

GENERAL NOTES

- The energy absorbing system represented on this standard drawing is a proprietary design by Energy Absorption Systems, Inc. and marketed under the trade name QuadGuard. Any infringement on the rights of the designer shall be the sole responsibility of the user.
- This standard drawing is produced by the Florida Department Of Transportation solely for use by the Department and its assignees. This standard drawing provides the general graphics and information necessary to field identify component parts of the QuadGuard System and their incorporation into a whole system.
- This standard drawing is sufficient for plan details for the QuadGuard installed as a free standing system or installed in connection with concrete barrier walls and other fixed barrier systems, and precludes the requirement for shop drawing submittals unless the plans otherwise call for such submittals.

The QuadGuard tension strut backup is the primary backup to be used on Florida Department Of Transportation projects. Use of concrete backups will be permitted, but will require call out and detailing in the plans for site specific construction; concrete backups must meet manufacturers specifications, installation guidelines and transition hardware requirements.
- The QuadGuard shall be assembled and installed in accordance with the manufacturer's detailed drawings, procedures and specifications.
- The QuadGuard is available in 24", 30", and 36" nominal widths for narrow hazards and 69" and 90" nominal widths for wide hazards. The system width will be as called out in the plans, permit or other contract document for each location.
- Only the QuadGuard Type I and Type II cartridges shall be used in bay and nose locations as described in the 'BAY SELECTION GUIDELINES' table.
- Cement concrete foundations and cement concrete backup assemblies shall be constructed with 4000 psi min. compressive strength concrete.
- The QuadGuard shall be constructed on cross slopes 1 : 10 or flatter.
- All metallic components shall meet the galvanizing requirements for guardrail, Index No. 400.
- A yellow Type I Object Marker shall be centered 3' in front of the nose of the QuadGuard. Mounting hardware shall be in conformance with Index Nos. 11860 and 11865. The cost of the Object Marker shall be included in the cost of the QuadGuard.
- Quantity for payment is based on each independent location as called for in the plans or as directed by the Engineer. The cost for foundations, subgrade preparation and miscellaneous asphalt shown on this index will be included in the cost for the QuadGuard system. The permanent QuadGuard System will be paid for under the contract unit price for Impact Attenuator Vehicular (QuadGuard), EA; temporary units will be paid for under the contract unit price for Vehicular Impact Attenuator (Temporary) (QuadGuard), LO, or when the QuadGuard system is used as an option in accordance with Index No. 415, it will be paid for under contract unit price for Vehicular Impact Attenuator (Temporary) (Redirective Option), LO.

DESIGN NOTES AND GUIDELINES

- The QuadGuard System is designed to cushion automobile end-on hits and to redirect automobiles from side hits. The QuadGuard is designed to shield fixed hazards or the ends of other temporary and permanent barrier systems. The number of bays to be used in a specific unit will be determined by the design speed, except where the Engineer determines that another speed is more applicable. The unit width will be determined by the width of the object to be shielded or by the connecting barrier system. The backup assembly for a specific unit will be determined by either (a) the unit standing free of the object to be shielded or (b) the barrier system(s) to which it is connected.
- The QuadGuard is a restorable system that is particularly suited to shielding hazards subject to high speed traffic, high volume traffic, and/or traffic with a history of frequent errant vehicle departures from the roadway or the potential exists for such departures. The QuadGuard is particularly suited to shielding hazards where the approach space is limited; and, is particularly suited to conditions where the terminal must be located close to the traffic lane.
- Currently the Department does not recognize other proprietary items as being equally suitable alternatives to the QuadGuard, and until such alternatives are available, the QuadGuard need not be bid against other proprietary items. However, for temporary use where the QuadGuard and other approved redirective crash cushions meet or exceed the minimum requirements for a specific location, the approved crash cushions will be considered optional systems and paid for as described in General Note II above.

