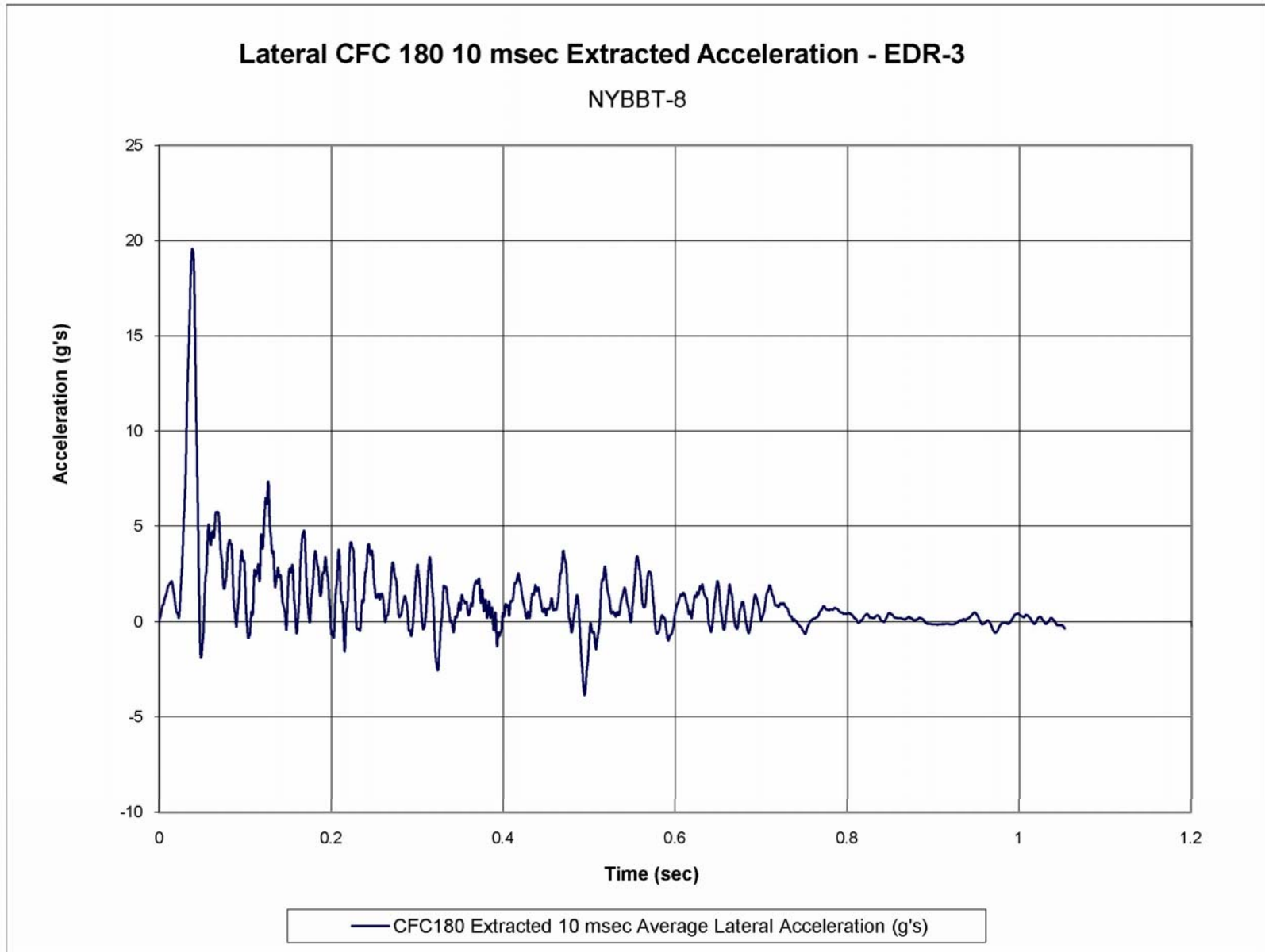


Figure U-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-8

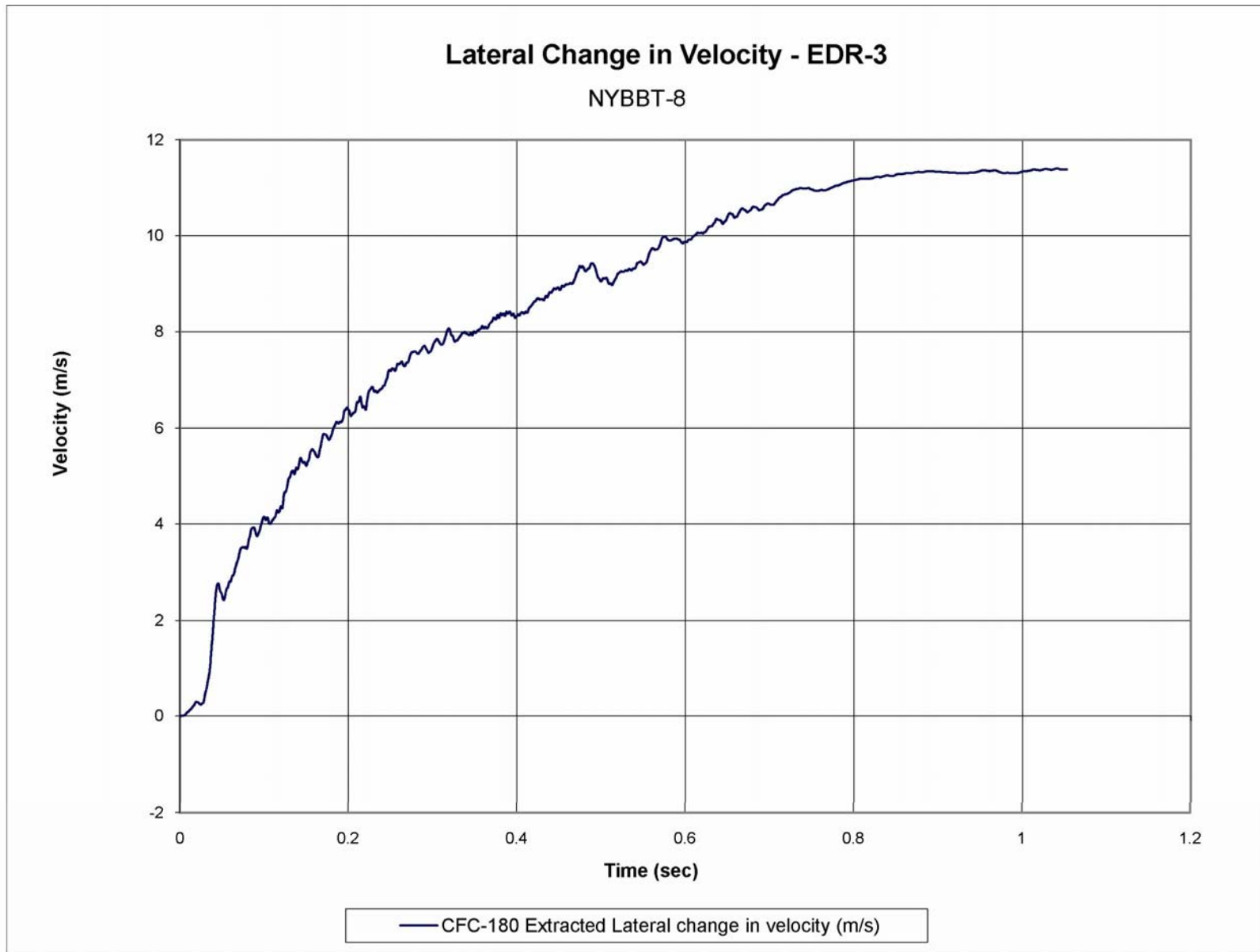


Figure U-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-8



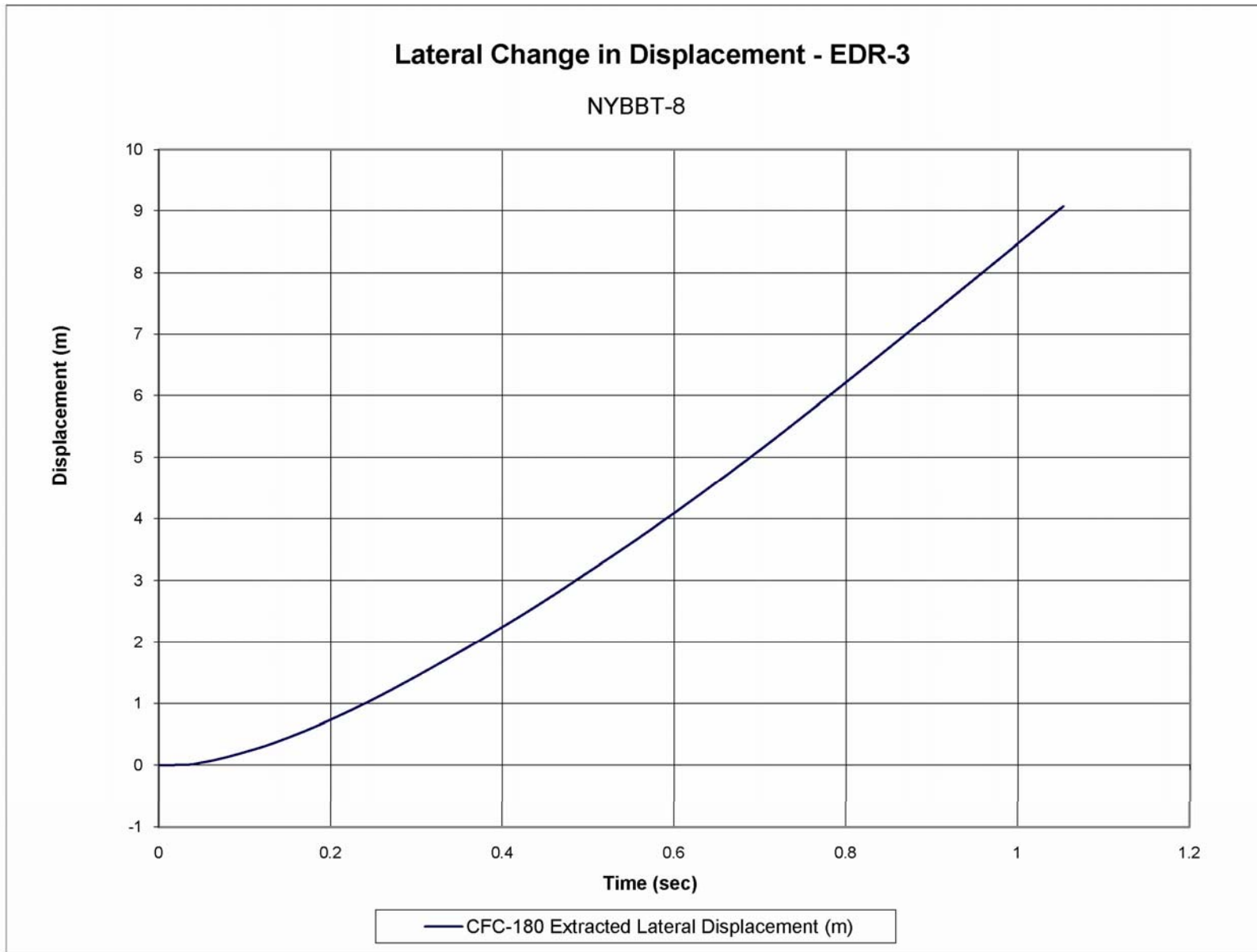


Figure U-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-8

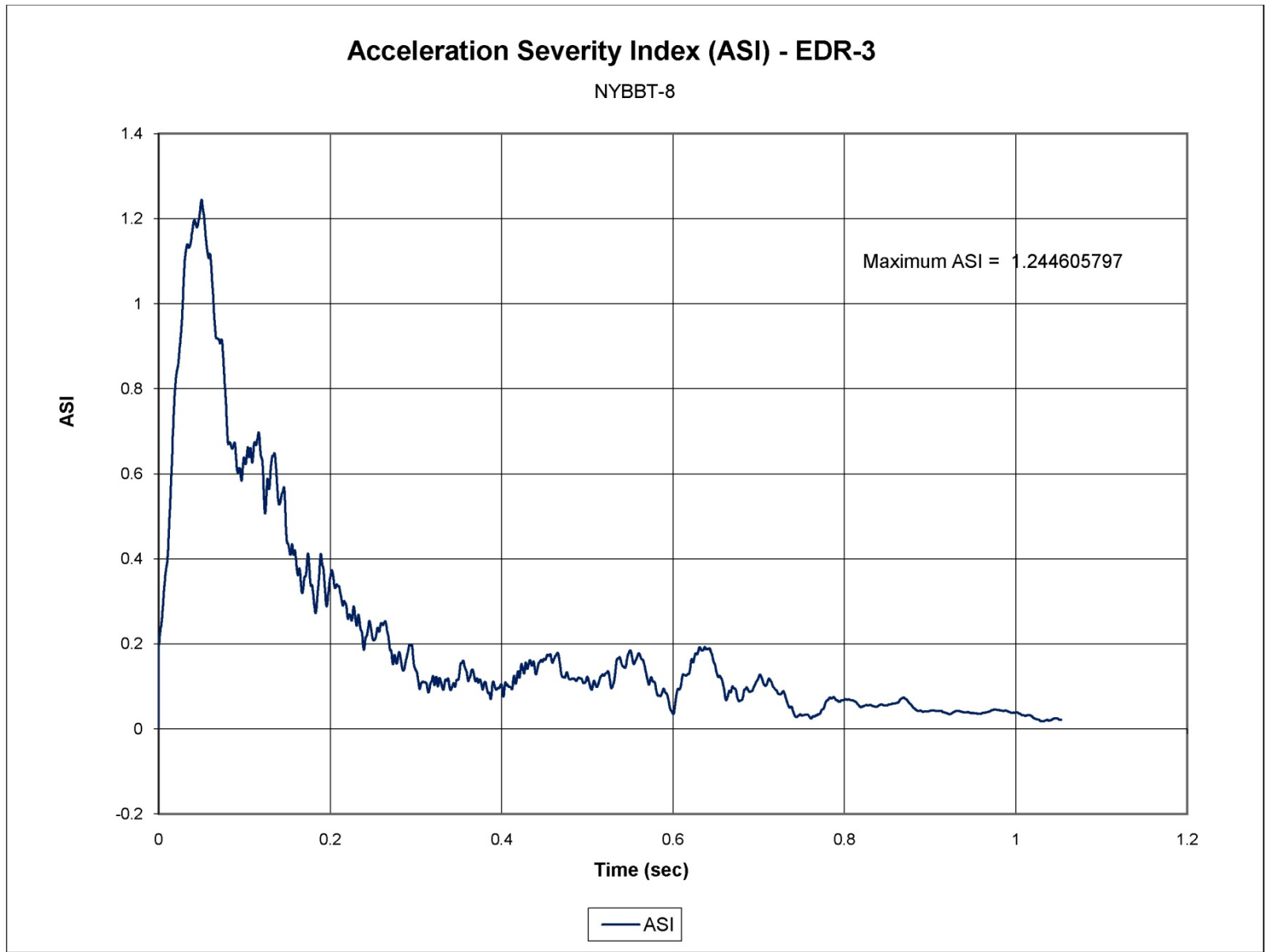


Figure U-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-8

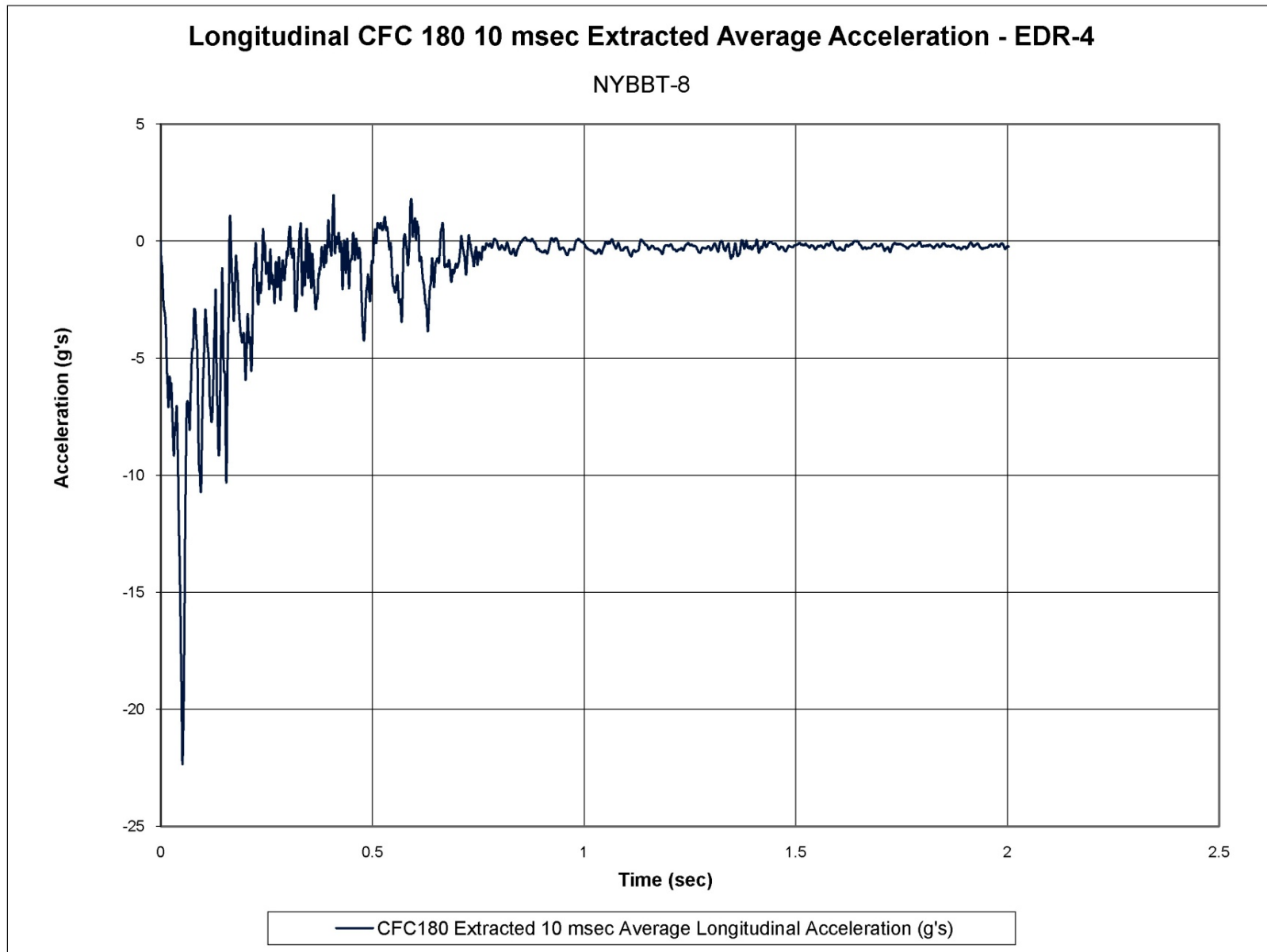


Figure U-8. Graph of Longitudinal Occupant Deceleration (EDR-4), Test No. NYBBT-8

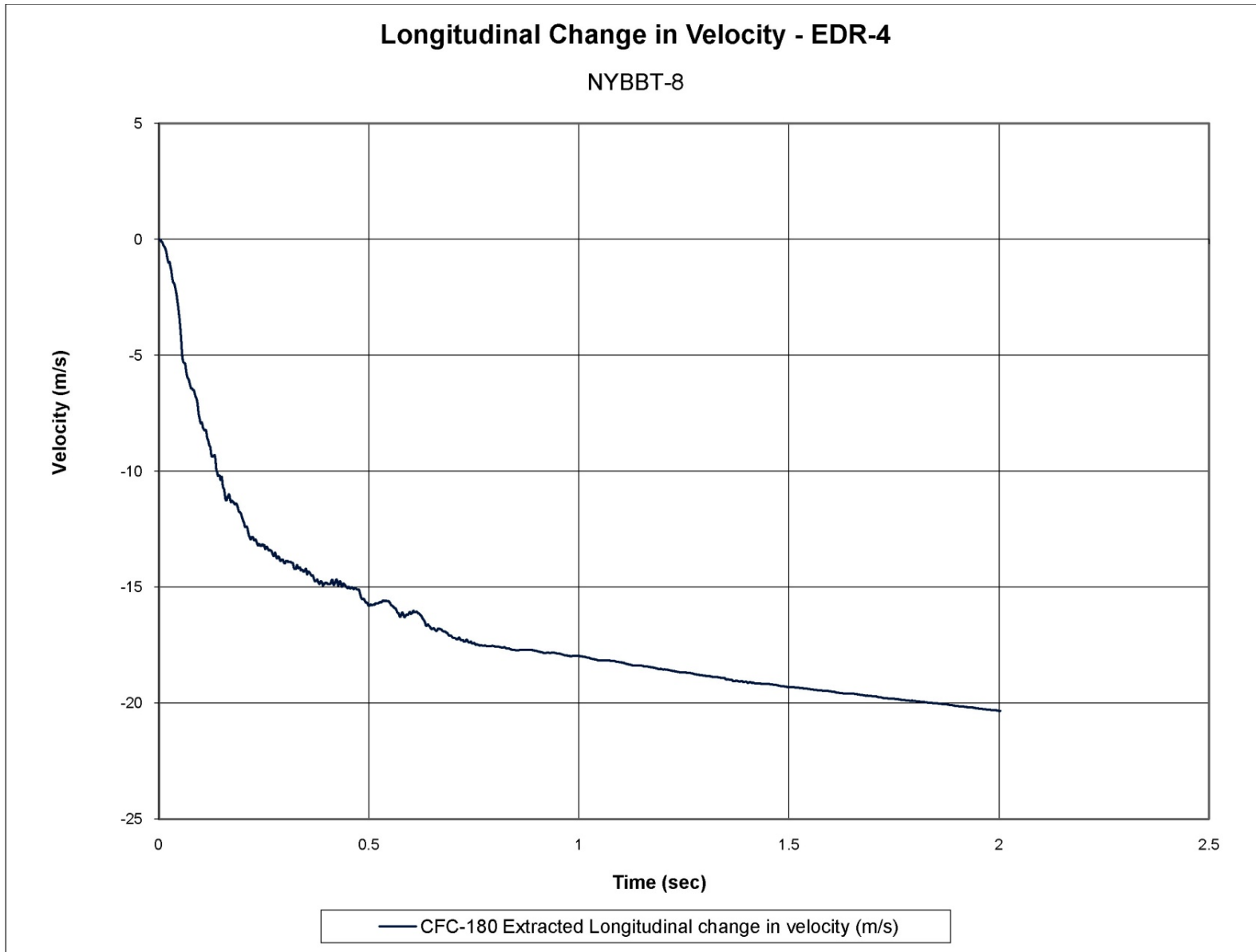


Figure U-9. Graph of Longitudinal Occupant Impact Velocity (EDR-4), Test No. NYBBT-8

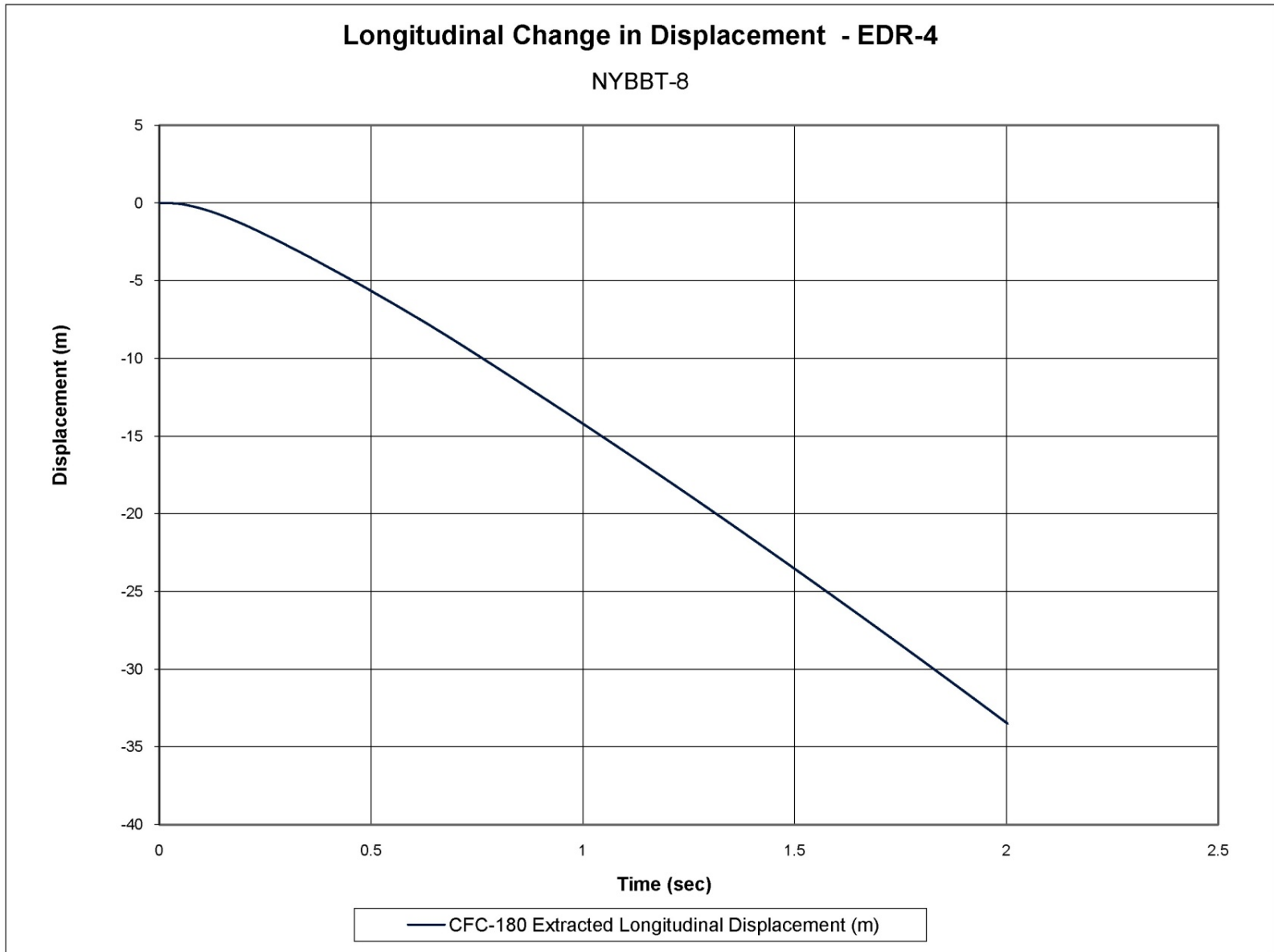


Figure U-10. Graph of Longitudinal Occupant Displacement (EDR-4), Test No. NYBBT-8

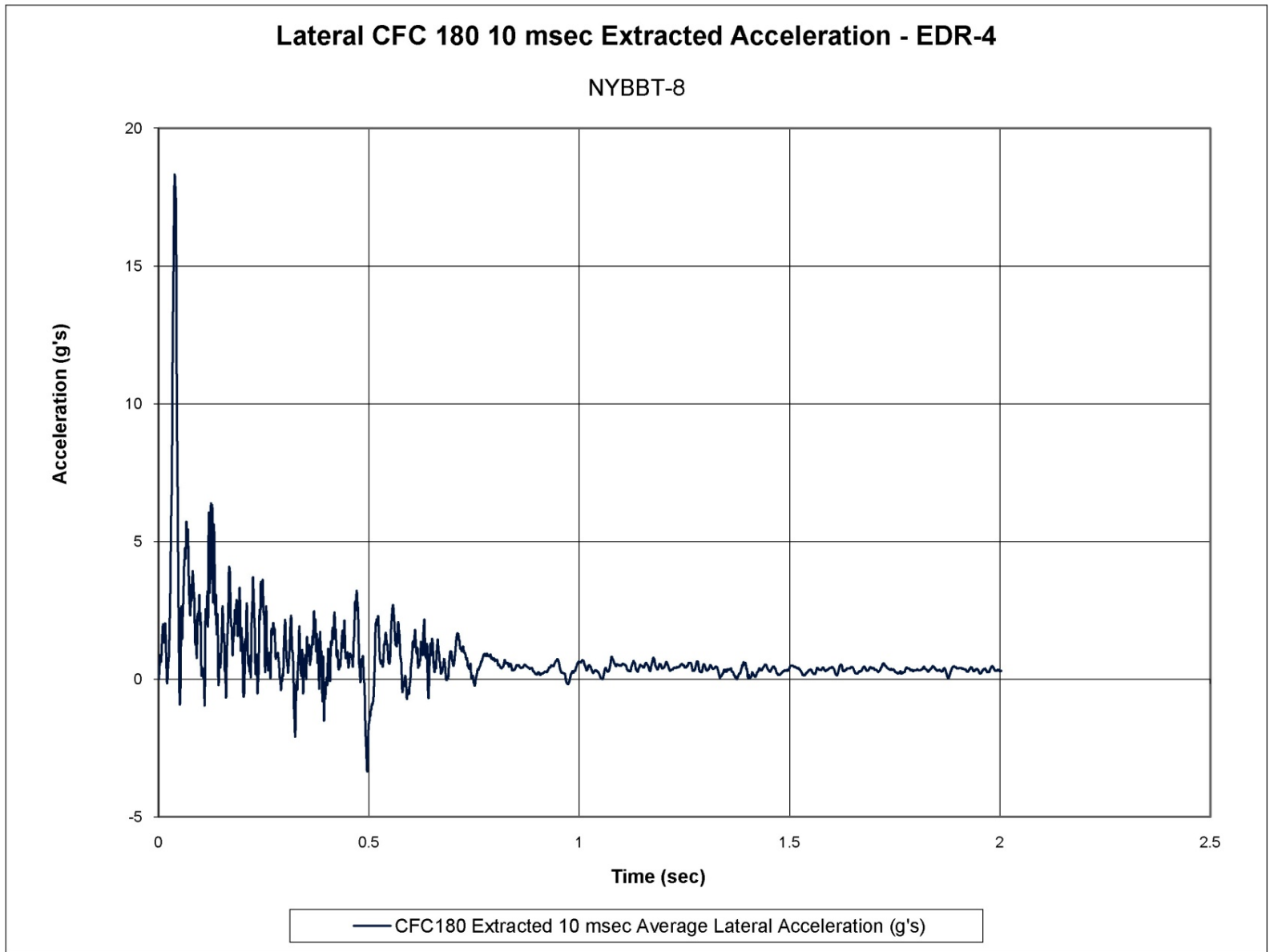


Figure U-11. Graph of Lateral Occupant Deceleration (EDR-4), Test No. NYBBT-8

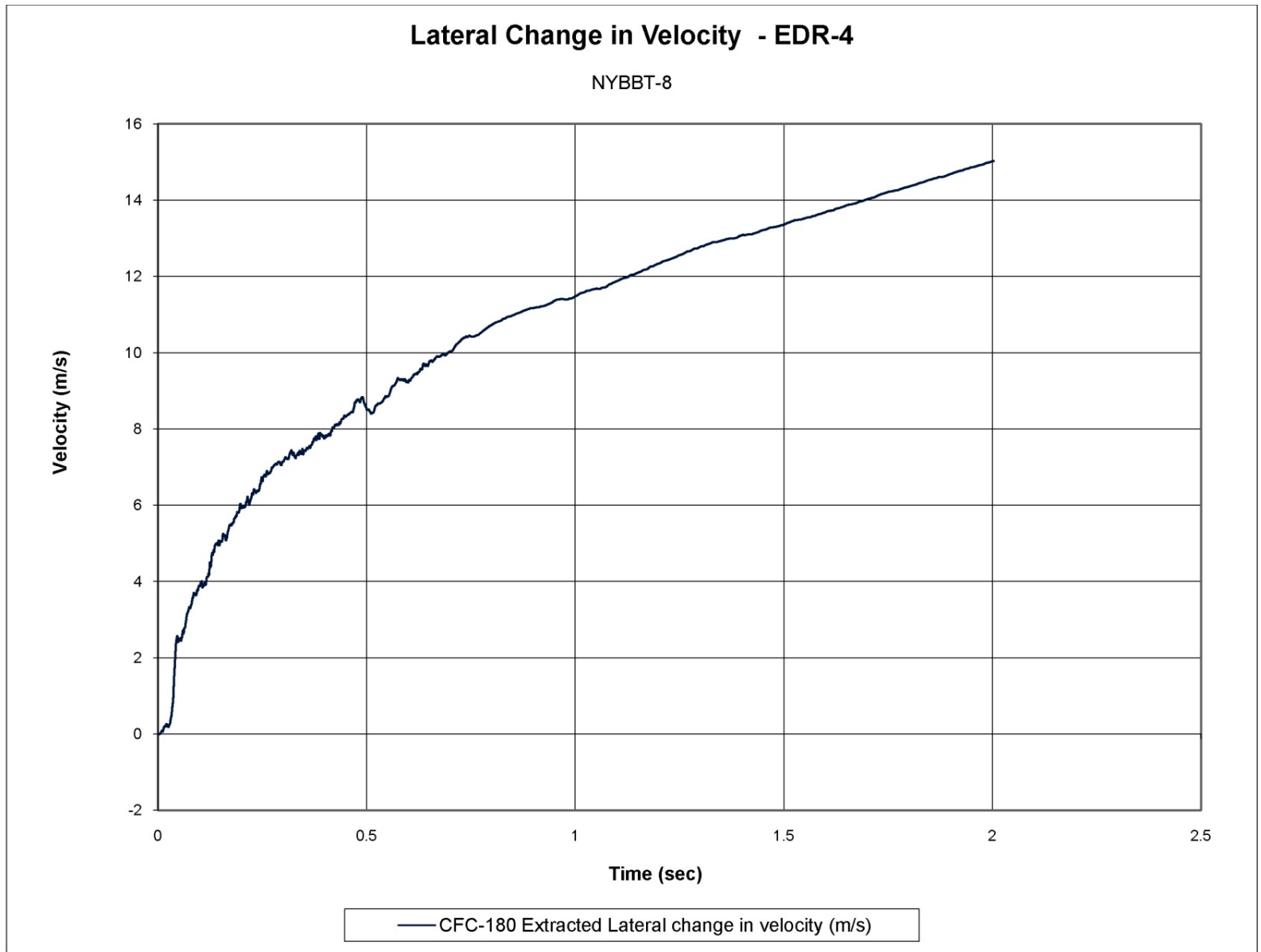


Figure U-12. Graph of Lateral Occupant Impact Velocity (EDR-4), Test No. NYBBT-8

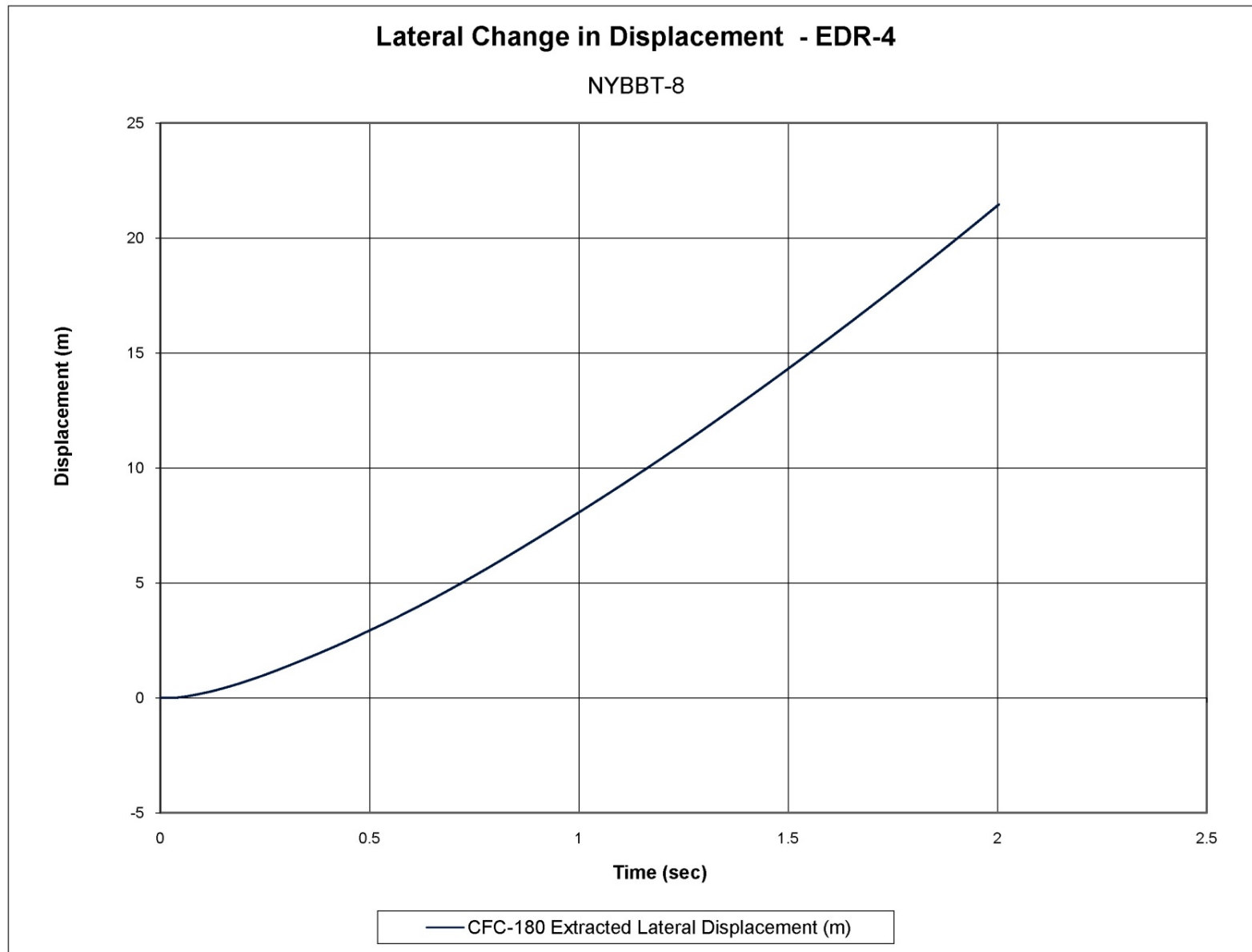


Figure U-13. Graph of Lateral Occupant Displacement (EDR-4), Test No. NYBBT-8



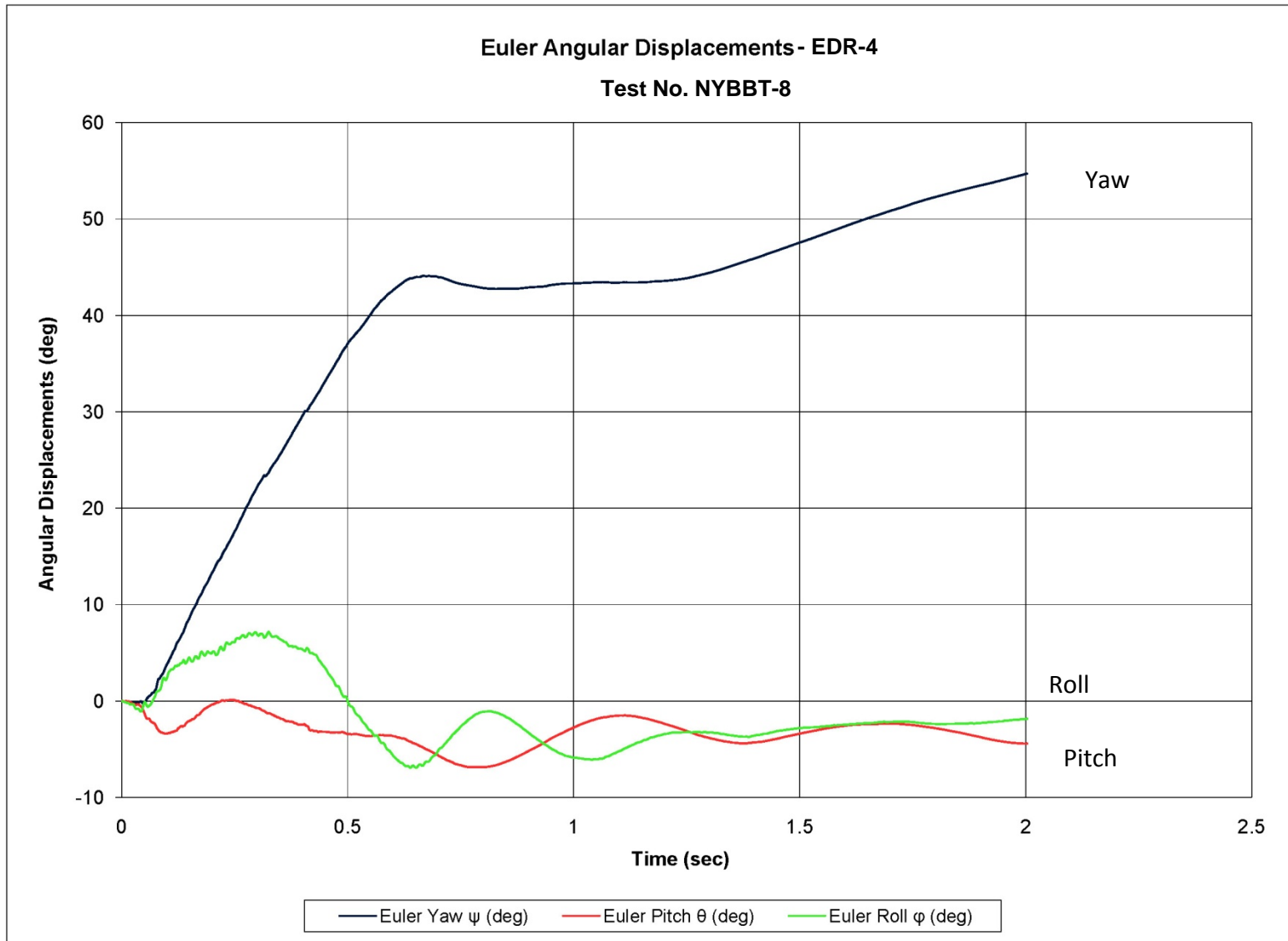


Figure U-14. Graph of Roll, Pitch, and Yaw Angular Displacement (EDR-4), Test No. NYBBT-8

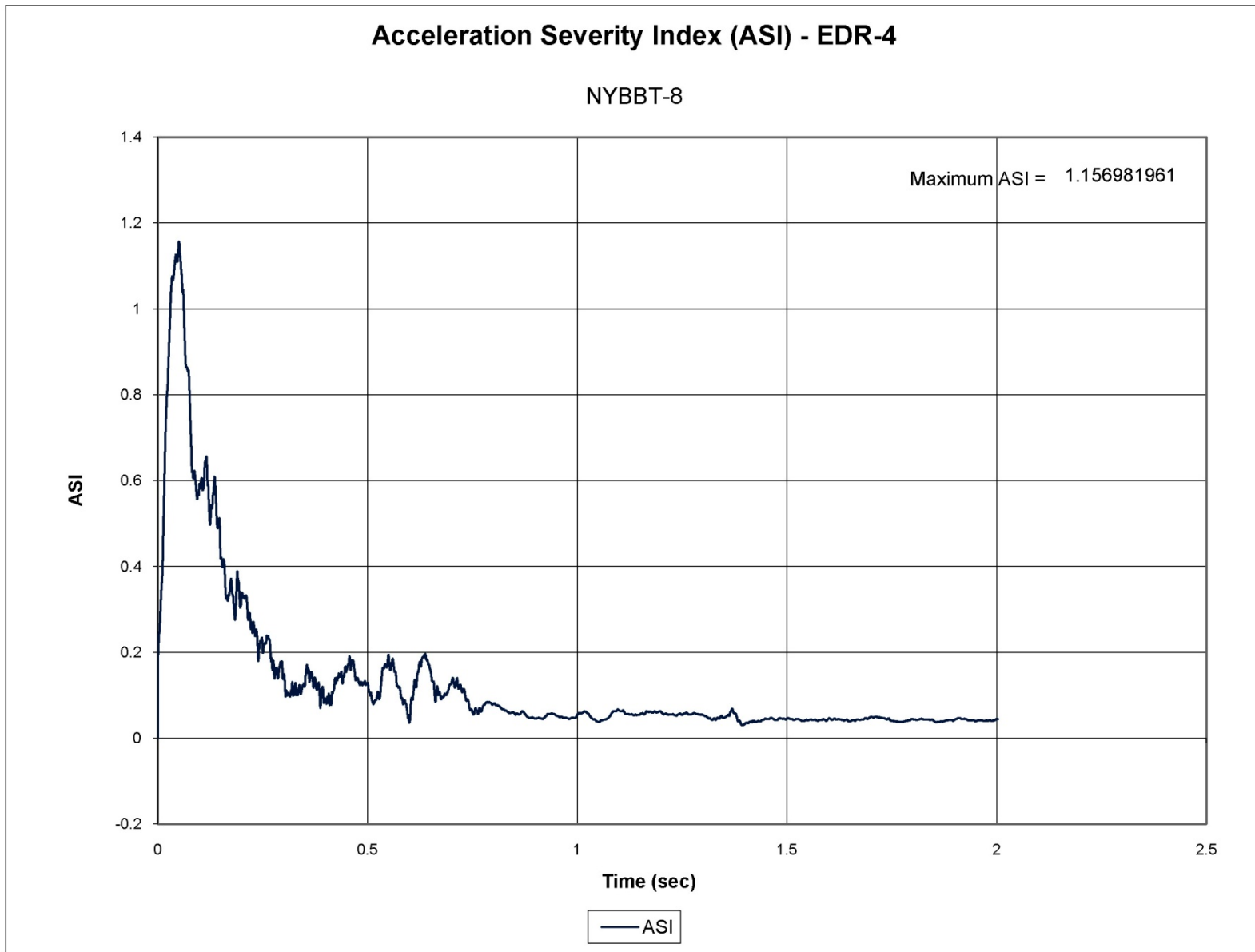


Figure U-15. Graph of Acceleration Severity Index (EDR-4), Test No. NYBBT-8

**APPENDIX V Accelerometer and Rate Transducer Data Analysis, Test No. NYBBT-9**

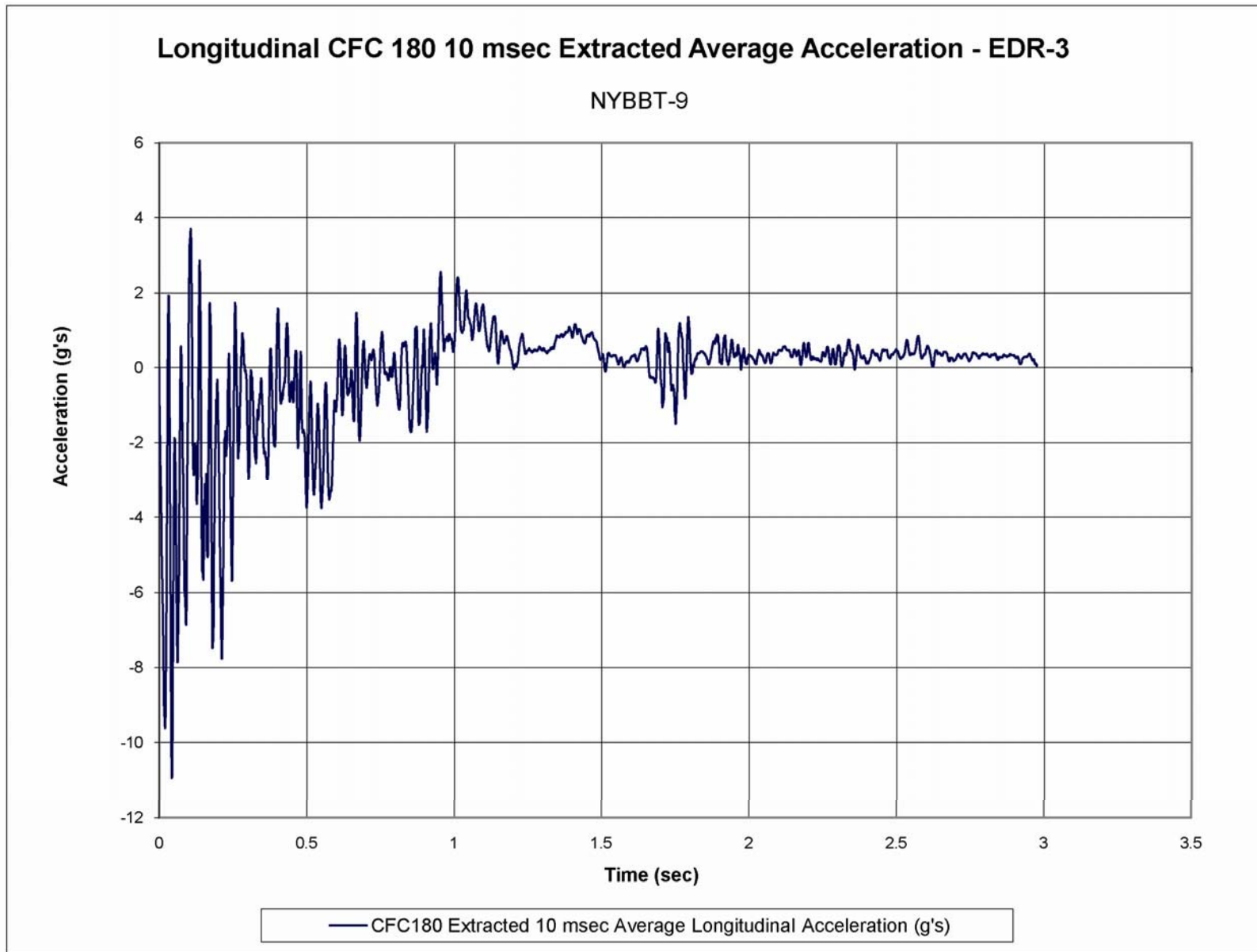


Figure V-1. Graph of Longitudinal Occupant Deceleration (EDR-3), Test No. NYBBT-9