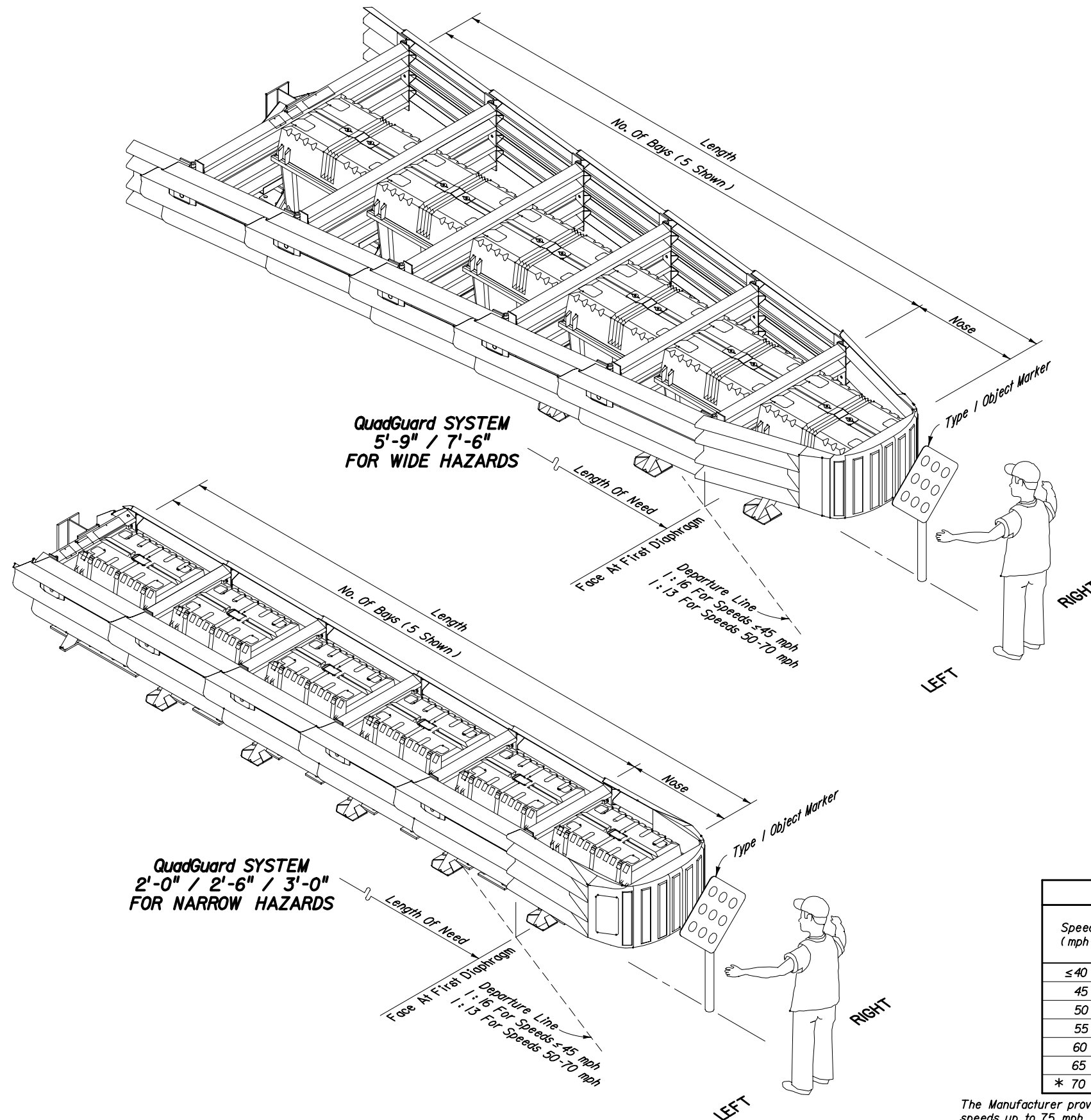
BAY SELECTION GUIDELINES

| Speed (mph) | No. Of Bays | Number Of Cartridges | | Length |
|-------------|-------------|----------------------|----------------|--------|
| | | Type I (Front) | Type II (Rear) | |
| ≤40 | 2 | 2 | 1 | 8'-8" |
| 45 | 3 | 3 | 1 | 11'-8" |
| 50 | 4 | 3 | 2 | 14'-8" |
| 55 | 5 | 4 | 2 | 17'-8" |
| 60 | 6 | 4 | 3 | 20'-8" |
| 65 | 7 | 4 | 4 | 23'-8" |
| * 70 | 9 | 4 | 6 | 29'-8" |

The Manufacturer provides QuadGuard units with up to 12 bays designed for use with speeds up to 75 mph. These larger units may be utilized when called for in the plans or as directed by the Engineer.


*QuadGuard HS units can be substituted for conventional 9-bay units.