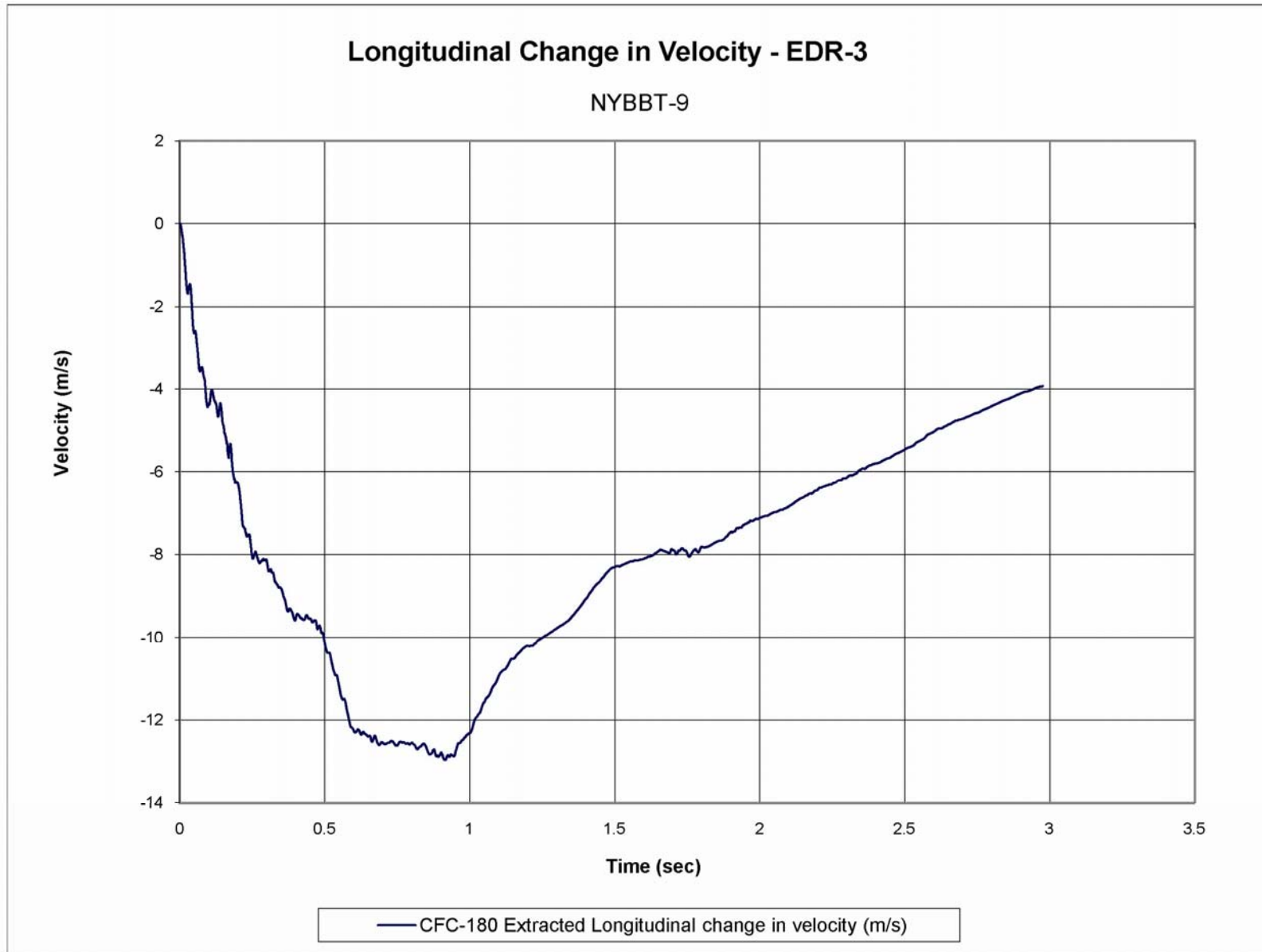


Figure V-2. Graph of Longitudinal Occupant Impact Velocity (EDR-3), Test No. NYBBT-9



Figure V-3. Graph of Longitudinal Occupant Displacement (EDR-3), Test No. NYBBT-9

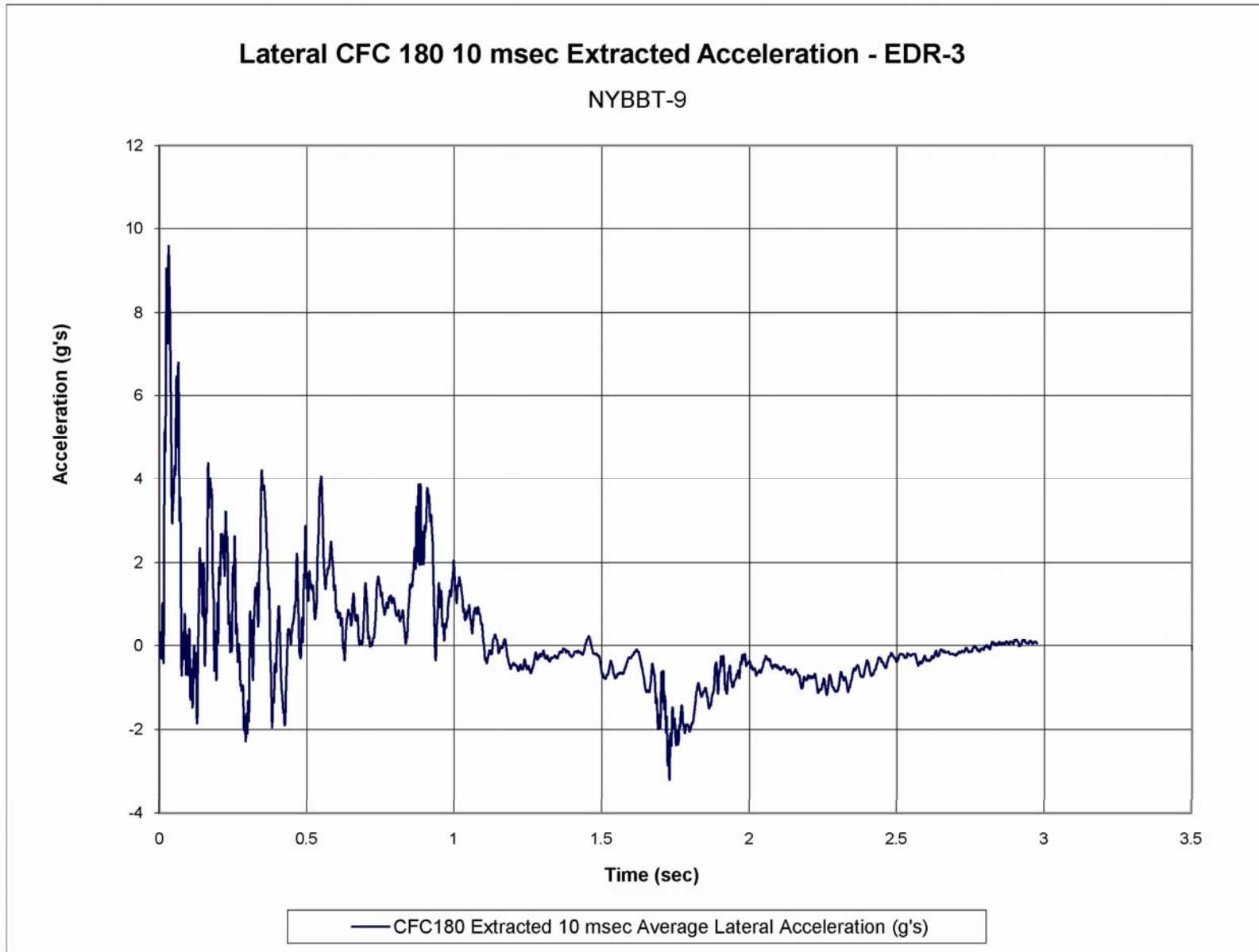


Figure V-4. Graph of Lateral Occupant Deceleration (EDR-3), Test No. NYBBT-9

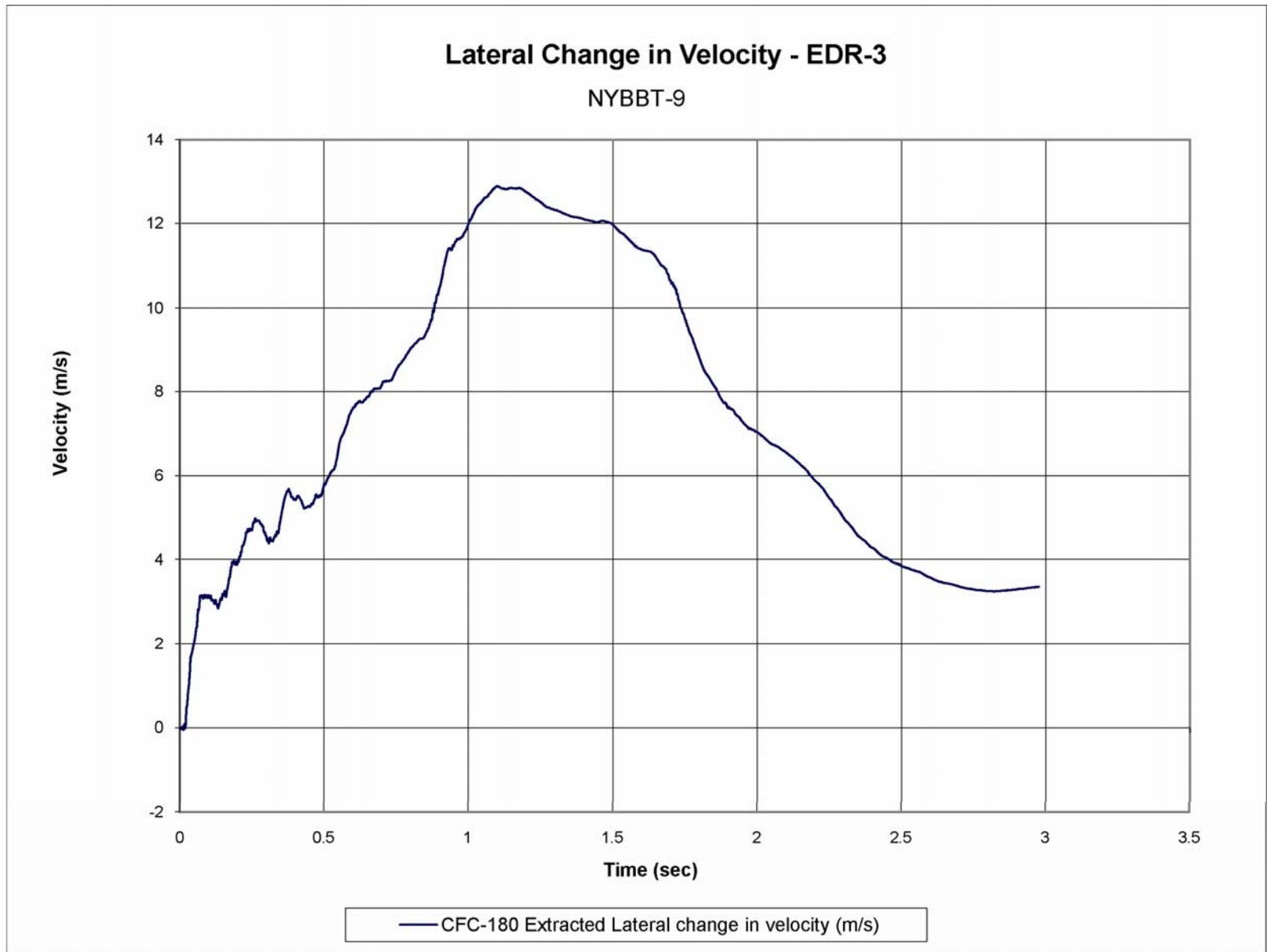


Figure V-5. Graph of Lateral Occupant Impact Velocity (EDR-3), Test No. NYBBT-9





Figure V-6. Graph of Lateral Occupant Displacement (EDR-3), Test No. NYBBT-9

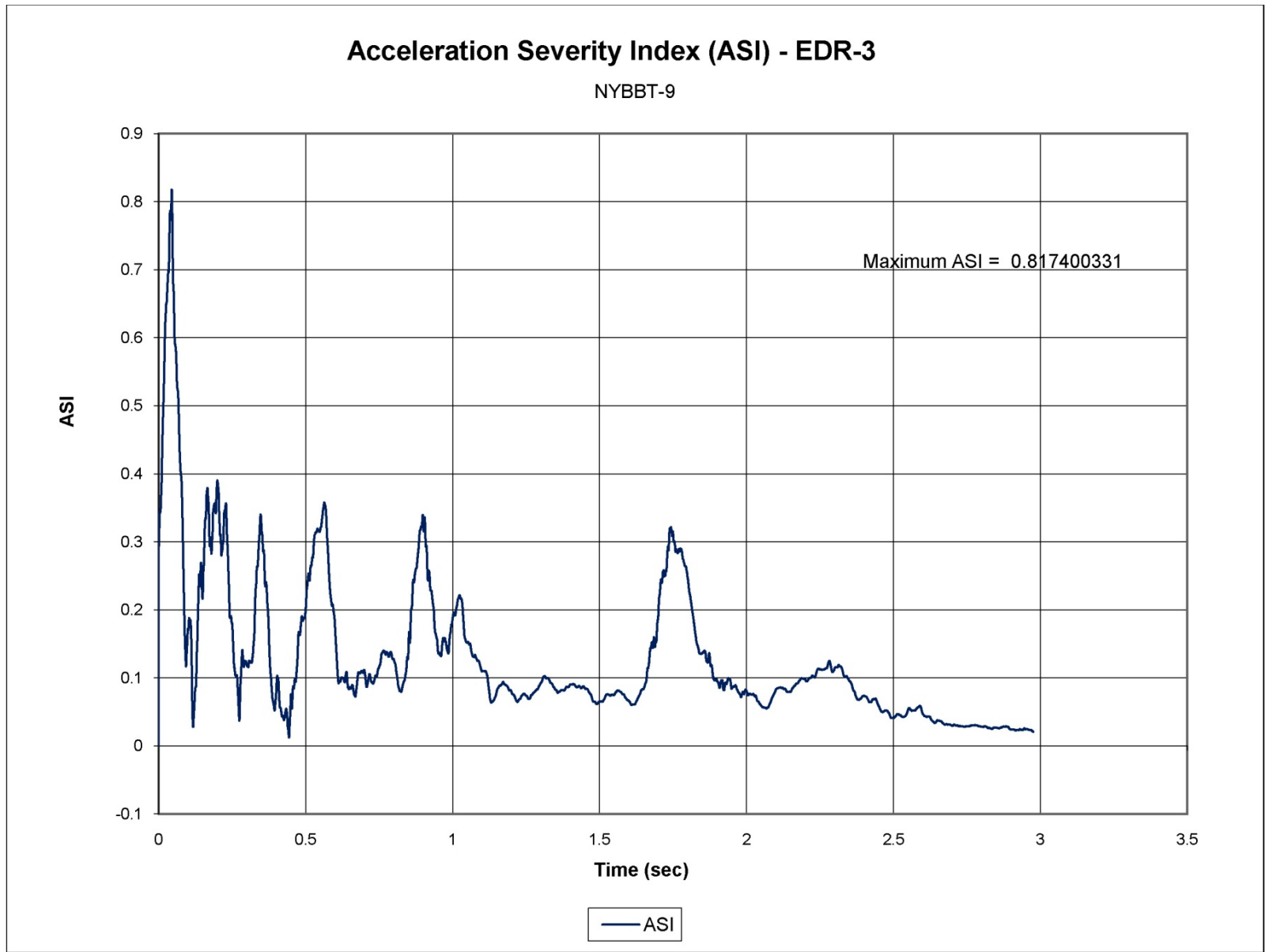


Figure V-7. Graph of Acceleration Severity Index (EDR-3), Test No. NYBBT-9

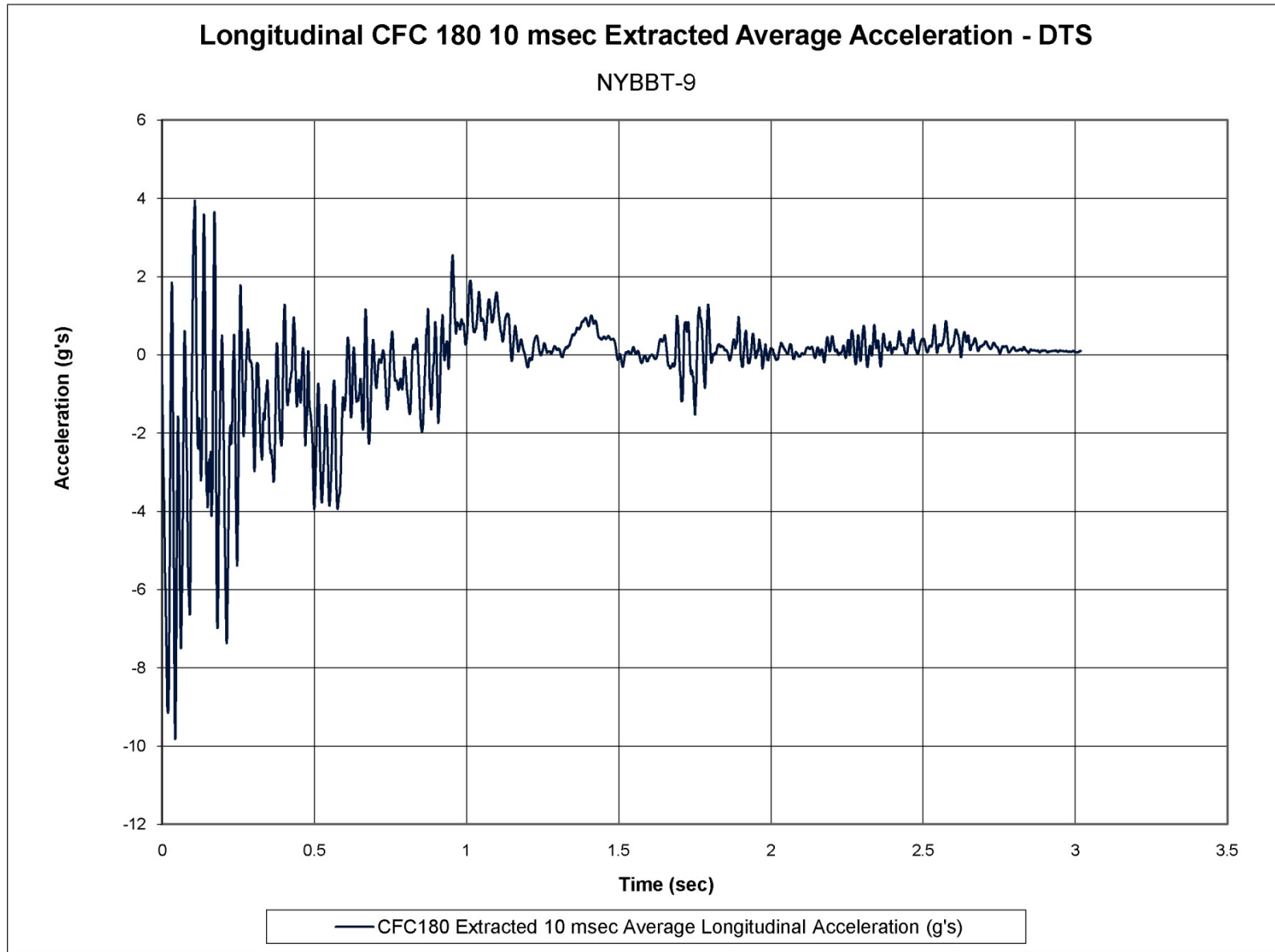


Figure V-8. Graph of Longitudinal Occupant Deceleration (DTS), Test No. NYBBT-9

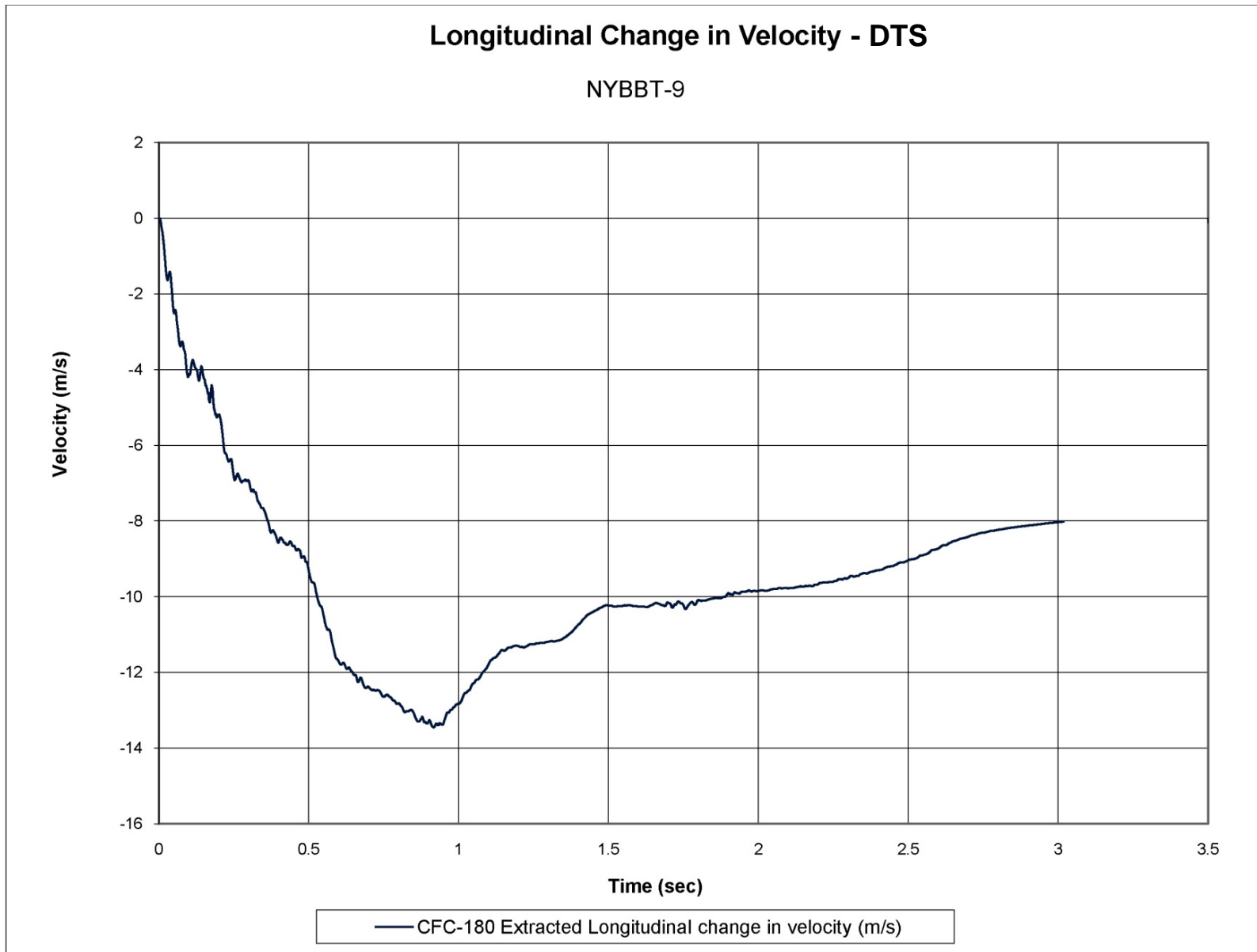


Figure V-9. Graph of Longitudinal Occupant Impact Velocity (DTS), Test No. NYBBT-9

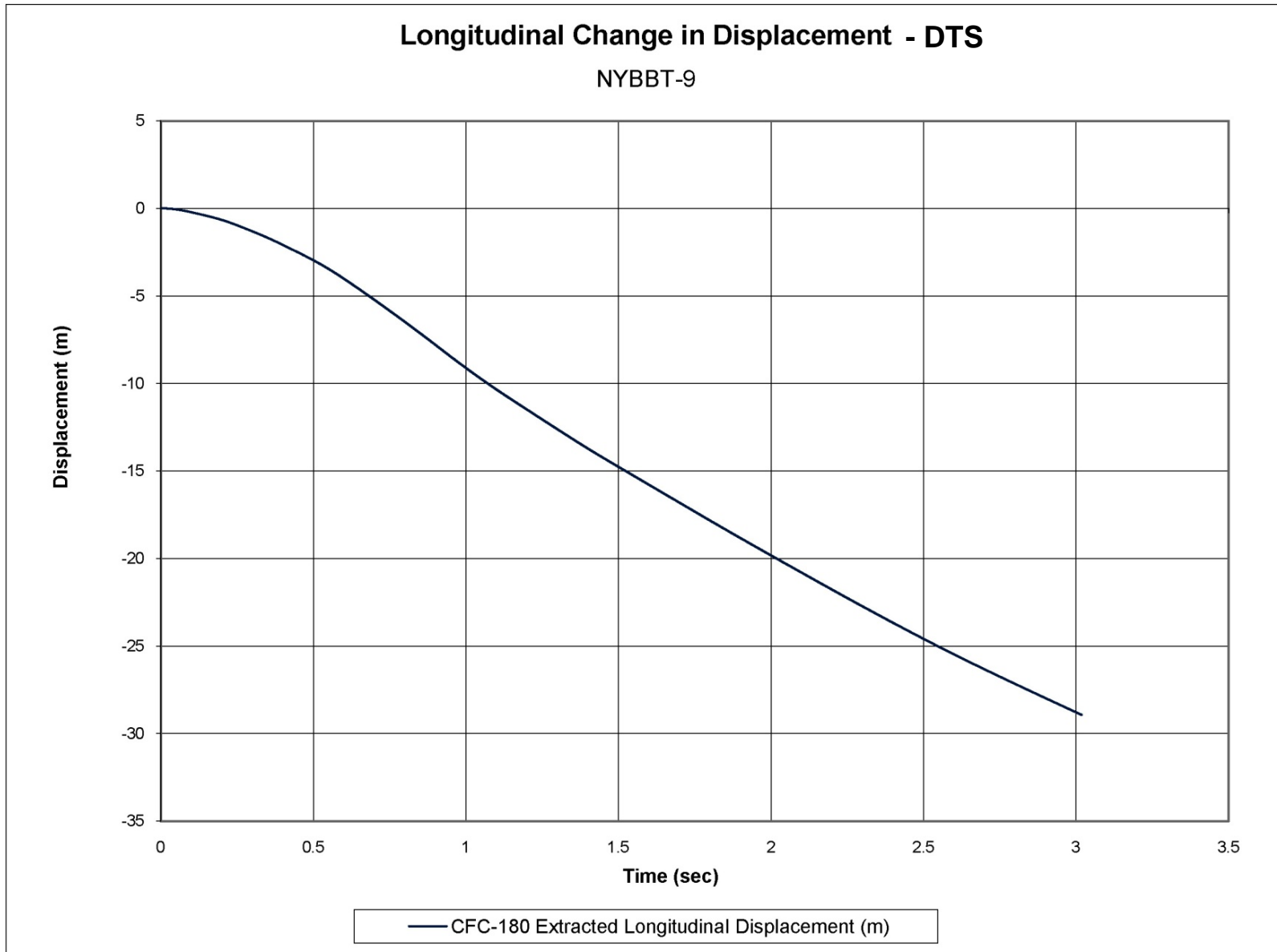


Figure V-10. Graph of Longitudinal Occupant Displacement (DTS), Test No. NYBBT-9

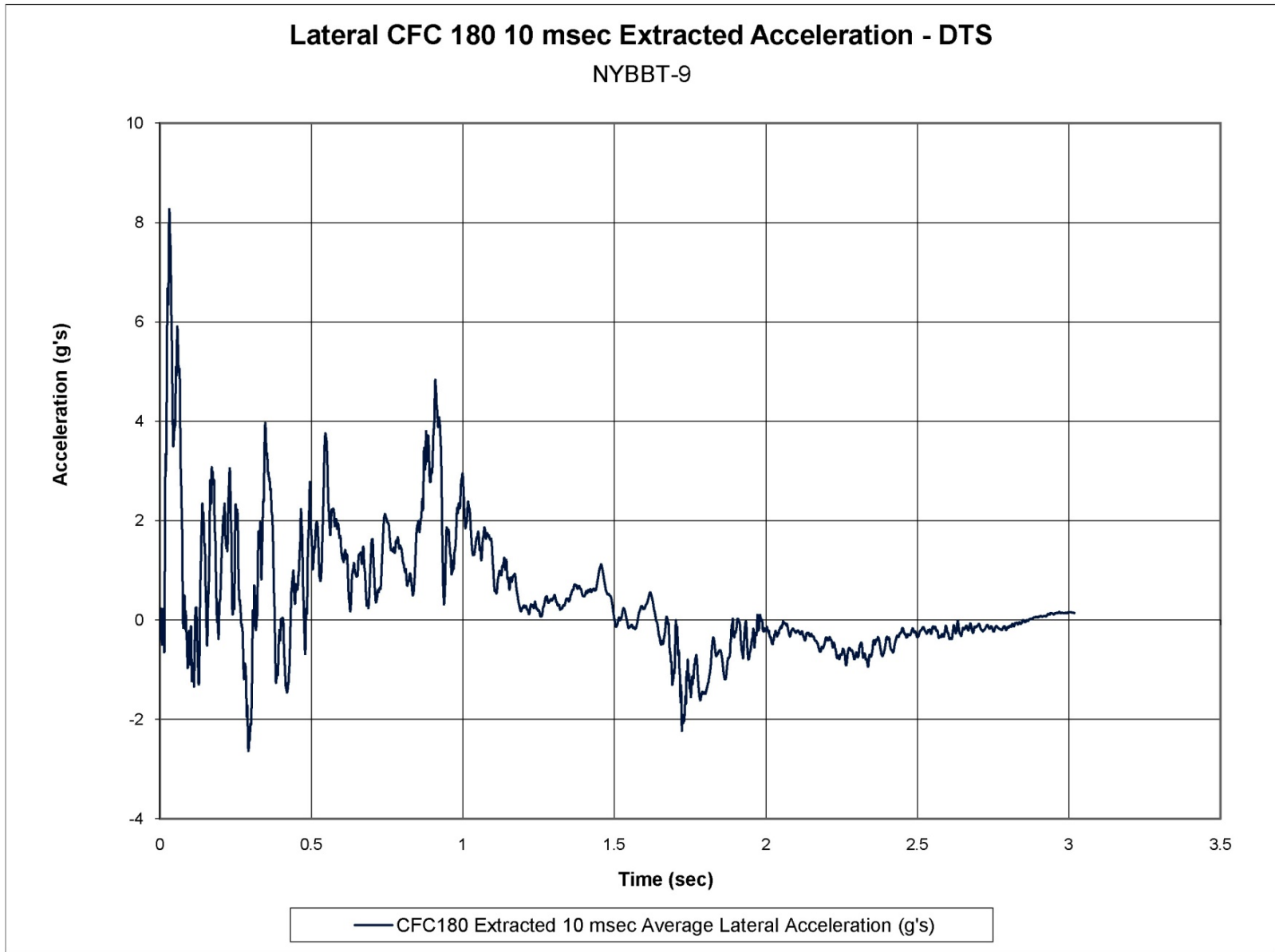


Figure V-11. Graph of Lateral Occupant Deceleration (DTS), Test No. NYBBT-9

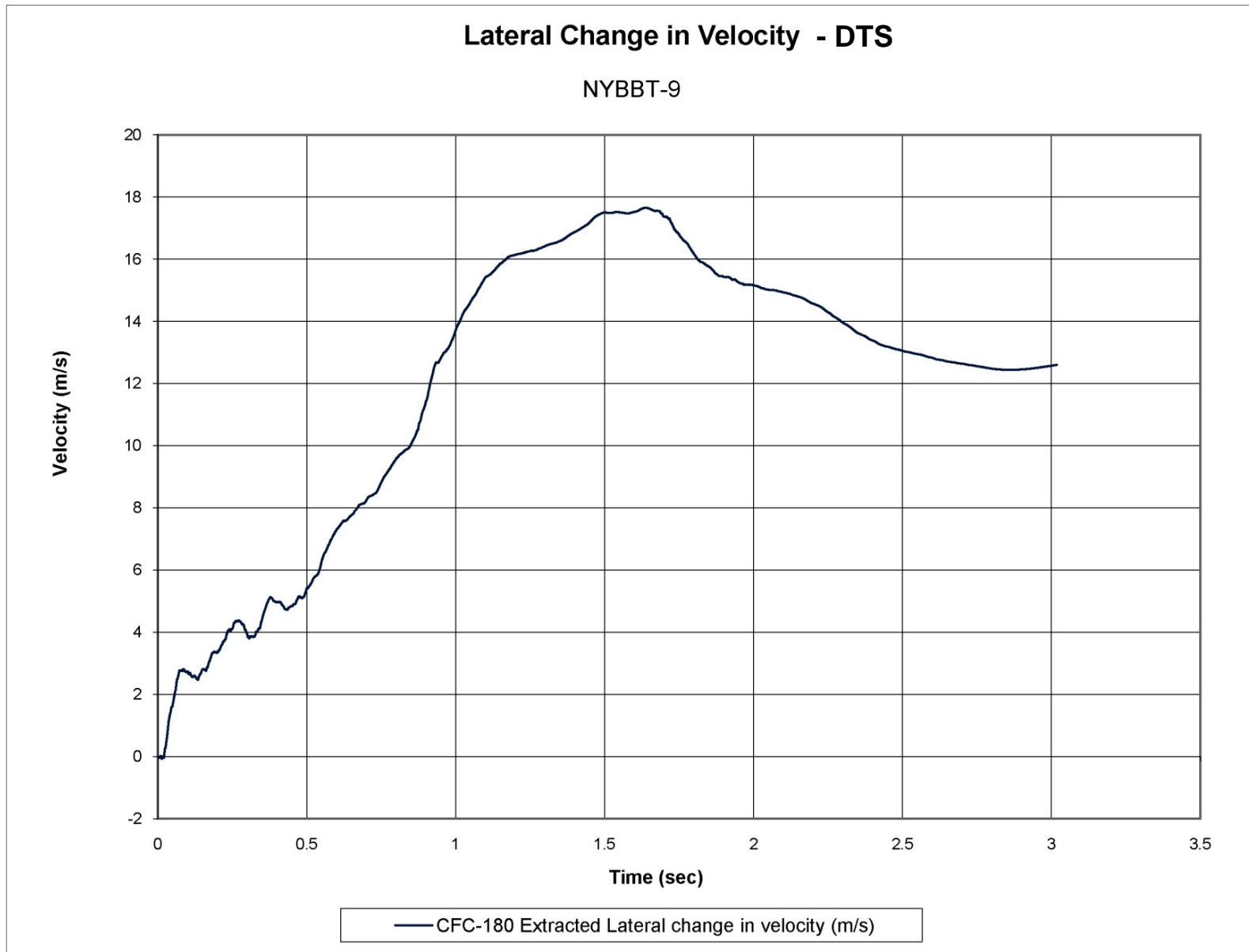


Figure V-12. Graph of Lateral Occupant Impact Velocity (DTS), Test No. NYBBT-9

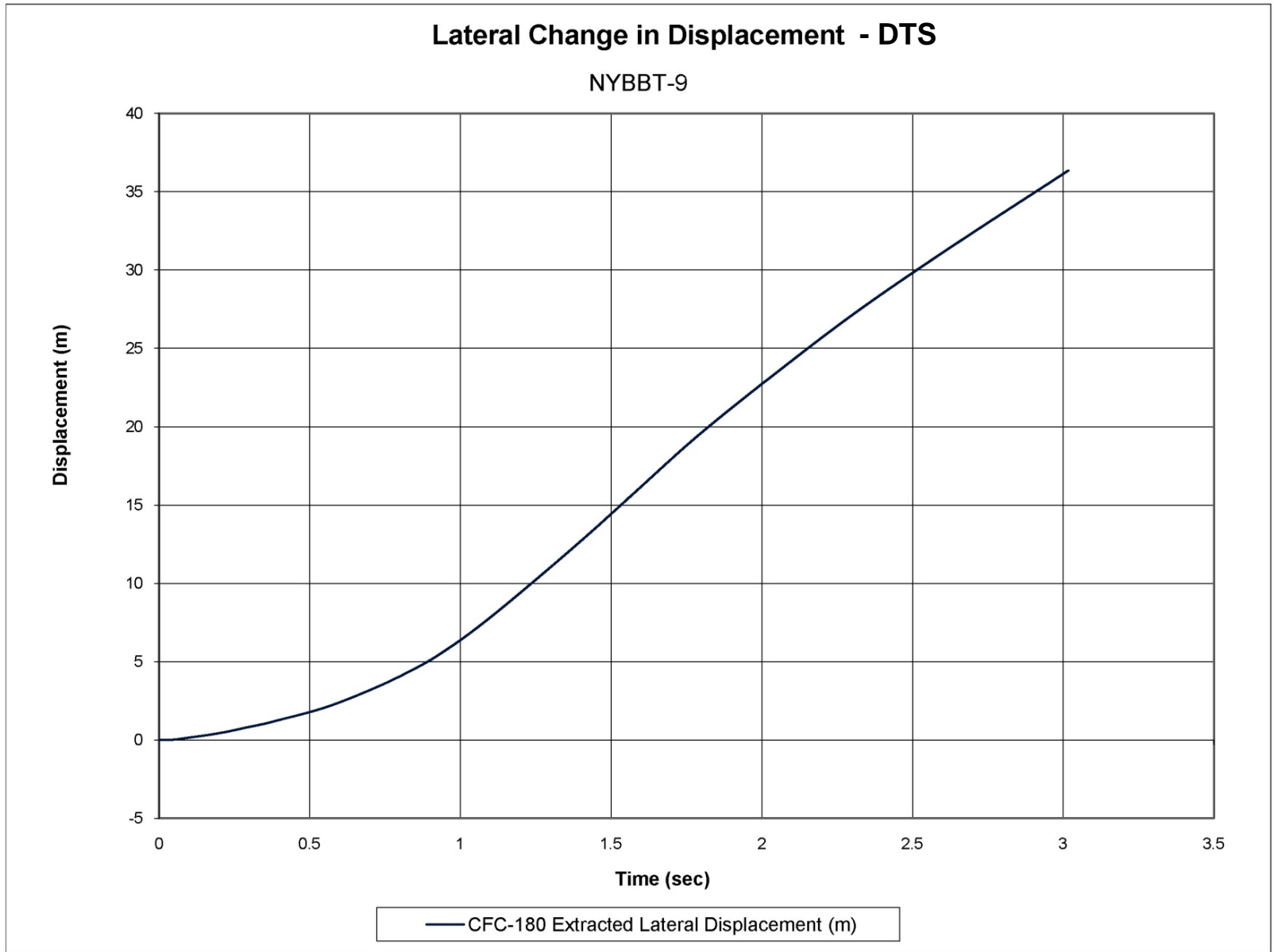


Figure V-13. Graph of Lateral Occupant Displacement (DTS), Test No. NYBBT-9



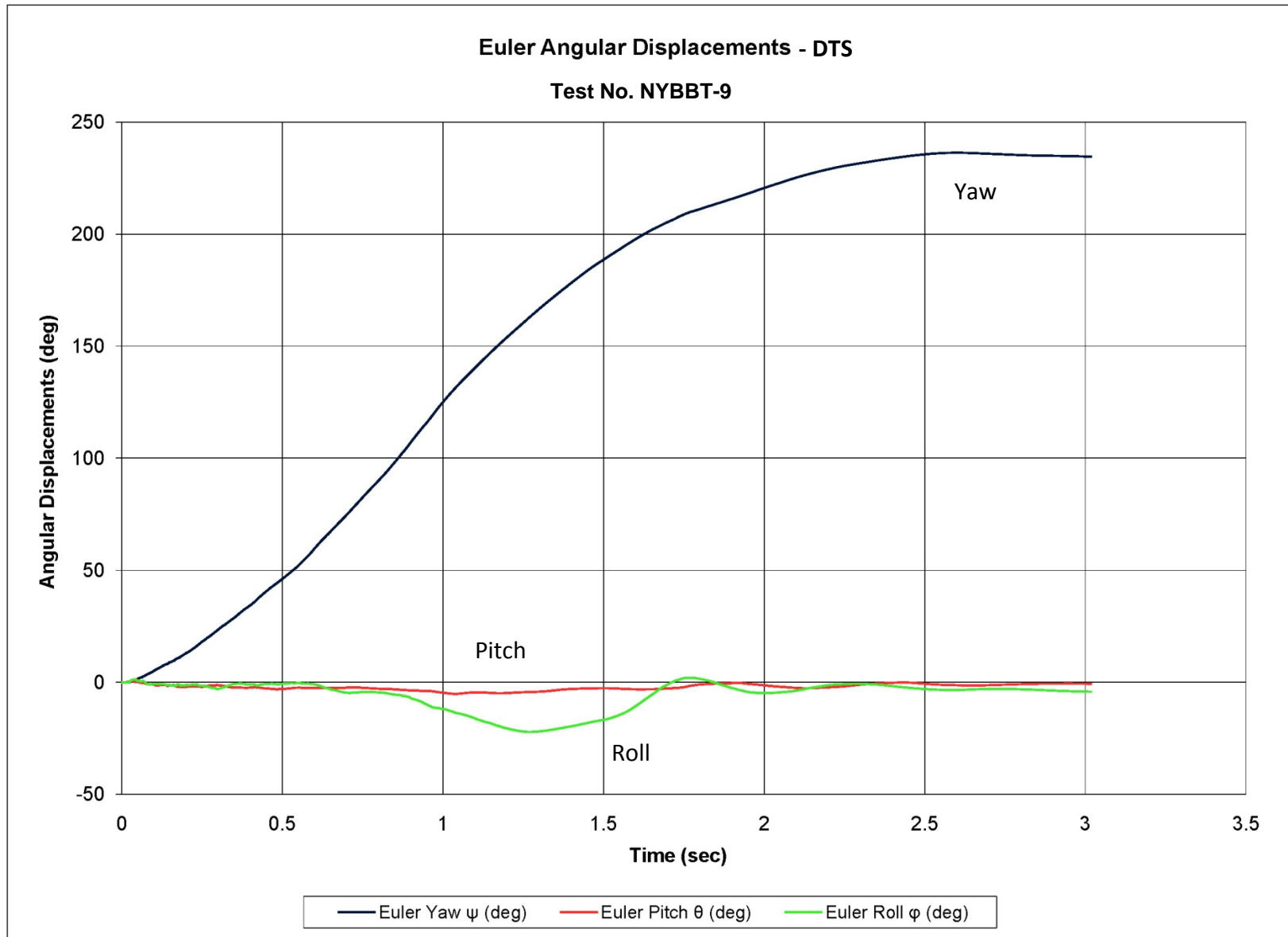


Figure V-14. Graph of Roll, Pitch, and Yaw Angular Displacement (DTS), Test No. NYBBT-9

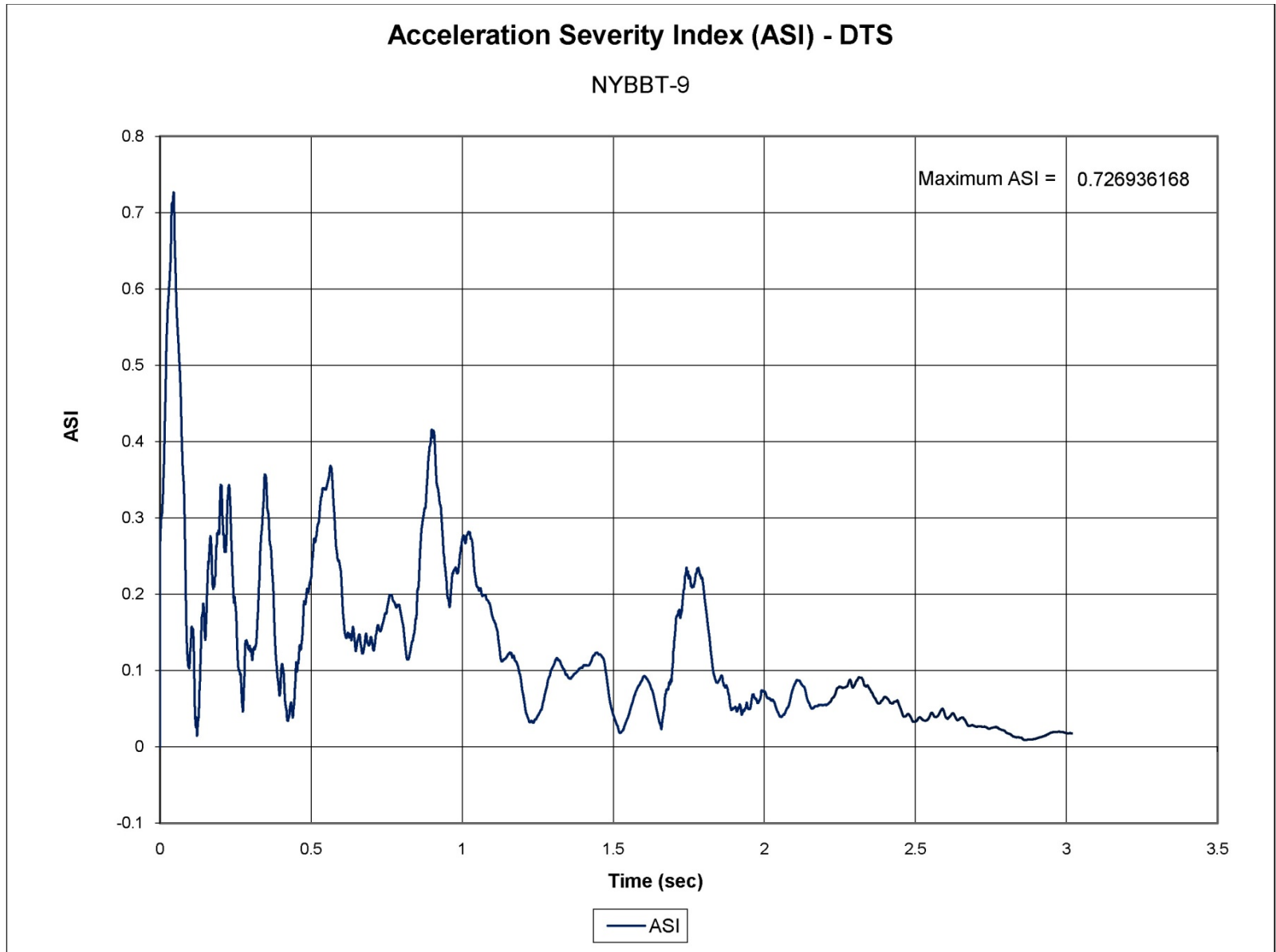


Figure V-15. Graph of Acceleration Severity Index (DTS), Test No. NYBBT-9

**APPENDIX W Material Specifications**



**ELDERLEE, INC.**

University of Nebraska-Lincoln  
Accounting Dept.  
PO Box 880439



**ACTIVE  
MEMBER**

**Date:** August 31, 2007  
**Order #:** 34513  
**PO #:** Per Jim @ Nebraska  
**Shippers #:** 43572  
**Invoice #:** 37729

*Certificate of Compliance*

The undersigned, being duly authorized by ELDERLEE, INC., Oaks Corners, NY and having reviewed the records of the company, hereby certifies that all material galvanized has been processed in accordance with AASHTO M111 and ASTM A-123 Specifications.

0013.02708	1 Ea.	3" I-Dwy Post w/Slots & Sp 47"
0057.18035	1 Ea.	BB 6x6 18' STD w/35' Rad.
0054.00052	1 Ea.	BB Dwy. Shelf Angle 4-1/2"

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SEP 5 2007

*James A. Morlang*  
James A. Morlang  
Galvanizing Plant Manager



**ELDERLEE, INC.**

University of Nebraska-Lincoln  
Accounting Dept.  
PO Box 880439



ACTIVE  
MEMBER

Date: July 10, 2007  
Order #: 10333  
PO #: Ltr. Dtd. 2/4/02  
Shippers #: 15135  
Invoice #: 0

Certificate of Compliance

The undersigned, being duly authorized by ELDERLEE, INC., Oaks Corners, NY and having reviewed the records of the company, hereby certifies that all material galvanized has been processed in accordance with AASHTO M111 and ASTM A-123 Specifications.

0013.01542	43 Ea.	Post 3" I-Univ. @ 63" w/Spade
0013.02708	1 Ea.	3" I-Dwy Post w/Slots & Sp 47"
0013.02707	2 Ea.	3" I Post Type II End 2'09" w/Sp.
0041.12701	Ea.	BR 3x5 Tube @ 27'5/16" Std.
0054.00018	13 Ea.	BB 6x6x3/16 @ 18'00" Std.
0054.00050	43 Ea.	BB Reg. Shelf Angle 4-1/2"
0054.00052	1 Ea.	BB Dwy. Shelf Angle 4-1/2"
0054.00100	12 Ea.	BB 6x6 Splice Plate 27" (Pair)
0054.00102	1 Ea.	BB 6x6 Splice Plate w/2 Degree (Pair)
0054.00104	1 Ea.	BB 6x6 Splice Plate w/4 Degree (Pair)
0054.01000	1 Ea.	BB 6x6 Type I End Section
0054.02000	1 Ea.	BB 6x6 Type II End Section
0057.18035	1 Ea.	BB 6x6 18' STD w/35' Radius

RECEIVED

JUL 17 2007

UNL ACCOUNTING

*James A. Morlang*  
James A. Morlang  
Galvanizing Plant Manager

STEEL OF WEST VIRGINIA  
HUNTINGTON, WEST VIRGINIA 25726-2547

DATE: January 5, 2007

SOLD TO: Elderlee Inc. SHIP TO:  
729 Cross Road Same  
Oaks Corner, NY 14518

CUSTOMER ORDER: P002162 SWV ORDER: 73028

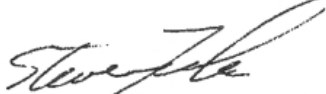
MATERIAL SPECIFICATION

3" X 5.7 lb/ft I-Beam. SWV Section 2658  
LENGTH: 42'. GRADE: ASTM A36-05.

All manufacturing processes for these materials occurred in the U.S.A.

Heat	Yield psi	Tensile psi	Elong % 8"	C	Mn	P	S	Si	Cu	Cr	Ni	Mo	V	Cb
52467	47000	69000	21.5	.13	0.68	.011	.031	.21	.37	.11	.12	.03	.002	.002
52467	45000	69000	22.8	.13	0.68	.011	.031	.21	.37	.11	.12	.03	.002	.002
52472	47000	68000	22.3	.13	0.68	.010	.031	.22	.33	.09	.10	.02	.001	.001
52472	48000	68000	23.7	.13	0.68	.010	.031	.22	.33	.09	.10	.02	.001	.001

This is to certify that the above is  
a true and correct report as contained  
in the records of this company.

  
Steve Fisher  
Metallurgist

ELDERLEE, INC.  
CERT RECEIVED: 1/8/07  
PURCHASE ORDER # P2162  
SALES ORDER # 73028  
SHIPPED FROM: SWVA

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UNIVERSAL ACCOUNTING

# Certificate of Analysis

**No. CT001070**

Date 03/05/07

## MET CON STEEL, Inc.

P.O. Box 876  
Wadsworth, Ohio 44282-0876  
(330) 336-3163  
fax 334-3296

Customer ELD10  
**ELDERLEE, INC.**  
729 Cross Road  
Oaks Corner, New York 14518

Ship To: ELD10  
**ELDERLEE, INC.**  
STEEL YARD  
729 Cross Road  
Oaks Corner, NY

Terms	Ship Via	FOB	Work Order No.	Shipper No.	Date Shipped	Slpn			
1%10 NET 30	MAWSON	DELVD	903552	BL603471	03/05/07	AI Rdy			
Tag#	Heat No.	Grade	Gauge	Width	Length	Pcs	Weight	Part No.	P.O No.
903552-07	C39516	A36	.246	8.000	24.00	300	3975		002182
903552-08	C39516	A36	.246	8.000	24.00	300	3975		002182

### Chemical Analysis

C .23 Mn .96 P .005 S .006 Si .03 Ti .002 Cr .025 Mo .005 Cu .01  
Al .035 Cb .005 V    Pb    Sn    Ca    Ni .01 B    Co     
Ni    Va    Fe    Zn    Mg   

### Physical Properties

Rockwell B88 Olsen    Yield 49150 Tensile 62690 Elongation 24% Grain     
Mill GALLATIN

Comments: MELTED & MFG. IN THE USA

We hereby certify the above figures are accurately stated,  
and are traceable in our records back to the supplier and/or  
an accredited test laboratory

(c)2002ApplicationsResearch734 449-43C

Rev. 01 (03/17/00)

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*W.P.D.*  
CREDIT DEPARTMENT

ELDERLEE, INC.  
CERT RECEIVED: 3/6/07  
PURCHASE ORDER # P2182  
SALES ORDER # SM 603444  
SHIPPED FROM: met con steel

TEST ACTION TRANSMITTAL  
NYS DOT MATERIALS BUREAU

Serial No.: 220564

To: Nova Tube, Morrisville, PA; Pennoni, King of Prussia, PA.

Test No.: 07MG001  
Date Received: 1/12/07

The Material represented by the sample submitted with the BR-240 having the above serial number was:

Accepted on 2/2/07.

Note: Originally Accepted on 1/16/07.

For ITEM: 710-21 Box Beam Guide Rail and Median Barrier; Galvanized 6"x6"x3/16"; Heat #422E0371, 372,373

Remarks: For DWTT Properties.

This document serves as the official transmittal of action on the noted sample. Attached hereto is a digital image of the BR-240 which accompanied same.

JOHN RONDINARO  
DIRECTOR, MATERIALS BUREAU

88 240a (11/74)		SAMPLE AND ACCEPTANCE TRANSMITTAL NYS DOT MATERIALS BUREAU		SERIAL NO. <b>220564</b>	DATE REC'D. <b>1/12/07</b>	TEST NO. <b>07MG001</b>
To:				Material Represented by the Sample Described Below Was _____		
On _____				For _____		
(Action Official) Only When Validated Below By The Materials Bureau						
<b>UPPER PORTION FOR MATERIALS BUREAU ONLY — INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW</b>						
16. ADDITIONAL INFO. (SEE INSTRUCTIONS ON REAR)		1. MATERIAL	2. ITEM NO.	3. DATE SAMPLED	4. CONTRACT NO.	
LOGO IMPRINTED NOVA 99 4" LG SAMPLE W/ AGENCY STAMP (P) E' LEFT WITH MANUFACTURER. COIL # 890291 TAG # T1A0405 Note: Error in Heat Number corrected by Brandon Starfish on 2/4/07 RETAIN PINK COPY FOR YOUR RECORDS FORWARD ALL OTHERS TO MATERIALS BUREAU		<b>6"x6"x0.188 STEEL BOX BEAM</b>	<b>710-21</b>	<b>12/20/06</b>	<b>STOCK</b>	
		5. SUPPLIER AND LOCATION	6. QUANTITY IN LOT	7. LOT NO.		
		<b>NOVA TUBE &amp; STEEL MORRISVILLE, PA</b>	<b>34,400 LB</b>	<b>NOVA 9</b>		
		8. MANUFACTURER AND LOCATION IF DIFFERENT THAN ABOVE	9. BATCH NO.	10. DATE OF MFG.		
		<b>12/15/06</b>				
11. SAMPLED AT	12. TYPE	13. SAMPLED FROM				
<input type="checkbox"/> MILL <input checked="" type="checkbox"/> PLANT <input type="checkbox"/> JOB	<input checked="" type="checkbox"/> CONTROL SAMPLE <input type="checkbox"/> INFO. SAMPLE	<input type="checkbox"/> GPR SAMPLE <input type="checkbox"/> APPROVED LIST MAT. <input type="checkbox"/> CERTIFIED MAT.	<b>TUBE WAREHOUSE</b>			
15. CONTRACTOR AND PROJECT LOCATION			14. SAMPLED BY (INC. DPT. NO. OR AGENCY)			
			<b>PAI - TAO39 - AAH</b>			
			MATERIALS BUREAU VALIDATION			

**RECEIVED**  
JUL 17 2007







**BAYOU STEEL CORPORATION**  
 RIVER ROAD P.O. BOX 5000  
 LA PLACE, LOUISIANA 70069 1156  
 Telephone (985) 652-4900

**MATERIAL CERTIFICATION REPORT**

TRIAD METALS INTERNATIONAL  
 SUITE A-1  
 WILLOW GROVE, PA 19090

TRIAD METALS  
 1951 BESSEMER RD.  
 PETERSBURG, VA 23805  
 PO:128178

TESTED IN ASTM A6  
 ACCORDANCE  
 WITH

INVOICE NO. DATE 03/19/07  
 PRODUCT UNEQUAL ANGLES Cust T-4200 -0030  
 HEAT NO. 54948 25 Pieces GRAD# A3652950 -  
 Length 40'0" SIZE U 5 X 3-1/2 X 3/8 X 10.40

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 JUL 1 10 00 AM '07  
 INVT. ACCOUNTING

03/19/2007 12:16:44 PM -0500

CHEMICAL ANALYSIS	MECHANICAL PROPERTIES	TEST 1		TEST 2		TEST 3	
		IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC
C .14	YIELD STRENGTH	55,829 PSI	385 MPa	55,198 PSI	381 MPa	PSI	MPa
Mn .94	TENSILE STRENGTH	76,205 PSI	525 MPa	76,363 PSI	527 MPa	PSI	MPa
P .012	ELONGATION	29.0 %	29.0 %	26.0 %	26.0 %	%	%
S .034	GAUGE LENGTH	8 in	203 mm	8 in	203 mm	in	mm
Si .24	BEND TEST DIAMETER	d	d	d	d	d	d
Cu .30	BEND TEST RESULTS						
Ni .17	SPECIMEN AREA	sq in	sq mm	sq in	sq mm	sq in	sq mm
Cr .15	REDUCTION OF AREA	%	%	%	%	%	%
Mo .047	IMPACT STRENGTH	ft-lbs	J	ft-lbs	J	ft-lbs	J
Cb .004							
V							
B							
Al							
Sn .020							
N							
Ti							

IMPACT STRENGTH	IMPERIAL	METRIC	INTERNAL CLEANLINESS		GRAIN SIZE	
AVERAGE	ft-lbs	J	SEVERITY		HARDNESS	
TEST TEMP	F	C	FREQUENCY		GRAIN PRACTICE	
ORIENTATION			RATING		REDUCTION RATIO	

Customer Grade & Specs: A36-04 A529-04 GRADE 50  
 44W, CSA50W, A70936  
 ASME SA36

ELDER, INC.  
 CERT RECEIVED: 4/9/07  
 PURCHASE ORDER # P2246  
 SALES ORDER # 162079  
 SHIPPED FROM: Triad Metals

WE HEREBY CERTIFY THAT THE MATERIAL TEST RESULTS PRESENTED HERE ARE FROM THE REPORTED HEAT AND ARE CORRECT. ALL TESTS WERE PERFORMED IN ACCORDANCE TO THE SPECIFICATIONS REPORTED ABOVE. ALL STEEL IS ELECTRIC FURNACE MELTED, MANUFACTURED, PROCESSED, AND TESTED IN THE U.S.A WITH SATISFACTORY RESULTS, AND IS FREE OF MERCURY CONTAMINATION IN THE PROCESS.

TESTED UPON REQUEST:  
 WORK TO AND SUBSCRIBED BEFORE ME IN AND FOR ST. JOHN  
 WITNESS ON THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_

SIGNED Mark Edwards  
 MARK EDWARDS, QUALITY ASSURANCE SUPERVISOR

DIRECT ANY QUESTIONS OR NECESSARY CLARIFICATIONS CONCERNING THIS REPORT TO THE SALES DEPARTMENT.

Michael E. Solioau, # 31887, Notary Public

1-800-535-7692 (USA)

PAGE 13 OF 19

January 20, 2010  
 MWRSF Report No. TRP-03-203-10



Steel Dynamics - Roanoke Bar Division  
P.O. Box 13948 Roanoke, VA 24038  
Office: 540-342-1831 Fax: 540-342-8437

Test and Inspection Report

NO. 31814-0

ROANOKE

AMERICAN STEEL & ALUM-LIVERPOOL

P. O. BOX 620  
LIVERPOOL NY 13080-0000

Date 1/03/07

HEAT NUMBER	SIZE	1-YIELD Pt. KSI	ULTIMATE KSI	ELONG 8 IN. TEST	BEND TEST	GRADE				
JF5962	FLATS 5/8 X 5 3/8	44.4	66.9	34.5		A36				
PURCHASE ORDER NUMBER	NUMBER PIECES	2-YIELD PT. KSI	ULTIMATE KSI	ELONG 8 IN. TEST	BEND TEST	GRADE				
0865612	180 PIECES 22'07"	43.5	65.7	37.5		A36				
HEAT NUMBER	SIZE	1-YIELD Pt. MPA	ULTIMATE MPA	ELONG 203mm TEST	BEND TEST	GRADE				
JF5962	FLATS 16 X 137	306.1	461.3	34.5		A36				
PURCHASE ORDER NUMBER	NUMBER PIECES	2-YIELD PT. MPA	ULTIMATE MPA	ELONG 203mm TEST	BEND TEST	GRADE				
0865612	180 PIECES 22'07"	299.9	453.0	37.5		A36				
C	MN	S	P	SI	CR	NI	MO	CU	V	NB
.14	.71	.020	.005	.21	.06	.10	.02	.29	.002	.001

Charpy requirement:  
15 ft-lbs @ +40° F

- 1) 80.0 ft-lbs
- 2) 74.5 ft-lbs
- 3) 84.0 ft-lbs

ELDERLEE, INC.  
CERT RECEIVED: 1/5/07  
PURCHASE ORDER # P2146  
SALES ORDER # 31814  
SHIPPED FROM: American Steel

MERCURY, RADIUM OR OTHER ALPHA SOURCE MATERIALS IN ANY FORM HAVE NOT BEEN USED IN THE PRODUCTION OF THIS MATERIAL. NO WELD REPAIR HAS BEEN PERFORMED

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JUL 17 2007

Approved ABS QA Mill. Certificate No. 00NN10108-X.

This material was melted and manufactured in the USA by basic Electric Furnace processes to meet specification: ASTM A36-04 ASME SA36 QQS741D A709-00A GR36 AASHTO M270 GR 36 IMPACTS WAIVED

The tensile values stated in either inch-pound units or SI units are to be regarded as separate as defined in the ASTM scope for this material. Unless a metric specification is ordered, this material has been tested and meets the requirements of the inch-pound ranges.

This is to certify the above to be a true and accurate report as contained in the records of this company.

Engineer of Tests: Charles R. Charlton

TEST ACTION TRANSMITTAL  
NYS DOT MATERIALS BUREAU

Serial No.: 251106

To: Nova Tube, Morrisville, PA; Pennoni, King of Prussia, PA.

Test No.: 06MG29  
Date Received: 4/6/06

The Material represented by the sample submitted with the BR-240 having the above serial number was:

Accepted on 4/20/06.

for ITEM: 710-21 Box Beam Guide Railing and Median Barrier; Galvanized 6"x6"x3/16"; Heat #401C6411.

Remarks: For DWTT Properties.

This document serves as the official transmittal of action on the noted sample. Attached hereto is a digital image of the BR-240 which accompanied same.

JOHN RONDINARO  
DIRECTOR, MATERIALS BUREAU

BR 240a (11/74)	SAMPLE AND ACCEPTANCE TRANSMITTAL NYS DOT MATERIALS BUREAU	SERIAL NO. 251106	DATE REC'D. 4-6-06	TEST NO. 06MG29	
To: _____		Material Represented by the Sample Described Below Was _____			
On _____		For _____			
(Action Official Only When Validated Below By The Materials Bureau)					
<b>UPPER PORTION FOR MATERIALS BUREAU ONLY — INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW</b>					
16. ADDITIONAL INFO. (SEE INSTRUCTIONS ON REAR) LOGO IMPRINTED NOVA 82 4" LG SAMPLE W/ AGENCY STAMP @ LEFT WITH MANUFACTURER COIL # 814427M TAG # T12901G	1. MATERIAL GALV. 6"x6" STL BOX BEAM	2. ITEM NO. 710-21	3. DATE SAMPLED 3/29/06	4. CONTRACT NO. STOCK	
	5. SUPPLIER AND LOCATION NOVA TUBE STEEL MORRISVILLE, PA	6. QUANTITY IN LOT 30,370 FT 450,000 LBS	7. LOT NO. NOVA 82		
	8. MANUFACTURER AND LOCATION (IF DIFFERENT THAN ABOVE)	9. BATCH NO. 401C6411	10. DATE OF MFG. 3/27/06		
	11. SAMPLED AT <input type="checkbox"/> MILL <input checked="" type="checkbox"/> PLANT <input type="checkbox"/> JOB	12. TYPE <input checked="" type="checkbox"/> CONTROL SAMPLE <input type="checkbox"/> INFO. SAMPLE <input type="checkbox"/> BPR SAMPLE <input type="checkbox"/> APPROVED LIST MAT. <input type="checkbox"/> CERTIFIED MAT.	13. SAMPLED FROM TUBE WAREHOUSE		
	14. SAMPLED BY (INC. DIST. NO. OR AGENCY) PAI, TAO33, AAW		15. DATE OF MFG. (IF DIFFERENT FROM 10)		
15. CONTRACTOR AND PROJECT LOCATION			MATERIALS BUREAU VALIDATION		

RETAIN PINK COPY FOR YOUR RECORDS  
FORWARD ALL OTHERS TO MATERIALS BUREAU

TEST ACTION TRANSMITTAL  
NYSDOT MATERIALS BUREAU

Serial No.: 219967

To: Nova Tube, Morrisville, PA; Pennoni, King of Prussia, PA.

Test No.: 07MG54  
Date Received: 3/28/07

The Material represented by the sample submitted with the BR-240 having the above serial number was:

Accepted on 4/10/2007

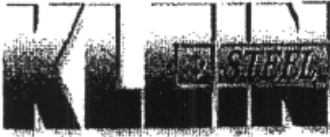
For ITEM: 710-21 Box Beam Guide Rail and Median Barrier; Galvanized 6"x6"x 3/16"; Heat #402H9991

Remarks: For DWTT Properties.

This document serves as the official transmittal of action on the noted sample. Attached hereto is a digital image of the BR-240 which accompanied same.

JOHN RONDINARO  
DIRECTOR, MATERIALS BUREAU

BR 240e (1174)		SAMPLE AND ACCEPTANCE TRANSMITTAL NYSDOT MATERIALS BUREAU		SERIAL NO.	DATE REC'D.	TEST NO.
To:		Material Represented by the Sample Described Below Was		219967	3/28/07	07MG54
On _____		For _____		RECEIVED JUL 17 2007		
(Action Official Only When Validated Below By The Materials Bureau)						
<b>UPPER PORTION FOR MATERIALS BUREAU ONLY -- INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW</b>						
15. ADDITIONAL INFO (SEE INSTRUCTIONS ON REAR)		1. MATERIAL	2. ITEM NO.	3. DATE SAMPLED	4. CONTRACT NO.	
LOGO IMPRINTED NOVA 102 4' LONG SAMPLE W/AGENCY STAMP 3' LEFT WITH MANUFACTURER COIL # 90639C TAG # T15548G		6"x6"x0.188 STL BOX BEAM	710-21	3/9/07	STOCK	
		5. SUPPLIER AND LOCATION	6. QUANTITY IN LOT		7. LOT NO.	
		NOVA TUBE STEEL MORRISVILLE, PA	41,394 FT 600,000 LBS		NOVA 102	
		8. MANUFACTURER AND LOCATION (IF DIFFERENT THAN ABOVE)		9. BATCH NO.	10. DATE OF MFG.	
				402H9991	3/2/07	
		11. SAMPLED AT	12. TYPE		13. SAMPLED FROM	
		<input type="checkbox"/> MILL <input checked="" type="checkbox"/> PLANT <input type="checkbox"/> JOB	<input checked="" type="checkbox"/> CONTROL SAMPLE <input type="checkbox"/> INFO. SAMPLE <input type="checkbox"/> BPR SAMPLE <input type="checkbox"/> APPROVED LIST MAT. <input type="checkbox"/> CERTIFIED MAT.		TUBE WAREHOUSE	
		15. CONTRACTOR AND PROJECT LOCATION			14. SAMPLED BY (INC. DIST. NO. OR AGENCY)	
					PAE; IA039; AAU	
RETAIN PINK COPY FOR YOUR RECORDS FORWARD ALL OTHERS TO MATERIALS BUREAU					MATERIALS BUREAU VALIDATION	



Klein Steel Service Inc.  
105 Vanguard Pkwy  
Rochester, NY 14606

November 16, 2006

**Certified Report of Chemical Analysis and Mechanical Tests**

Producing Mill: Mittal Steel USA-Cleveland  
Product: Hot Rolled Sheet Steel  
Certification Type: ASTM  
Klein PO#: JS946 Code: HC180A36

Gauge	Width	Length	Finish	Surface	Treatment	Quality	Type
3/16	60.000	Various		DRY		A36	
Coil/Lift	Heat#	Tensile	Yield	E-Long%	Hardness	L/Ft	
484688	4180445	67,000	49,100	30.0%			

Heat#	4180445			Domestic	
C%	Mn%	P%	S%	SI%	Al%
0.180	0.420	0.009	0.009	0.010	0.036

Heat#	4180445			Domestic	
C%	Mn%	P%	S%	SI%	Al%

The above figures are extracts from the original mill records as contained in the records of the company

Prepared by the office of:  
Jim Sloan, QA Manager

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JUL 17 2007

**UNL ACCOUNTING**

E.L.S.  
CERT RECEIVED *3/23/07*  
PURCHASE ORDER # *P2240*  
SALES ORDER # *141025*  
SHIPPED FROM *Klein Steel*

11Jan07 11: TEST CERTIFICATE No: 1 16872  
Sold By: THE UNIVERSAL STEEL COMPANY P/O No JS946Z1  
6600 GRANT AVENUE Rel  
CLEVELAND, OH 44105 S/O No 1 119771-001  
Tel: 216 883-4972 Fax: 216 341-0421 B/L No 1 107022-002 Shp 11Jan07  
Inv No Inv

Sold To: (110053) Ship To: (001)  
KLEIN STEEL KLEIN STEEL  
105 VANGURAD PKWY 105 VANGURAD PKWY  
ROCHESTER NY 14606 ROCHESTER NY 14606

Tel: 800-477-6789 Fax: 585-328-7377

-----  
CERTIFICATE of ANALYSIS and TESTS Cert. No: 1 16872  
11Jan07

Part No 62 *P314570*  
Hot Roll Sheet A36 Pcs Wgt  
.1790 Min X 60.0000" X 120.0000" 60 23,080

Heat Number	Tag No	Pcs	Wgt
4180445	67807	15	5,770
4180445	67808	15	5,770
4180445	67809	15	5,770
4180445	67810	15	5,770

Heat Number 4180445 \*\*\* Chemical Analysis \*\*\*  
C=<.18> Mn=<.42> P=<.009> S=<.009> Si=<.010> Al=<.036> Cu=<.030>  
Mo=<.010> Sn=<.0040> V=<.0020> Ca=<.0003> N=<.0044> Cr=<.020>  
Ni=<.010> Ti=<.0020> Sb=<.0020>

RECEIVED  
JUL 17 2007  
UNL ACCOUNTING

# BENNETT BOLT WORKS, INC.

12 Elbridge Street  
P.O. Box 922  
Jordan, New York 13080

PH 315-689-3981  
FX 315-689-3999

## CERTIFICATION OF COMPLIANCE

Customer: ELDERLEE, INC.  
729 CROSS RD  
OAKS CORNERS, NY 14518

We certify that our system and procedures for the control of quality assures that all items furnished on the order will meet applicable tests, process requirements, and inspection requirements as required by the purchase order and applicable specifications.

Customer PO No.: 2214 NG  
Date Shipped: 4/20/2007  
Invoice No.: 5008241  
Purchase Date: 4/19/2007

QUANTITY	DESCRIPTION
100	3/4-10 X 4 1/2 A307 HEX SCREW W/ N & 2 FW HDG ( MFG - SILO FAST #3661-A, NUCOR FAST # 213520A, WROUGHT WASHER # 213859, GALV.- UNIVERSAL GALV., NUCOR FAST., ROGERS BROTHERS GALV.)
1000	3/4 X 8 A307 HEX SCREW W/ N & 2 FW HDG ( MFG- BIRMINGHAM FAST, NUCOR FAST, WROUGHT WASHER # 167415, GALV.- BIRMINGHAM FAST., NUCOR FAST., ROGERS BROTHERS GALV.)
1000	3/4 X 8 A307 CARRIAGE BOLT W/ N & FW & LW HDG ( MFG- MIDWEST FAB #65061, NUCOR FAST #213520A, WROUGHT WASHER #018139/213859, GALV.- COLUMBUS GALV., NUCOR FAST., ROGERS BROTHERS GALV.)
4800	3/8 X 7 1/2 A307 HEX SCREW W/ N & 2 FW MG ( MFG- AUTO BOLT & NUT #15545-1 & 2, TELEFAST IND #O13699-1-66461, G13935-66988, WROUGHT WASHER #169742, GALV.- MECH GALV. PLATING)
6000	1/2 X 1 1/2 A307 HEX SCREW W/ N & SAE FW HDG ( MFG- NUCOR FAST #204059A, TELEFAST IND # R15389, WROUGHT WASHER, GALV.- NUCOR FAST., NORTH AMERICAN GALV., ROGERS BROTHERS GALV.)

M/F: STOCK

All products were melted and manufactured in the U.S.A. This material is in compliance with domesticity requirements, and conforms to ASTM & AASHTO specifications for standardized highway barrier rail and hardware.

*James L. Limerbeaux*  
SUPERVISOR QUALITY ASSURANCE  
DATE: 4/23/2007

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JUL 17 2007

UNL ACCOUNTING



# BENNETT BOLT WORKS, INC.

12 Elbridge Street  
P.O. Box 922  
Jordan, New York 13080

PH 315-689-3981  
FX 315-689-3999

## CERTIFICATION OF COMPLIANCE

Customer: ELDERLEE, INC.  
729 CROSS RD  
OAKS CORNERS, NY 14518

We certify that our system and procedures for the control of quality assures that all items furnished on the order will meet applicable tests, process requirements, and inspection requirements as required by the purchase order and applicable specifications.

Customer PO No.: 2214 NG  
Date Shipped: 5/11/2007  
Invoice No.: 5008488  
Purchase Date: 5/10/2007

QUANTITY	DESCRIPTION
4800	3/4 X 1 1/2 A325 STRUCT BOLT W/USS MIL FW MG ( MFG- NUCOR FAST #197920B/184171D/197920C, WROUGHT WASHER #216460, GALV.- NUCOR FAST., WISCONSIN METAL) 80.6005
4800	3/8 X 7 1/2 A307 HEX SCREW W/ N & 2 FW MG ( MFG- AUTO BOLT & NUT #155451&2, TELEFAST IND # G13935-66988, WROUGHT WASHER #169742, GALV.- MECH GALV. PLATING) 80.3355

M/F: STOCK

All products were melted and manufactured in the U.S.A. This material is in compliance with domesticity requirements, and conforms to ASTM & AASHTO specifications for standardized highway barrier rail and hardware.

*James L. Lumbaux*  
SUPERVISOR QUALITY ASSURANCE  
DATE: 5/14/2007

RECEIVED

JUL 17 2007

UNL ACCOUNT

NOVA TUBE AND STEEL CORPORATION  
600 Dean Sievers Place  
Morrisville, Pa. 19067  
Tel: 215-295-8813 Fax: 215-295-8798

TEST CERTIFICATE

Sold to: AMERICAN STEEL (LIVERPOOL)      DATE SHIPPED: 04/04/07  
Ship to: AMERICAN STEEL (LIVERPOOL)      B/L #: 149131  
          BOX 296 CROWN ROAD                      P.O. #: N0819505  
          LIVERPOOL, NY                              SALES ORDER #: 125998

13088

s0p12h10v0s0b3T

Description	Dimensions	PostMill/Heat Number	Specifications
Hot Rolled Plate	0.250x60x120	20 MIT /412H2031	ASTM A36/SA 36
Hot Rolled Plate	0.250x60x144	8 MIT /412H2031	ASTM A36/SA 36

s0p15h12v0s0b3T

Chemical Analysis																
Heat Number	C	Mn	P	S	Si	Cu	Ni	Cr	Cb	Mo	V	Al	N	Sn	B	Ti
MIT/412H2031	0.190	0.680	0.019	0.012	0.010	0.040	0.010	0.030	0.001	0.001	0.001	0.046	0.004	-	-	-
Melted & Manufactured in U.S.A.																

s0p10h12v0s0b3T

Mechanical Test Results				
Heat Number/Size	Yield Strength	Tensile Strength	Elong. &	Hardness
MIT/412H2031	44,300	68,400	33.00	

Heat #      Origin  
MIT /412H2031      United States

RECEIVED

JUL 17 2007

ELDER... INC. UNL ACCOUNT

CERT RECEIVED: 4/16/07  
PURCHASE ORDER # 02254  
SALES ORDER # 080142  
SHIPPED FROM: American Steel

Authorized by Andrew Hurlbrink, Quality Ctrl Dept  
APR 4. 2007 14:58:01  
s0p10h12v0s0b3T  
s0p10h12v0s0b3T

BENNETT BOLT WORKS, INC  
P.O. BOX X  
JORDAN, NEW YORK 13080

**CERTIFICATE OF COMPLIANCE**

**TO:** Elderlee, Inc.  
Oaks Corners, NY 14518

*We certify that our system and procedures for the control of quality assures that all items furnished on the order will meet applicable tests, process requirements and inspection requirements as required by the purchase order and applicable specifications.*

**P.O.#:** 70024 JCH  
**DATE SHIPPED:** 3/3/99  
**INVOICE #:** 21394  
**PURCHASE DATE:** 2/17/99  
**GALVANIZER:** See Below  
**GALV. DATE:**

**QUANTITY, DESCRIPTION & MANUFACTURER:**

- 500 - 1/4 x 1 1/2 Gr 2 Hex Screw w/ N & 2 FW MG ( mfg- Nucor Fast. #n106399A, Telefast Ind. #E2416A, Wrought Washer, galv.- Mech Galv. Plating)
- 5000 - 1/2 x 1 1/2 A307 Hex Screw w/ N & SAE FW MG ( mfg- Nucor Fast. #n108712A, Telefast Ind. #M6921-51461, Wrought Washer, galv.- Mech Galv Plating)

RECEIVED  
JUL 17 2007  
UNL. ACCOUNTING

*All manufacturing processes for this steel have occurred in the USA. This material is in compliance with domesticity requirements and conforms to NYS DOT Engineering Bulletin 83-10.*

*James L. Lincbeaux*  
**Supervisor, Quality Control**  
**Date:** 3/4/99

# BENNETT BOLT WORKS, INC.

12 Elbridge Street  
P.O. Box 922  
Jordan, New York 13080

PH 315-689-3981  
FX 315-689-3999

## CERTIFICATION OF COMPLIANCE

Customer: ELDERLEE, INC.  
729 CROSS RD  
OAKS CORNERS, NY 14518

We certify that our system and procedures for the control of quality assures that all items furnished on the order will meet applicable tests, process requirements, and inspection requirements as required by the purchase order and applicable specifications.

Customer PO No.: 2214 NG  
Date Shipped: 3/23/2007  
Invoice No.: 5007976  
Purchase Date: 3/20/2007

### QUANTITY DESCRIPTION

126	3/8 X 10 A307 HEX SCREW W/ N & 2 FW HDG ( MFG- GAFFNEY BOLT #14690, DECKER MFG #05-03-019, WROUGHT WASHER #169742, GALV.- ROGERS BROTHERS GALV., DECKER MFG., WISCONSIN METAL)
-----	--

M/F: STOCK  
80.3700

RECEIVED

MAR 23 2007

UNIVERSITY OF ALABAMA

All products were melted and manufactured in the U.S.A. This material is in compliance with domesticity requirements, and conforms to ASTM & AASHTO specifications for standardized highway barrier rail and hardware.

*James L. Lumb*  
SUPERVISOR QUALITY ASSURANCE  
DATE: 3/26/2007



**ELDERLEE, INC.**

University of Nebraska-Lincoln  
Accounting Dept.  
PO Box 880439



ACTIVE  
MEMBER

Date: August 31, 2007  
Order #: 34513  
PO #: Per Jim @ Nebraska  
Shippers #: 43572  
Invoice #: 37729

Certificate of Compliance

The undersigned, being duly authorized by ELDERLEE, INC., Oaks Corners, NY and having reviewed the records of the company, hereby certifies that all material galvanized has been processed in accordance with AASHTO M111 and ASTM A-123 Specifications.

0013.02708	1 Ea.	3" I-Dwy Post w/Slots & Sp 47"
0057.18035	1 Ea.	BB 6x6 18' STD w/35' Rad.
0054.00052	1 Ea.	BB Dwy. Shelf Angle 4-1/2"

SEP 5 2007

*James A. Morlang*  
James A. Morlang  
Galvanizing Plant Manager



# Certificate of Analysis

**No. CT001075**  
Date 03/21/07

**MET CON STEEL, Inc.**  
P.O. Box 876  
Wadsworth, Ohio 44282-0876  
(330) 336-3163  
fax 334-3296

Customer: ELD10  
**ELDERLEE, INC.**  
729 Cross Road  
Oaks Corner, New York 14518

Ship To: ELD10  
**ELDERLEE, INC.**  
STEEL YARD  
729 Cross Road  
Oaks Corner, NY

Terms	Ship Via	FOB	Work Order No.	Shipper No.	Date Shipped	Sign			
1%10NET30	TRUCK	DELVD			03/20/07	AL RADY			
Tag#	Heat No.	Grade	Gauge	Width	Length	Pcs	Weight	Part No.	P/O No.
903549-05/10	C39516	A36	.246	8.000	24.00	1500	19625		

Chemical Analysis																	
C	.23	Mn	.96	P	.005	S	.006	Si	.03	Ti	.002	Cr	.025	Mo	.005	Cu	.01
Al	.035	Cb	.005	V		Pb		Sn		Ca		Ni	.01	B		Co	
Ni		Va		Fe		Zn		Mg									

## Physical Properties

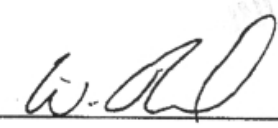
Rockwell B88 Olsen      Yield 49150 Tensile 62690 Elongation 24% Grain       
Mill GALLATIN

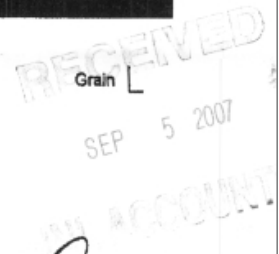
Comments: MELTED & MFG. IN THE USA

We hereby certify the above figures are accurately stated,  
and are traceable in our records back to the supplier and/or  
an accredited test laboratory

(c)2002ApplicationsResearch734 449-43C

Rev. 01 (03/17/00)

  
**ELDERLEE, INC.**  
 CERT RECEIVED: 3/22/07  
 PURCHASE ORDER # P2182  
 SALES ORDER # QYM603444  
 SHIPPED FROM Met Con Steel



TEST ACTION TRANSMITTAL  
NYSDOT MATERIALS BUREAU

Serial No.: 251110

To: Nova Tube, Morrisville, PA; Pennoni, King of Prussia, PA.

Test No.: 06MG44  
Date Received: 5/8/06

The Material represented by the sample submitted with the BR-240 having the above serial number was:

Accepted on 5/18/06.

for ITEM: 710-21 Box Beam Guide Railing and Median Barrier; Galvanized 6"x6"x3/16"; Heat #411C2201/2202.

Remarks: For DWTT Properties.

This document serves as the official transmittal of action on the noted sample. Attached hereto is a digital image of the BR-240 which accompanied same.

RECEIVED  
SEP 5 2007

JOHN RONDINARO  
DIRECTOR, MATERIALS BUREAU

INL ACCOUNTING

BR 240a (11/74)	SAMPLE AND ACCEPTANCE TRANSMITTAL NYSDOT MATERIALS BUREAU	SERIAL NO. 251110	DATE REC'D. 5/8/06	TEST NO. 06MG44
To: _____				
Material Represented by the Sample Described Below Was _____				
On _____ For _____				
(Action Official Only When Validated Below By The Materials Bureau)				

UPPER PORTION FOR MATERIALS BUREAU ONLY — INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW

14. ADDITIONAL INFO. (SEE INSTRUCTIONS ON REAR)  
LOGO IMPRINTED NOVA 86  
4" LG. SAMPLE W/ AGENCY  
STAMP (P) LEFT WITH  
MANUFACTURER  
COIL # 829113  
TAG # T131510

RETAIN PINK COPY FOR YOUR RECORDS  
FORWARD ALL OTHERS TO MATERIALS BUREAU

1. MATERIAL 6"x6"x3/16" GALV. STEEL BOX BEAM		2. ITEM NO. 710-21	3. DATE SAMPLED 4/28/06	4. CONTRACT NO. STOCK
5. SUPPLIER AND LOCATION NOVA TUBE & STEEL MORRISVILLE, PA		6. QUANTITY IN LOT 34,412 FT	7. LOT NO. NOVA 86	
8. MANUFACTURER AND LOCATION (IF DIFFERENT THAN ABOVE)		9. BATCH NO. 411C2201/2202	10. DATE OF MFR. 4/28/06	
11. SAMPLED AT <input type="checkbox"/> MILL <input checked="" type="checkbox"/> PLANT <input type="checkbox"/> JOB	12. TYPE <input checked="" type="checkbox"/> CONTROL SAMPLE <input type="checkbox"/> INFO. SAMPLE <input type="checkbox"/> GPR SAMPLE <input type="checkbox"/> APPROVED LIST MAT. <input type="checkbox"/> CERTIFIED MAT.		13. SAMPLED FROM TUBE WAREHOUSE	
15. CONTRACTOR AND PROJECT LOCATION		14. SAMPLED BY (INC. DIST. NO. OR AGENCY) PAI; IA039; AAN		
		MATERIALS BUREAU VALIDATION		





JACKSON STEEL MILL  
801 AMERISTEEL ROAD  
JACKSON TN 38305 USA  
(731) 424-5600

Chemical and Physical Test Report

MADE IN UNITED STATES

V-811988

PRODUCED IN: JACKSON TN

SHIP TO TRIAD METAL 1951 BESSEMER ROAD 804-732-5000 PETERSBURG, VA 23805	INVOICE TO TRIAD METALS INTERNATIONAL METAL TRADERS INC 2300 COMPUTER AVE. STE-A-1 WILLOW GROVE, PA 19090	SHIP DATE 05/08/07  CUST. ACCOUNT NO 40213035
--	---	---

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER
A2 1/2 X 2 1/2 X 3/16	A36	ASTM A36-05, CSA G40.21-44W	6129053-02	150015-02
HEAT I.D.	C Mn P S Si Cu Ni Cr Mo V Nb B N Sn Al Ti Zr Ca C Eqr			
V7-1226	.19 .89 .014 .008 .20 .31 .10 .11 .030 .015 .002 .0003 -.0058 .011 .002 .00100 .000 .00000 .308			

Mechanical Test: Yield 48900 PSI, 337.15 MPA Tensile: 70290 PSI, 484.36 MPA %EL: 32.28in, 32.2700MM  
 Mechanical Test: Yield 48920 PSI, 335.22 MPA Tensile: 70470 PSI, 485.87 MPA %EL: 31.82in, 31.6200MM

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER
A5 X 3 1/2 X 3/8	A36	ASTM A36-05	7002998-13	151821-13
HEAT I.D.	C Mn P S Si Cu Ni Cr Mo V Nb B N Sn Al Ti Zr Ca C Eqr			
V7-1967	.15 .74 .019 .008 .22 .27 .08 .13 .025 .005 .002 .0004 .0021 .010 .001 .00100 .000 .00000 .325			

Mechanical Test: Yield 47090 PSI, 324.47 MPA Tensile: 68580 PSI, 472.84 MPA %EL: 34.09in, 34.0200MM  
 Mechanical Test: Yield 48900 PSI, 344.48 MPA Tensile: 71430 PSI, 492.91 MPA %EL: 33.28in, 33.2700MM

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER
A5 X 3 X 1/2	A36	ASTM A36-05	8114924-39	145081-39
HEAT I.D.	C Mn P S Si Cu Ni Cr Mo V Nb B N Sn Al Ti Zr Ca C Eqr			
V7-1906	.18 .72 .014 .009 .20 .34 .10 .09 .028 .003 <.008 .0004 .0100 .011 .000 .00100 .000 .00000 .353			

Mechanical Test: Yield 47850 PSI, 328.91 MPA Tensile: 70610 PSI, 488.84 MPA %EL: 31.28in, 31.2200MM  
 Mechanical Test: Yield 47300 PSI, 328.12 MPA Tensile: 70450 PSI, 485.74 MPA %EL: 31.88in, 31.8200MM

426

This material, including the billets, was produced and manufactured in the United States of America

*Maskay*  
Bhaskar Yalamanchil  
Quality Director  
Gerdaul Ameristeel

THE ABOVE FIGURES ARE CERTIFIED EXTRACTS FROM THE ORIGINAL CHEMICAL AND PHYSICAL TEST RECORDS AS CONTAINED IN THE PERMANENT RECORDS OF COMPANY.

SEP 5 2007

*HB*  
My. Melbring Svcs.  
JACKSON STEEL MILL

CUST. ACCOUNT

RECEIVED

ELDERLE, *ELDERLE*  
CERT RECEIVED: 6/14/07  
PURCHASE ORDER # P2302  
SALES ORDER # 4202  
SHIPPED FROM: Triad Metals

January 20, 2010  
MwRSF Report No. TRP-03-203-10

# BENNETT BOLT WORKS, INC.

12 Elbridge Street  
P.O. Box 922  
Jordan, New York 13080

PH 315-689-3981  
FX 315-689-3999

## CERTIFICATION OF COMPLIANCE

Customer: ELDERLEE, INC.  
729 CROSS RD  
OAKS CORNERS, NY 14518

We certify that our system and procedures for the control of quality assures that all items furnished on the order will meet applicable tests, process requirements, and inspection requirements as required by the purchase order and applicable specifications.

Customer PO No.: 2214 NG

Date Shipped: 4/20/2007

Invoice No.: 5008241

Purchase Date: 4/19/2007

QUANTITY	DESCRIPTION
100	3/4-10 X 4 1/2 A307 HEX SCREW W/ N & 2 FW HDG ( MFG - SILO FAST #3661-A, NUCOR FAST # 213520A, WROUGHT WASHER # 213859, GALV.- UNIVERSAL GALV., NUCOR FAST., ROGERS BROTHERS GALV.)
1000	3/4 X 8 A307 HEX SCREW W/ N & 2 FW HDG ( MFG- BIRMINGHAM FAST, NUCOR FAST, WROUGHT WASHER # 167415, GALV.- BIRMINGHAM FAST., NUCOR FAST., ROGERS BROTHERS GALV.)
1000	3/4 X 8 A307 CARRIAGE BOLT W/ N & FW & LW HDG ( MFG- MIDWEST FAB #65061, NUCOR FAST #213520A, WROUGHT WASHER #018139/213859, GALV.- COLUMBUS GALV., NUCOR FAST., ROGERS BROTHERS GALV.)
4800	3/8 X 7 1/2 A307 HEX SCREW W/ N & 2 FW MG ( MFG- AUTO BOLT & NUT #15545-1 & 2, TELEFAST IND #O13699-1-66461, G13935-66988, WROUGHT WASHER #169742, GALV.- MECH GALV. PLATING)
6000	1/2 X 1 1/2 A307 HEX SCREW W/ N & SAE FW HDG ( MFG- NUCOR FAST #204059A, TELEFAST IND # R15389, WROUGHT WASHER, GALV.- NUCOR FAST., NORTH AMERICAN GALV., ROGERS BROTHERS GALV.)

M/F: STOCK

All products were melted and manufactured in the U.S.A. This material is in compliance with domesticity requirements, and conforms to ASTM & AASHTO specifications for standardized highway barrier rail and hardware.

*James L. Lincicum*  
SUPERVISOR QUALITY ASSURANCE  
DATE: 4/23/2007

RECEIVED

SEP 5 2007

UML ACCOUNTING

ELDERLEE, INC.  
729 CROSS RD.  
OAKS CORNERS, NY 14532  
Telephone: (315) 789-6670

University of Nebraska-Lincoln  
Accounting Dept.  
PO Box 880439  
Lincoln, NE 68588-0439

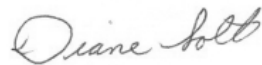
Date: August 13, 2008  
Order #: 38655  
PO #: 4500193110  
Shippers #: 48408  
Invoice #: 41967

TRANSMITTAL OF CERTIFICATIONS, ETC.:

Attached please find one set of the following:

- Galvanizing & Material Certifications
- Galvanizing Certifications Only
- Material Certifications Only
- CS-417 (PA) Certifications
- Other:

Very truly yours,



Diane Solt  
Administrative Assistant

RECEIVED  
AUG 18 2008  
UNLACCOUNTING



**ELDERLEE, INC.**

University of Nebraska-Lincoln  
Accounting Dept.  
PO Box 880439

Date: August 13, 2008  
Order #: 38655  
PO #: 4500193110  
Shippers #: 48408  
Invoice #: 41967



ACTIVE  
MEMBER

Certificate of Compliance

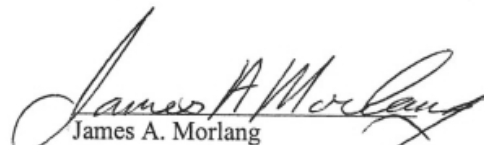
The undersigned, being duly authorized by ELDERLEE, INC., Oaks Corners, NY and having reviewed the records of the company, hereby certifies that all material galvanized has been processed in accordance with AASHTO M111 and ASTM A-123 Specifications.

0057.18035	1 Ea.	BB 6x6 18' STD w/35' Radius
0054.01000	1 Ea.	BB 6x6 Type I End Section

RECEIVED

AUG 18 2008

UNACCOUNTING

  
James A. Morlang  
Galvanizing Plant Manager

TEST ACTION TRANSMITTAL  
NYS DOT MATERIALS BUREAU

Serial No.: 220564

To: Nova Tube, Morrisville, PA; Pennoni, King of Prussia, PA.

Test No.: 07MG001

Date Received: 1/12/07

The Material represented by the sample submitted with the BR-240 having the above serial number was:

Accepted on 2/2/07.

Note: Originally Accepted on 1/16/07.

For ITEM: 710-21 Box Beam Guide Rail and Median Barrier; Galvanized 6"x6"x3/16"; Heat #422E0371, 372,373

Remarks: For DWTT Properties.

This document serves as the official transmittal of action on the noted sample. Attached hereto is a digital image of the BR-240 which accompanied same.

JOHN RONDINARO  
DIRECTOR, MATERIALS BUREAU

BR 240a (11/74)		SAMPLE AND ACCEPTANCE TRANSMITTAL NYS DOT MATERIALS BUREAU		SERIAL NO. <b>220564</b>	DATE REC'D <b>1/12/07</b>	TEST NO. <b>07MG001</b>	
To: _____				Material Represented by the Sample Described Below Was _____			
On _____				For _____			
(Action Official) Only When Validated Below By The Materials Bureau)							
<b>UPPER PORTION FOR MATERIALS BUREAU ONLY — INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW</b>							
15. ADDITIONAL INFO. (SEE INSTRUCTIONS ON REAR)							
LOGO IMPRINTED NOVA 99 4" LG SAMPLE W/ AGENCY STAMP (P) 1" LEFT WITH MANUFACTURER COIL # 890291 TAG # T14940G Note: Error in Heat Number corrected by Brandon Stanfield RETAIN PINK COPY FOR YOUR RECORDS ON 2/2/07 FORWARD ALL OTHERS TO MATERIALS BUREAU		1. MATERIAL <b>6"x6"x0.188 STEEL BOX BEAM</b>	2. ITEM NO. <b>710-21</b>	3. DATE SAMPLED <b>12/20/06</b>	4. CONTRACT NO. <b>STOCK</b>	5. QUANTITY IN LOT <b>34,400 FT</b>	
		5. SUPPLIER AND LOCATION <b>NOVA TUBE &amp; STEEL MORRISVILLE, PA</b>		6. BATCH NO. <b>422E0371</b>		7. LOT NO. <b>NOVA 99</b>	
		8. MANUFACTURER AND LOCATION (IF DIFFERENT THAN ABOVE): _____		9. DATE OF MEGR. <b>12/15/06</b>		10. DATE OF MEGR. <b>12/15/06</b>	
		11. SAMPLED AT <input type="checkbox"/> MILL <input checked="" type="checkbox"/> PLANT <input type="checkbox"/> JOB	12. TYPE <input checked="" type="checkbox"/> CONTROL SAMPLE <input type="checkbox"/> INFO. SAMPLE	<input type="checkbox"/> BPR SAMPLE <input type="checkbox"/> APPROVED LIST MAT. <input type="checkbox"/> CERTIFIED MAT.		13. SAMPLED FROM <b>TUBE WAREHOUSE</b>	
15. CONTRACTOR AND PROJECT LOCATION _____				14. SAMPLED BY (INC. DIST. NO. OR AGENCY) <b>PAI, TAO39, JAVAN</b>			
				MATERIALS BUREAU VALIDATION			

NYSDOT MATERIALS BUREAU

To: Nova Tube, Morrisville, PA; Pennoni, King of Prussia, PA.

Test No.: 07MG63  
Date Received: 4/19/07

The Material represented by the sample submitted with the BR-240 having the above serial number was:

Accepted on 4/30/2007

For ITEM: 710-21 Nova Tube & Steel Box Beam; 6"x6"x0.188"; Heat #402H9981

Remarks: For DWTT Properties.

This document serves as the official transmittal of action on the noted sample. Attached hereto is a digital image of the BR-240 which accompanied same.

JOHN RONDINARO  
DIRECTOR, MATERIALS BUREAU

BR 240a (11/76)	SAMPLE AND ACCEPTANCE TRANSMITTAL NYSDOT MATERIALS BUREAU	SERIAL NO. <b>219970</b>	DATE REC'D. <b>4/19/07</b>	TEST NO. <b>07MG63</b>
To:	Material Represented by the Sample Described Below Was _____			
On _____	For _____			
(Action Official Only When Validated Below by The Materials Bureau)				
<b>UPPER PORTION FOR MATERIALS BUREAU ONLY — INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW</b>				
15. ADDITIONAL INFO. (SEE INSTRUCTIONS ON REAR) <b>LEAD IMPRINTED NOVA 105</b> <b>4" LONG SAMPLE w/ AGENCY</b> <b>STAMP (P) LEFT WITH</b> <b>MANUFACTURER</b> <b>COIL # 907872</b> <b>TAG # T1569960</b>	7. MATERIAL <b>6"x6"x0.188 STEEL BOX BEAM</b>	8. TEST NO. <b>710-21</b>	9. DATE SAMPLED <b>3/23/07</b>	10. CONTRACT NO. <b>STOCK</b>
	6. SUPPLIER AND LOCATION <b>NOVA TUBE STEEL MORRISVILLE, PA</b>	5. QUANTITY IN LOT <b>30,910 FT</b>	7. LOT NO. <b>NOVA 105</b>	11. DATE OF MFG. <b>3/23/07</b>
	8. MANUFACTURER AND LOCATION (IF DIFFERENT THAN ABOVE)	9. BATCH NO. <b>402H9981</b>	12. DATE OF MFG. <b>3/23/07</b>	
	11. SAMPLED AT <input type="checkbox"/> MILL <input checked="" type="checkbox"/> PLANT <input type="checkbox"/> JOB	12. TYPE <input checked="" type="checkbox"/> CONTROL SAMPLE <input type="checkbox"/> INFO. SAMPLE	13. SAMPLED FROM <b>TUBE WAREHOUSE</b> 14. SAMPLED BY (INC. DIST. NO. OR AGENCY) <b>PAI; JAO39; AAN</b>	
15. CONTRACTOR AND PROJECT LOCATION		MATERIALS BUREAU VALIDATION		

RETAIN PINK COPY FOR YOUR RECORDS  
FORWARD ALL OTHERS TO MATERIALS BUREAU

06Sep07 9:53 TEST CERTIFICATE No: 1 21371

Sold By:  
THE UNIVERSAL STEEL COMPANY  
6600 GRANT AVENUE  
CLEVELAND, OH 44105  
Tel: 216 883-4972 Fax: 216 341-0421

P/O No JS1265Z1  
Rel  
S/O No 1 127370-001  
B/L No 1 113440-001 Shp 06Sep07  
Inv No Inv

Sold To: (110053)  
KLEIN STEEL  
105 VANGURAD PKWY  
ROCHESTER NY 14606

Ship To: (001)  
KLEIN STEEL  
105 VANGURAD PKWY  
ROCHESTER NY 14606

Tel: 800-477-6789 Fax: 585-328-7377

CERTIFICATE of ANALYSIS and TESTS

Cert. No: 1 21371  
06Sep07

Part No P316510  
Hot Roll Sheet ASTM A36  
.1790 Min X 60.0000" X 120.0000"

Heat Number	Tag No	YLD=<54.1>/TEN=<75.1>/ELG=<27>	Pcs	Wgt
4153565	94949		85	32,580
4153565	94950		15	5,750
4153565	94951		15	5,750
4153565	94952		15	5,750
4153565	94953		15	5,750
4153565	94954		10	3,830

Heat Number  
4153565

\*\*\* Chemical Analysis \*\*\*  
C=<.2200> Mn=<.7800> P=<.0100> S=<.0070> Si=<.0200> Al=<.0510>  
Cu=<.0300> Mo=<.0100> Sn=<.0050> V=<.0020> N=<.0045> Cr=<.0300>  
Ni=<.0100> Ti=<.0020> Sb=<.0030> Ca=<.0001>

820782

NOVA TUBE AND STEEL CORPORATION  
600 Dean Sievers Place  
Morrisville, PA, 19067  
Tel: 215-295-8813 Fax: 215-295-8798

TEST CERTIFICATE

Sold to: AMERICAN STEEL(LIVERPOOL) DATE SHIPPED: 03/03/08  
Ship to: AMERICAN STEEL(LIVERPOOL) B/L #: 158204  
BOX 296 CROWN ROAD P.O. #:M0820782  
LIVERPOOL,NY SALES ORDER #: 130630

1/4x48x120

13088

Description	Dimensions	Pcs	Mill/Heat Number	Specifications
Hot Rolled Plate	0.250x48x120	6	MIT /422J8791	ASTM A36/SA 36

Chemical Analysis																
Heat Number	C	Mn	P	S	Si	Cu	Ni	Cr	Cb	Mo	V	Al	N	Sn	B	Ti
MIT 422J8791	0.220	0.770	0.018	0.011	0.011	0.040	0.020	0.040	0.001	0.011	0.002	0.066	0.002	-	-	-
Melted & Manufactured in the U.S.A.																

Mechanical Test Results						
Heat Number/Size or Ser#	Yield	Tensile	Elong.%	N-fact	Crush	
422J8791 (Tail)	50,300 PSI	73,200 PSI	30.00(2*)			

Heat # Origin  
422J8791 United States MITTAL STEEL - SPT

Authorized by Andrew Hurlbrink, Quality Ctrl Dept

MAR 3, 2008N

ELDEN, INC.  
CERT RECEIVED: 3/25/08  
PURCHASE ORDER # P2539  
SALES ORDER # 0822951  
SHIPPED FROM: American steel



4x4x3/8

NY

Certification 918592 6/10/08 1

Submitted Hanna Steel Corporation  
By: Tuscaloosa Division  
1701 Boone Blvd  
P O Box 428  
Northport AL 35476

Cust P.O.: P80606SS001  
Date Shipped: 6/10/08  
Load Tally 5-20961  
Invoice # 000000

Send State Steel of Omaha  
To: 13433 CENTECH ROAD  
P O Box 390745  
Omaha NE 68139

Ship State Steel of Omaha  
To: 13433 CENTECH ROAD  
P O Box 390745  
Omaha NE 68139

434

No	Item	Heat #	ASTM	Year	GradeClass	Yield	Tens	Elong	Rock
01	4500212		4 SQ	3/8	HRA500	24.000FT			
3666790	B74033		A500	2003a	B	1 64,000	71,500	25.3	B85
Total Weight				6,217					

Heat #	C	Mn	P	S	Si	Al	Cb	Cr	Cu	Mo	Ni	V
B74033	.180	.770	.010	.010	.011	.029	.000	.030	.050	.010	.020	.001
	N .0045	Ti	.0020	B	.0001							

Heat# B74033 was melted and manufactured in the USA

**CERTIFICATE OF TEST**



7/16x3

Page 01 of 01

Certification Date  
15-DEC-2008

**CUSTOMER ORDER NUMBER**  
29288

EARLE M. JORGENSEN COMPANY

Invoice Number  
T627516

**CUSTOMER PART NUMBER**  
0001

1800 N UNIVERSAL AVENUE  
KANSAS CITY MO 64120

**SOLD TO:** RIVERS METAL PRODUCTS  
3100 N 38TH  
LINCOLN NE 68504

**SHIP TO:** RIVERS METAL PRODUCTS  
3100 NORTH 38TH  
LINCOLN NE 68504

Description: 1018 CF BAR ASTM A108  
7/16 X 3 FLATS X 12' R/L  
HEAT: 0716363

ITEM: 502898

Line Total: 56 LB

Specifications:  
ASTM A108 03

-----  
CHEMICAL ANALYSIS  
-----

C	MN	P	S	SI	CU	NI	CR
0.19	0.85	0.01	0.027	0.16	0.17	0.07	0.11
MO	V	SN	TI				
0.03	0.006	0.008	0.001				

RCPT: R475956

MILL : NUCOR WISCONSIN COLD FINISH

COUNTRY OF ORIGIN : USA

STRAND CAST REDUCTION RATIO 17.8 TO 1  
MATERIAL IS FREE FROM MERCURY CONTAMINATION

-----  
COMMENTS

melt source ameristeel usa  
coarse grain  
ACCEPTED FOR 1E0065B FOR ALL PF PARTS PER JFG 5-22-08

The above data were transcribed from the manufacturer's Certificate of Test after verification for completeness and specification requirements of the information on the certificate. All test results remain on file subject to examination.

We hereby certify that the material covered by this report will meet the applicable requirements described herein, including any specification forming a part of the description.

The willful recording of false, fictitious, or fraudulent statements in connection with test results may be punishable as a felony under federal statutes.

Material did not come in contact with mercury while in our possession.

LARRY BUSICK

Manager, Quality Assurance

ID: #227483 Page 4 of 7



CALVERT CITY STEEL MILL  
1035 SHAR-CAL ROAD  
CALVERT CITY KY 42029 USA  
(270) 395-3100

7x4x3/16

Chemical and Physical Test Report

MADE IN UNITED STATES

Y-029353

PRODUCED IN: CALVERT CITY

SHIP TO STATE STEEL 13433 CENTECH RD P.O. BOX 390745 OMAHA, NE 68139	INVOICE TO STATE STEEL SUPPLY CO INC/SC/1 PO BOX 3224  SIOUX CITY, IA 51102	SHIP DATE 03/24/07  CUST. ACCOUNT NO 60005758
--	---	---

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER													
A7 X 4 X 3/8	A36	A36/44W A36/44W ASTM A36-05, ASTM A709 GR36	6110266-01	P81020DE001-01													
HEAT I.D.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Nb	B	N	Sn	Al	Ti	C Eqv
Y700999	.14	.71	.015	.032	.23	.31	.10	.05	.025	.001	<.008	.0005	.0085	.012	.001	.00100	.339

Mechanical Test: Yield 50000 PSI, 344.74 MPA Tensile: 89000 PSI, 475.74 MPA %E: 27.0%/in, 27.0/203.2mm Std Dev:0  
Customer Requirements CASTING: STRAND CAST  
Mechanical Test: Yield 50000 PSI, 344.74 MPA Tensile: 89000 PSI, 475.74 MPA %E: 23.0%/in, 23.0/203.2mm Std Dev:0  
Customer Requirements CASTING: STRAND CAST

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER													
A8 X 6 X 1/2	A36	A36/44/572 A36/44/572 ASTM A36-05, A709 GR36, A572-50, A709 GR50/345	6076635-01	P60629DE011-01													
HEAT I.D.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Nb	B	N	Sn	Al	Ti	C Eqv
Y701324	.17	.86	.017	.019	.28	.30	.09	.08	.022	.019	<.008	.0005	.0092	.011	.001	.00100	.41

Mechanical Test: Yield 54000 PSI, 372.32 MPA Tensile: 78000 PSI, 524 MPA %E: 21.0%/in, 21.0/203.2mm Std Dev:0  
Customer Requirements CASTING: STRAND CAST  
Mechanical Test: Yield 54000 PSI, 372.32 MPA Tensile: 76000 PSI, 524 MPA %E: 23.0%/in, 23.0/203.2mm Std Dev:0  
Customer Requirements CASTING: STRAND CAST  
CUST ITEM NUMBER: 2/24

This material, including the billets, was melted and manufactured in the United States of America

*Mhaskar*

Bhaskar Yalamarchil  
Quality Director  
Gerdau Ameristeel

THE ABOVE FIGURES ARE CERTIFIED EXTRACTS FROM THE ORIGINAL CHEMICAL AND PHYSICAL TEST RECORD AS CONTAINED IN THE PERMANENT RECORDS OF COMPANY.

*Alice L. P. [Signature]*

Mgr. Metallurg. Svcs.  
CALVERT CITY STEEL MILL

03/24/2007 Sat 09:45

Name: Gerdau Ameristeel AutoFax System Ph:

436



3" 5.7#



CARTERSVILLE STEEL MILL  
384 OLD GRASSDALE RD NE  
CARTERSVILLE GA 30121 USA  
(770) 387-3300

Chemical and Physical Test Report  
MADE IN UNITED STATES

G-110068

PRODUCED IN: CARTERSVILLE

<b>SHIP TO</b> STATE STEEL 13433 CENTECH RD P.O. BOX 390745 OMAHA, NE 68139	<b>INVOICE TO</b> STATE STEEL SUPPLY CO INC/SC1 PO BOX 3224 SIOUX CITY, IA 51102	<b>SHIP DATE</b> 02/19/08  <b>CUST. ACCOUNT NO</b> 80005758
---	---	---

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER
W3 X 5 7/8 S-BEAM	A57280/892	ASTM A572 GR50-07, ASTM A992 -06A	8020438-04	P80218JTD51-04
HEAT I.D.	C	Mn P S Si Cu Ni Cr Mo V Nb B N Sn Al Ti Ca Zn C Equ		
G800884	.14	.90 .009 .020 .20 .20 .10 .03 .020 .015 .002 .0003 .0091 .009 .001 .00100 .00090 .00440 .33		

Mechanical Test: Yield 52900 PSI, 364.73 MPA Tensile: 72100 PSI, 497.11 MPA %El: 23.5%/in, 23.5/200MM Std Dev:0 Id Diam: .457  
 Customer Requirements: CASTING: STRAND CAST  
 Mechanical Test: Yield 55300 PSI, 381.28 MPA Tensile: 71300 PSI, 461.6 MPA %El: 23.4%/in, 23.4/200MM Std Dev:0 Id Diam: .457  
 Customer Requirements: CASTING: STRAND CAST

437

This material, including the billets, was produced and manufactured in the United States of America

*Shaskar*  
 Shaskar Yalamanchili  
 Quality Director  
 Gerdau Ameristeel

THE ABOVE FIGURES ARE CERTIFIED EXTRACTS FROM THE ORIGINAL CHEMICAL AND PHYSICAL TEST RECORDS AS CONTAINED IN THE PERMANENT RECORDS OF COMPANY.

*Zarway*  
 Mgr. Metallurg. Svcs.  
 CARTERSVILLE STEEL MILL

Seller warrants that all material furnished shall comply with specifications subject to standard published manufacturing variations. NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE MADE BY THE SELLER, AND SPECIFICALLY EXCLUDED ARE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. In no event shall seller be liable for indirect, consequential or punitive damages arising out of or related to the materials furnished by seller. Any claim for damages for materials that do not conform to specifications must be made from buyer to seller immediately after delivery of same in order to allow the seller the opportunity to inspect the material in question.



CAMBRIDGE STEEL MILL  
160 ORION PLACE  
CAMBRIDGE ON N1T 1R9 CAN  
(519) 740-2488

Chemical and Physical Test Report

MADE IN CANADA

N-083053

3/16 x 1

PRODUCED IN: CAMBRIDGE

<b>SHIP TO</b> NORFOLK IRON & METAL CO INC 3001 NO. VICTORY RD 402-371-1810 NORFOLK, NE 68702	<b>INVOICE TO</b> NORFOLK IRON & METAL CO INC ATTN-ACCTS PAYABLE PO BOX 1129 NORFOLK, NE 68702	<b>SHIP DATE</b> 04/30/08  <b>CUST. ACCOUNT NO</b> 60056348
---	--	---

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER																
F3/16 X 1	A36	ASTM A36/A36M-05; CSA-G40.21-300W-98(44W)	8018284-01	125210-01																
HEAT I.D.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Nb	B	N	Sn	Al	Ti	Zr	Ca	Zn	C Eqv
N802351	.15	.59	.010	.044	.18	.29	.16	.18	.030	.003	.002	.0003	.0081	.017	.001	.00100	.002	.00030	.00300	.32

Mechanical Test: Yield 51381 PSI, 354.28 MPA Tensile: 72048 PSI, 496.74 MPA %E: 23.0/8in, 23.0/200MM Red R 133.7 : 1 Std Dev:0 Idl Diam: .487  
Customer Requirements CASTING: STRAND CAST  
Mechanical Test: Yield 51038 PSI, 351.89 MPA Tensile: 71225 PSI, 491.08 MPA %E: 22.0/8in, 22.0/200MM Red R 133.7 : 1 Std Dev:0 Idl Diam: .487  
Customer Requirements CASTING: STRAND CAST

SHAPE + SIZE	GRADE	SPECIFICATION	SALES ORDER	CUST P.O. NUMBER																
F3/8 X 3/4	A36	ASTM A36/A36M-05; CSA-G40.21-300W-98(44W)	8030891-01	125410-01																
HEAT I.D.	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V	Nb	B	N	Sn	Al	Ti	Zr	Ca	Zn	C Eqv
N802370	.13	.58	.013	.039	.13	.28	.12	.18	.040	.003	.002	.0002	.0127	.011	.002	.00100	.002	.00000	.00300	.3

Mechanical Test: Yield 46605 PSI, 321.33 MPA Tensile: 68868 PSI, 474.83 MPA %E: 27.5/8in, 27.5/200MM Red R 89 : 1 Std Dev:0 Idl Diam: .4  
Customer Requirements CASTING: STRAND CAST  
Mechanical Test: Yield 45595 PSI, 314.37 MPA Tensile: 68158 PSI, 469.93 MPA %E: 27.5/8in, 27.5/200MM Red R 89 : 1 Std Dev:0 Idl Diam: .4  
Customer Requirements CASTING: STRAND CAST

438

This material, including the billets, was produced and manufactured in Canada

*Maskay*  
Bhaskar Yelamanchili  
Quality Director  
Gerdau Ameristeel

THE ABOVE FIGURES ARE CERTIFIED EXTRACTS FROM THE ORIGINAL CHEMICAL AND PHYSICAL TEST RECORDS AS CONTAINED IN THE PERMANENT RECORDS OF COMPANY.

*Eric Hannah*  
Mgr. Metallurg. Svcs.  
CAMBRIDGE STEEL MILL

Seller warrants that all material furnished shall comply with specifications subject to standard published manufacturing variations. NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, ARE MADE BY THE SELLER, AND SPECIFICALLY EXCLUDED ARE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. In no event shall seller be liable for indirect, consequential or punitive damages arising out of or related to the materials furnished by seller. Any claim for damages for materials that do not conform to specifications must be made from buyer to seller immediately after delivery of same in order to allow the seller the opportunity to inspect the material in question.

January 20, 2010  
MwRSF Report No. TRP-03-203-10

ELDERLEE, INC.  
729 CROSS RD.  
OAKS CORNERS, NY 14532  
Telephone: (315) 789-6670

University Of Nebraska-Lincoln  
Accounting Dept.  
PO Box 880439  
Lincoln, NE 68588-0439

Date: June 24, 2009  
Order #: 41980  
PO #: 4500206719  
Shippers #: 52505  
Invoice #: 45748

TRANSMITTAL OF CERTIFICATIONS, ETC.:

Attached please find one set of the following:

- Galvanizing & Material Certifications
- Galvanizing Certifications Only
- Material Certifications Only
- CS-417 (PA) Certifications
- Other:

Very truly yours,



Diane Solt  
Administrative Assistant



**ELDERLEE, INC.**



**ACTIVE  
MEMBER**

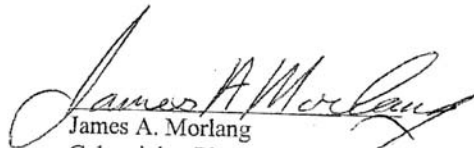
University Of Nebraska-Lincoln  
Accounting Dept.  
PO Box 880439  
Lincoln, NE 68588-0439

Date: June 24, 2009  
Order #: 41980  
PO #: 4500206719  
Shippers #: 52505  
Invoice #: 45748

Certificate of Compliance

The undersigned, being duly authorized by ELDERLEE, INC., Oaks Corners, NY and having reviewed the records of the company, hereby certifies that all material galvanized has been processed in accordance with AASHTO M111 and ASTM A-123 Specifications.

0013.57400	4 Ea.	Post 3" IDbl Angle 7' Lg. w/Sapde
0013.57401	2 Ea.	Post 3" I Special End 7' w/Spade
0054.00018	8 Ea.	BB 6x6x3/16 @ 18'00" Std.
0054.00050	42 Ea.	BB Reg. Shelf Angle 4-1/2"
0054.00052	2 Ea.	BB Dwy. Shelf Angle 4-1/2"
0054.00100	10 Ea.	BB 6x6 Splice Plate 27" (Pair)
0054.01000	2 Ea.	BB 6x6 Type 1 End Section
0057.18035	2 Ea.	BB 6x6x3/16 @ 18' STD w/35' Radius

  
James A. Morlang  
Galvanizing Plant Manager





# CERTIFICATE OF CONFORMANCE

24" Spc. A36

MET CON STEEL INC.  
9950 RITTMAN ROAD  
WADSWORTH, OH 44282  
330-334-3296

3/02/09

Page# 1

TO: ELDERLEE, INC.  
729 CROSS ROAD  
OAKS CORNER, NEW YORK 14518

SHIP TO: ELDERLEE, INC.  
STEEL YARD  
729 CROSS ROAD  
OAKS CORNER, NY

SIZE: .250 X 7.87500 X 23.62500  
GRADE: SHEETS HOT ROLLED  
A36

Bill/Ladng# 000442 B/L Date 3/02/09 Sales Ord: 800316 01  
Cust. P/O#: 02811 Part No.: 0333.70001

Tag# 50032603 01 Heat# A47387 MasterTag# C40073771 01  
C : .23 Mn: 1.19 P : .010 S : .09 Al: .02 Si: .03  
Ti: .002 Mo: .010 Cr: .04  
Rock: B98 Tens: 65100 Yld: 53250 Elng: 23%

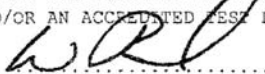
Tag# 50034205 01 Heat# A48816 MasterTag# 309536 01  
C : .23 Mn: .85 P : .010 S : .009 Al: .040 Si: .23  
Cu: .07  
Tens: 63200 Yld: 51980 Elng: 24%

Tag# 50034206 01 Heat# A48816 MasterTag# 309536 01  
C : .23 Mn: .85 P : .010 S : .009 Al: .040 Si: .23  
Cu: .07  
Tens: 63200 Yld: 51980 Elng: 24%

Tag# 50034209 01 Heat# A48816 MasterTag# 309536 01  
C : .23 Mn: .85 P : .010 S : .009 Al: .040 Si: .23  
Cu: .07  
Tens: 63200 Yld: 51980 Elng: 24%

MISC INFO: MELTED & MANUFACTURED IN THE USA

WE HEREBY CERTIFY THE ABOVE FIGURES ARE ACCURATELY STATED, MEET YOUR  
MATERIAL REQUIREMENTS AND ARE TRACEABLE IN OUR RECORDS BACK TO THE  
PRODUCER AND/OR AN ACCREDITED TEST LABORATORY.

  
.....  
QUALITY ASSURANCE MANAGER

CERT RECEIVED: 3/3/09  
PURCHASE ORDER # P2811  
SALES ORDER # 800316  
SHIPPED FROM Met Con Steel

TEST ACTION TRANSMITTAL  
NYSDOT MATERIALS BUREAU

Serial No.: 266003  
Test No.: 08MG105  
Date Received: 8/22/08

To: Nova Tube, Morrisville, PA; Pennoni, King of Prussia, PA.

The Material represented by the sample submitted with the BR-240 having the above serial number was:

**Accepted on 9/03/2008**

For Item: 710-21 Box Beam Guide Rail, 6" x 6" x 3/16"; Heat #421K5071

Remarks: For DWTT Properties.

This document serves as the official transmittal of action on the noted sample.  
Attached is a digital image of the BR-240 which accompanied the sample.

JOHN RONDINARO  
DIRECTOR, MATERIALS BUREAU

BR 240a (11/76)		SAMPLE AND ACCEPTANCE TRANSMITTAL NYSDOT MATERIALS BUREAU		SERIAL NO. <b>266003</b>	DATE RECD. <b>8/22/08</b>	TEST NO. <b>08MG105</b>
To:	Material Represented by the Sample Described Below Was					
On	For					
(Action Official Only When Validated Below By The Materials Bureau)						
<b>UPPER PORTION FOR MATERIALS BUREAU ONLY - INSPECTOR TO COMPLETE ALL APPLICABLE BOXES BELOW</b>						
15. ADDITIONAL INFO. (SEE INSTRUCTIONS ON REAR)		1. MATERIAL <b>6x6x0.188</b>	2. ITEM NO. <b>710-21</b>	3. DATE SAMPLED <b>8/13/08</b>	4. CONTRACT NO. <b>STECK</b>	
		5. SUPPLIER AND LOCATION <b>NOVA Tube &amp; Steel Morrisville PA</b>	6. QUANTITY IN LOT <b>3655 LB 431.0 FT</b>		7. LOT NO. <b>NOVA 125</b>	
		8. MANUFACTURER AND LOCATION (IF DIFFERENT THAN ABOVE)		9. BATCH NO. <b>MTT/421K5071</b>	10. DATE OF MFG. <b>8/15/08</b>	
11. SAMPLED AT		12. TYPE		13. SAMPLED FROM		
<input type="checkbox"/> MILL		<input checked="" type="checkbox"/> CONTROL SAMPLE		<b>Tube Warehouse</b>		
<input checked="" type="checkbox"/> PLANT		<input type="checkbox"/> INFO. SAMPLE		14. SAMPLED BY (INC. DIST. NO. OR AGENCY)		
<input type="checkbox"/> JOB		<input type="checkbox"/> BPR SAMPLE		<b>PAE JA C39 TEC #822</b>		
		<input type="checkbox"/> APPROVED LIST MAT.		15. CONTRACTOR AND PROJECT LOCATION		
		<input type="checkbox"/> CERTIFIED MAT.		MATERIALS BUREAU VALIDATION		

RETAIN PINK COPY FOR YOUR RECORDS  
FORWARD ALL OTHERS TO MATERIALS BUREAU





Steel Dynamics - Roanoke Bar Division  
P.O. Box 13948 Roanoke, VA 24038  
Office: 540-342-1831 Fax: 540-342-8437

Test and Inspection Report

NO. 75372-1  
ROANOKE

ELDERLEE, INC.  
729 CROSS ROAD  
OAKS CORNERS NY 14518-0000

Date 2/09/09

HEAT NUMBER	SIZE	1-YIELD Pt. KSI	ULTIMATE KSI	ELONG 8 IN. TEST	BEND GRADE					
JG8522	FLATS 5/8 X 5 3/8	42.5	63.5	40.0	A36					
PURCHASE ORDER NUMBER	NUMBER PIECES	2-YIELD PT. KSI	ULTIMATE KSI	ELONG 8 IN. TEST	BEND GRADE					
P002771	160 PIECES 22'07"	42.5	62.6	40.0	A36					
HEAT NUMBER	SIZE	1-YIELD Pt. MPA	ULTIMATE MPA	ELONG 203mm TEST	BEND GRADE					
JG8522	FLATS 16 X 137	293.0	437.8	40.0	A36					
PURCHASE ORDER NUMBER	NUMBER PIECES	2-YIELD PT. MPA	ULTIMATE MPA	ELONG 203mm TEST	BEND GRADE					
P002771	160 PIECES 22'07"	293.0	431.6	40.0	A36					
C	MN	S	P	SI	CR	NI	MO	CU	V	NB
.15	.75	.020	.009	.20	.07	.10	.02	.28	.002	.001
Commodity # 410008 P										

Charpy requirements:  
15 ft-lbs @ +40° F

- 1) 88.0 ft-lbs
- 2) 100.0 ft-lbs
- 3) 82.0 ft-lbs

ELDERLEE, INC.  
CERT RECEIVED: 2/10/09  
PURCHASE ORDER # P2771  
SALES ORDER # 75372-0  
SHIPPED FROM: Steel Dynamics

MERCURY, RADIUM OR OTHER ALPHA SOURCE MATERIALS IN ANY FORM HAVE NOT BEEN USED IN THE PRODUCTION OF THIS MATERIAL. NO WELD REPAIR HAS BEEN PERFORMED.

Approved ABS QA Mill. Certificate No. 00NN10108-X.

This material was melted and manufactured in the USA by basic Electric Furnace processes to meet specification: ASTM A36-05 ASME SA36 QCS741D A709-06A GR36 AASHTO M270 GR 36 IMPACTS WAIVED

The tensile values stated in either inch-pound units or SI units are to be regarded as separate as defined in the ASTM scope for this material. Unless a metric specification is ordered, this material has been tested and meets the requirements of the inch-pound ranges.

This is to certify the above to be a true and accurate report as contained in the records of this company.

Engineer of Tests: Charles R. Charlton

**BAYOU STEEL CORPORATION**RIVER ROAD P.O. BOX 5000  
LA PLACE, LOUISIANA 70069-1156  
Telephone (985) 652-4800**MATERIAL CERTIFICATION REPORT**TRIAD METALS INTERNATIONAL  
1 VILLAGE RD  
HORSHAM, PA 19044TRIAD METALS  
3480 GRAND AVE.  
NEVILLE ISLAND, PA 15225TESTED IN ASTM A6  
ACCORDANCE  
WITHINVOICE NO. BSLP08208340 DATE 12/15/08 PO:10191  
PRODUCT UNEQUAL ANGLES Cust T-4200 -0008  
HEAT NO. 67284 48 Pcs GRADE A3652950 -  
Length 40'0" SIZE U 5 X 3-1/2 X 3/8 X 10.40

CHEMICAL ANALYSIS	MECHANICAL PROPERTIES	TEST 1		TEST 2		TEST 3	
		IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC
C .14	YIELD STRENGTH	59,810 PSI	412 MPa	59,330 PSI	409 MPa	PSI	MPa
Mn .82	TENSILE STRENGTH	79,999 PSI	552 MPa	79,990 PSI	552 MPa	PSI	MPa
P .018	ELONGATION	31.0 %	31.0 %	32.0 %	32.0 %	%	%
S .039	GUAGE LENGTH	8 in	203 mm	8 in	203 mm	in	mm
Si .20	BEND TEST DIAMETER	d	d	d	d	d	d
Cu .27	BEND TEST RESULTS						
Ni .17	SPECIMEN AREA	sq in	sq mm	sq in	sq mm	sq in	sq mm
Cr .15	REDUCTION OF AREA	%	%	%	%	%	%
Mb .048	IMPACT STRENGTH	ft-lbs	J	ft-lbs	J	ft-lbs	J
Cb .013							
V .000							
B							
Al							
Sn .009							
N							
Ti							

IMPACT STRENGTH	IMPERIAL	METRIC	INTERNAL CLEANLINESS		GRAIN SIZE HARDNESS
AVERAGE	ft-lbs	J	SEVERITY		
TEST TEMP	F	C	FREQUENCY		
ORIENTATION			RATING		GRAIN PRACTICE REDUCTION RATIO
					FINE 10.5 TO 1

Customer Grade & Specs: A36  
44W, CSA50W, A70936  
ASME SA36

A529 GRADE 50

ELDER  
CERT RECEIVED: 1/26/09  
PURCHASE ORDER # P2788  
SALES ORDER # 48937  
SHIPPED FR Triad Metals

I HEREBY CERTIFY THAT THE MATERIAL TEST RESULTS PRESENTED HERE ARE FROM THE REPORTED HEAT AND ARE CORRECT. ALL TESTS WERE PERFORMED IN ACCORDANCE TO THE SPECIFICATIONS REPORTED ABOVE. ALL STEEL IS ELECTRIC FURNACE MELTED, MANUFACTURED, PROCESSED, AND TESTED IN THE U.S.A WITH SATISFACTORY RESULTS, AND IS FREE OF MERCURY CONTAMINATION IN THE PROCESS.

NOTARIZED UPON REQUEST:

SWORN TO AND SUBSCRIBED BEFORE ME IN AND FOR ST. JOHN  
PARISH ON THIS \_\_\_\_\_ DAY OF \_\_\_\_\_, 20\_\_\_\_

Michael E. Soileau, # B1587, Notary Public

SIGNED

  
MARK EDWARDS, QUALITY ASSURANCE SUPERVISORDIRECT ANY QUESTIONS OR NECESSARY CLARIFICATIONS CONCERNING  
THIS REPORT TO THE SALES DEPARTMENT.

1-800-535-7692 (USA)

Customer Name  
Eldersee, Inc.Customer PO#  
P002788Shipper No  
46937Heat Number  
67284

446

January 20, 2010  
MWRSEF Report No. TRP-03-203-10



MILL TEST CERTIFICATE

1700 HOLT RD N.E.  
Tuscaloosa, AL 35404-1000  
800-827-8872

#258782

7/16" Plate A36

Load Number	Tally	Mill Order Number	P.O. Number	Part Number	Certificate Number	Date
358782	0000000337092	N-095012-001	JCR5794		L256079-1	01/30/2009 15:47
Grade				Customer:		
Order Description: A36, 0.1875 IN x 96.000 IN x 240.000 IN				Sold TO: WARREN FABRICATING & MACHINING WARREN OH		
Quality Plan Description: A36/SA36/A70936: (ASTM A36-05/A36M/ASME SA36-03/A709-36-07				Ship TO: WARREN FABRICATING & MACHINING Hubbard OH		

Shipped Item	Heat/Slab Number	Certified By	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	Al	Ti	N2	B	Ca	Sn	CEV
9A0242D	B9M5031-03 ***	B9M5031 ✓	0.19	0.87	0.010	0.006	0.06	0.24	0.09	0.06	0.026	0.000	0.003	0.034	0.002	0.011	0.0001	0.0024	0.009	
9A0110C	B9M5014-01 ***	B9M5014 ✓	0.19	0.89	0.011	0.004	0.07	0.36	0.14	0.06	0.028	0.000	0.003	0.031	0.002	0.010	0.0001	0.0021	0.010	
9A0112C	B9M5014-03 ***	B9M5014	0.19	0.89	0.011	0.004	0.07	0.36	0.14	0.06	0.028	0.000	0.003	0.031	0.002	0.010	0.0001	0.0021	0.010	
9A0112E	B9M5014-03 ***	B9M5014	0.19	0.89	0.011	0.004	0.07	0.36	0.14	0.06	0.028	0.000	0.003	0.031	0.002	0.010	0.0001	0.0021	0.010	

Shipped Item	Certified By	Heat Number	Yield ksi	Tensile ksi	Y/T %	ELONGATION %		Bend OK?	Hard HB	Charpy Impacts (ft-lbf)				Shear %				Test Temp			
						2"	8"			Size mm	1	2	3	Avg	1	2	3		Avg		
9A0242D	S9A0239FTT	B9M5031 ***	53.1	70.8	75.0	28.3															
9A0242D	S9A0240FTT	B9M5031 ***	50.7	73.3	69.2	31.1															
9A0242D	S9A0239MTT	B9M5031 ***	51.1	68.3	74.8	29.2															
9A0242D	S9A0240MTT	B9M5031 ***	49.3	67.4	73.1	32.5															
9A0110C	S9A0110FTT	B9M5014 ***	51.8	73.9	70.1	29.4															
9A0110C	S9A0110MTT	B9M5014 ***	45.6	68.2	66.9	28.9															
9A0112C	S9A0110FTT	B9M5014 ***	51.8	73.9	70.1	29.4															
9A0112C	S9A0112FTT	B9M5014 ***	46.3	68.3	67.8	31.5															
9A0112C	S9A0110MTT	B9M5014 ***	45.6	68.2	66.9	28.9															
9A0112C	S9A0112MTT	B9M5014 ***	49.6	70.1	70.8	29.1															
9A0112E	S9A0110FTT	B9M5014 ***	51.8	73.9	70.1	29.4															
9A0112E	S9A0112FTT	B9M5014 ***	46.3	68.3	67.8	31.5															
9A0112E	S9A0110MTT	B9M5014 ***	45.6	68.2	66.9	28.9															
9A0112E	S9A0112MTT	B9M5014 ***	49.6	70.1	70.8	29.1															

ELDER, INC.  
CERT RECEIVED: 2/25/09  
PURCHASE ORDER # P2821  
SALES ORDER # 76225  
SHIPPED FROM On.ester

Items: 4 PCS. 37 Weight: 45331 LBS

Mercury has not come in contact with this product during the manufacturing process nor has any mercury been used by the manufacturing process. Certified in accordance with EN 10204 3.1. No weld repair has been performed on this material. Manufactured to a fully killed fine grain practice. \*\* Produced from Coil \*\* ISO 9001:2000 Registered, PED Certified

We hereby certify that the product described above passed all of the tests required by the specifications.

*Qiulin Yu*  
Qiulin Yu - Rolling Mill Process Metallurgist

\*\*\* indicates Heats melted and Manufactured in the U.S.A.

447

Vendor  
ArcelorMittal Cleveland Inc

Heat number  
9504928

*1/4" plate A36*



Klein Steel Service Inc.  
105 Vanguard Pkwy  
Rochester, NY 14606

October 16, 2008

**Certified Report of Chemical Analysis and Mechanical Tests**

Producing Mill: ArcelorMittal Cleveland Inc.  
Product: Hot Rolled Plate Steel  
Certification Type: ASTM A1018  
Klein PO#: JS2097 Code HC240A36

Gauge	Width	Length	Finish	Surface	Treatment	Quality	Type
1/4	48.000	Coil		DRY		A36/SA36	
B/L	Coil/Lift	Heat#	Tensile	Yield	E-Long%	Hardness	L/Ft
1271996	697251	4159210	66,900	41,800	29.0		
1269284	696040	4189357	69,000	46,200	35.0		
1272556	687250	9504928	70,400	43,000	36.0		

Heat#	4159210		Domestic		
C%	Mn%	P%	S%	Si%	Al%
0.250	0.680	0.008	0.005	0.020	0.048
Heat#	4189357		Domestic		
C%	Mn%	P%	S%	Si%	Al%
0.210	0.700	0.01	0.006	0.02	0.066
Heat#	9504928		Domestic		
C%	Mn%	P%	S%	Si%	Al%
0.230	0.640	0.01	0.003	0.03	0.036

The above figures are extracts from the original mill records as contained in the records of the company

Prepared by the office of:  
Jim Sloan, QA Manager

ELDER...  
CERT RECEIVED: *3/23/09*  
PURCHASE ORDER # *P2848*  
SALES ORDER # *240847*  
SHIPPED FROM: *Klein Steel*

# BENNETT BOLT WORKS, INC.

12 Elbridge Street  
P.O. Box 922  
Jordan, New York 13080

PH 315-689-3981  
FX 315-689-3999

## CERTIFICATION OF COMPLIANCE

Customer: ELDERLEE, INC.  
729 CROSS RD  
OAKS CORNERS, NY 14518

We certify that our system and procedures for the control of quality assures that all items furnished on the order will meet applicable tests, process requirements, and inspection requirements as required by the purchase order and applicable specifications.

Customer PO No.: 2214 JC

Date Shipped: 6/12/09

Invoice No.: 5015307

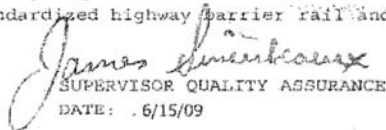
Purchase Date: 6/3/09

### QUANTITY DESCRIPTION

- 22 - 3/8-16 X 7 1/2 A307 HEX SCREW MG ( MFG- AUTO BOLT & NUT #17785-1, GALV.- MECH GALV. PLATING)
- 10 - 3/8-16 A563 HEX NUT MG ( MFG- TELEFAST IND # 016722-1-71733, GALV.- MECH GALV PLATING)
- 44 - 3/8 FB44 USS FW MG ( MFG- WROUGHT WASHER #050045, GALV.- WISCONSIN MECH)
- 29 - 1/2-13 X 1 1/2 A307 HEX SCREW HDG ( MFG & GALV.- NUCOR FAST #241990A)
- 43 - 1/2-13 A563 HEX NUT HDG ( MFG- TELEFAST IND # R17745-73825, GALV.- AZZ GALV.)
- 31 - 1/2 SAE FW MG ( MFG- WROUGHT WASHER #253804, GALV.- WISCONSIN MECH)
- 4 - 1/2 FB44 USS FW MG ( MFG- WROUGHT WASHER #37569, GALV.- MECH GALV PLATING)
- 1 - 1/2-13 X 8 A307 HEX SCREW HDG ( MFG- SOUTHEASTERN BOLT #54015, GALV.- METAL PLATE GALV.)
- 1 - 1/2-13 X 8 GR 5 HEX SCREW HDG ( MFG- NUCOR FAST # 178065A, GALV.- VICTAULIC GALV.)
- 3 - 3/4-10 A563 GR DH HVY HEX NUT HDG ( MFG - UNYTITE # NS441, GALV.- ROGERS BROTHERS GALV.)
- 1 - 3/4-10 X 8 A307 HEX SCREW HDG ( MFG- BIRMINGHAM FAST , GALV.- KENNEDY GALV.)
- 20 - 3/4-10 X 1 1/2 A325 STRUCT BOLT HDG 9 MFG & GALV.- NUCOR FAST #244495A)

M/F: UNIVERSITY OF NEBRASKA PO#4500206719 REPLACE

All products were melted and manufactured in the U.S.A. This material is in compliance with domesticity requirements, and conforms to ASTM & AASHTO specifications for standardized highway barrier rail and hardware.

  
SUPERVISOR QUALITY ASSURANCE  
DATE: 6/15/09



# BENNETT BOLT WORKS, INC.

12 Elbridge Street  
P.O. Box 922  
Jordan, New York 13080

PH 315-689-3981  
FX 315-689-3999

## CERTIFICATION OF COMPLIANCE

Customer: ELDERLEE, INC.  
729 CROSS RD  
OAKS CORNERS, NY 14518

We certify that our system and procedures for the control of quality assures that all items furnished on the order will meet applicable tests, process requirements, and inspection requirements as required by the purchase order and applicable specifications.

Customer PO No.: .2214 JC

Date Shipped: . 6/12/09

Invoice No.: . 5015306

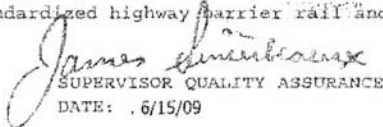
Purchase Date: . 6/3/09

### QUANTITY DESCRIPTION

- 23 - 3/8 X 7 1/2 A307 HEX SCREW W/ NUT & 2 FW MG ( MFG- AUTO BOLT & NUT # 17785-1, TELEFAST IND. #O16722-2-71734, WROUGHT WASHER #050045, GALV.- MECH GALV. PLATING, MGP, WISCONSIN MECH)
- 27 - 1/2 X 1 1/2 A307 HEX SCREW W/ NUT & SAE FW HDG ( MFG- NUCOR FAST #241990A, TELEFAST IND. #R1764-73562, NUCOR FAST #241990A, WROUGHT WASHER, GALV.- NUCOR FAST., AAA GALV, ROGERS BROTHERS GALV.)
- 5 - 1/2 SAE FW MG ( MFG- WROUGHT WASHER #253804, GALV.- WISCONSIN MECH)
- 1 - 3/4 X 8 A307 HEX SCREW W/ NUT & 2 FW HDG ( MFG- BIRMINGHAM FAST # 118976, NUCOR FAST #229487A, WROUGHT WASHER #227934, GALV.- KENNEDY GALV., NUCOR FAST, ROGERS BROTHERS GALV.)
- 56 - 3/4 X 1 1/2 A325 STRUCT BOLT W/ USS MIL FW MG ( MFG- NUCOR FAST # 244495A, PRESTIGE STAMPING #B9023M, GALV.- NUCOR FAST., MECH GALV PLATING)
- 2 - 1/2-13 X 8 GR 5 HEX SCREW HDG ( MFG- NUCOR FAST #178065, GALV.- VICTAULIC GALV.)
- 2 - 1/2-13 A563 HEX NUT HDG ( MFG- TELEFAST IND # R17745-73825, GALV.- AZZ GALV.)
- 4 - 1/2 F844 USS FW MG ( MFG- WROUGHT WASHER # 37569, GALV.- MECH GALV PLATING)

M/F: UNIVERSITY OF NEBRASKA PO#4500206719 NEW UNIT

All products were melted and manufactured in the U.S.A. This material is in compliance with domesticity requirements, and conforms to ASTM & AASHTO specifications for standardized highway barrier rail and hardware.

  
SUPERVISOR QUALITY ASSURANCE  
DATE: . 6/15/09

END OF DOCUMENT