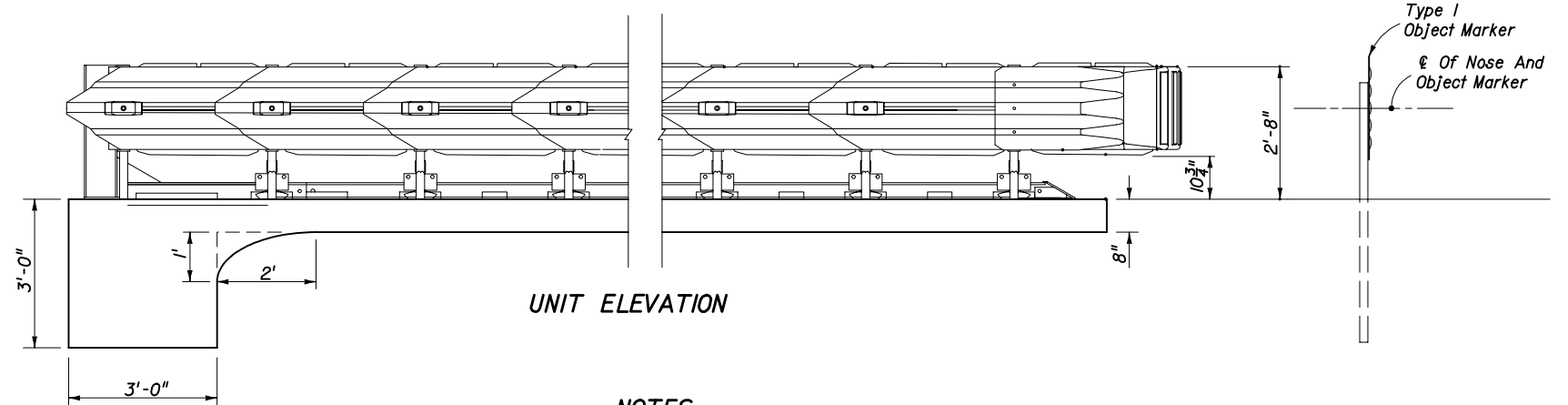
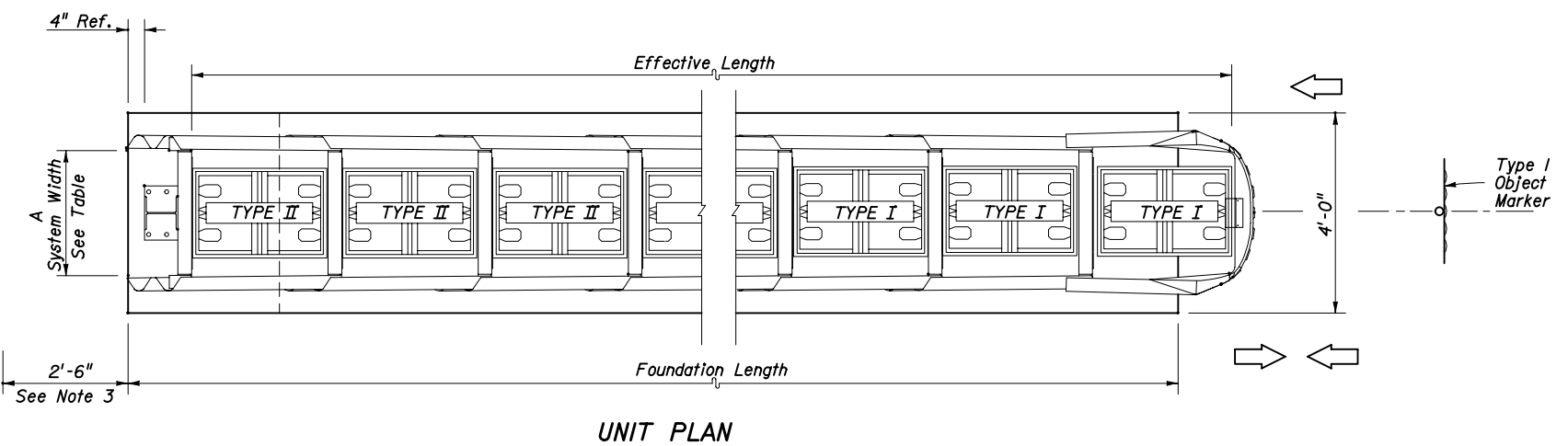
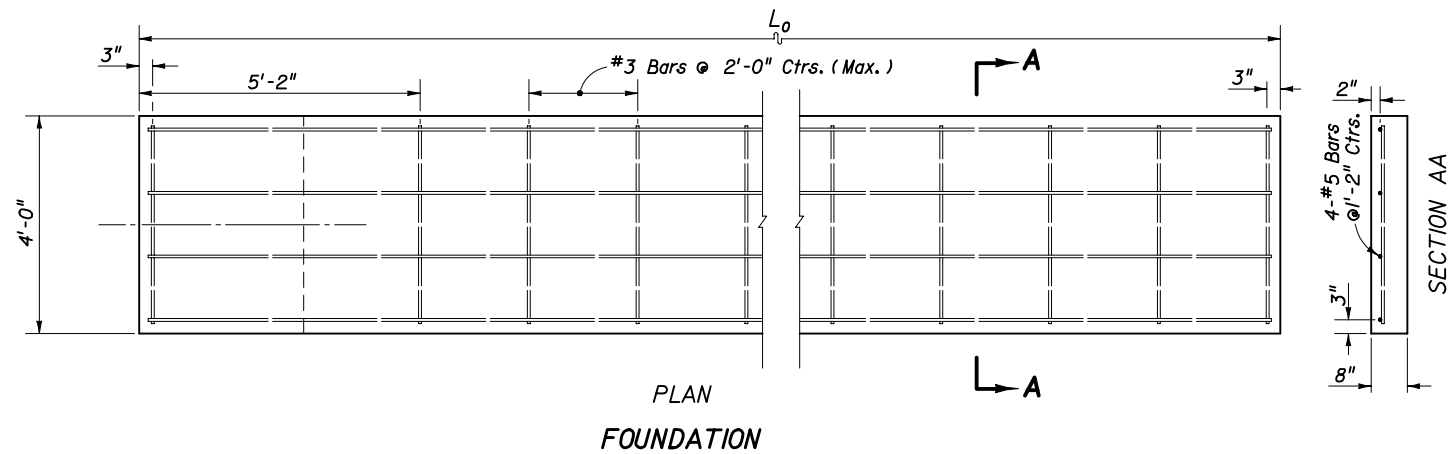
GENERAL SYSTEM FEATURES AND BAY SELECTION GUIDELINES



STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

QuadGuard

| Names | Dates | Approved By | | | |
|-------------|---------|--|--|--|-----------|
| Designed By | MF6/STD |  Roadway Design Engineer | | | |
| Drawn By | HKH | | | | |
| Checked By | JVG | | | | |
| Revision | 04 | | | | Sheet No. |



| Nominal System Width | A (Backup Width) |
|----------------------|------------------|
| 2'-0" | 2'-0" |
| 2'-6" | 2'-6" |
| 3'-0" | 3'-0" |
| 5'-9" | 5'-3 3/4" |
| 7'-6" | 6'-10 5/8" |

| ESTIMATED FOUNDATION QUANTITIES For Informational Purposes Only | | | | |
|--|----------------|---------------|---------|---------------|
| No. Of Bays | L ₀ | REINFORCEMENT | | CONCRETE (CY) |
| | | #3 | #5 | |
| 2 | 9'-0" | 14'-8" | 34'-8" | 2.0 |
| 3 | 12'-0" | 22'-0" | 46'-8" | 2.3 |
| 4 | 15'-0" | 25'-8" | 58'-8" | 2.6 |
| 5 | 18'-0" | 33'-0" | 70'-8" | 2.9 |
| 6 | 21'-0" | 36'-8" | 82'-8" | 3.2 |
| 7 | 24'-0" | 44'-0" | 94'-8" | 3.5 |
| 9 | 30'-0" | 55'-0" | 118'-8" | 4.1 |

Note: Monorail anchorage bolt spacing to be in accordance with the manufacturer's installation drawings and specifications.

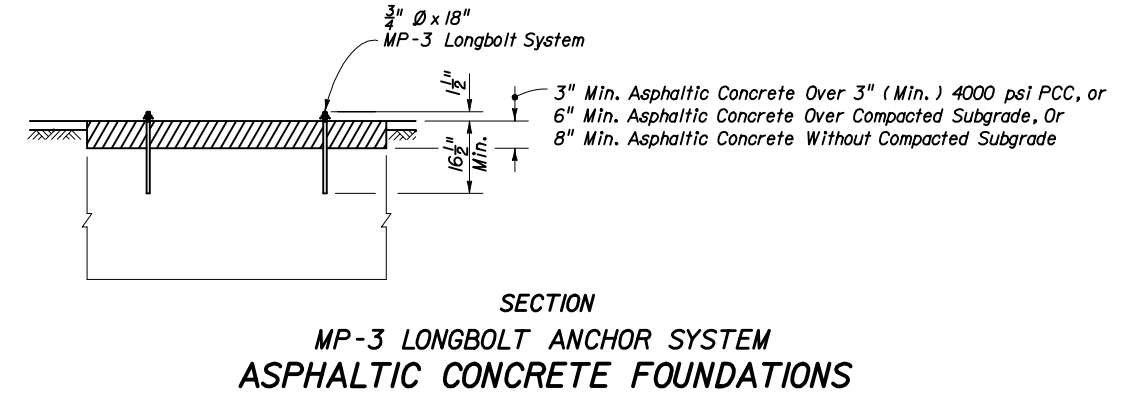
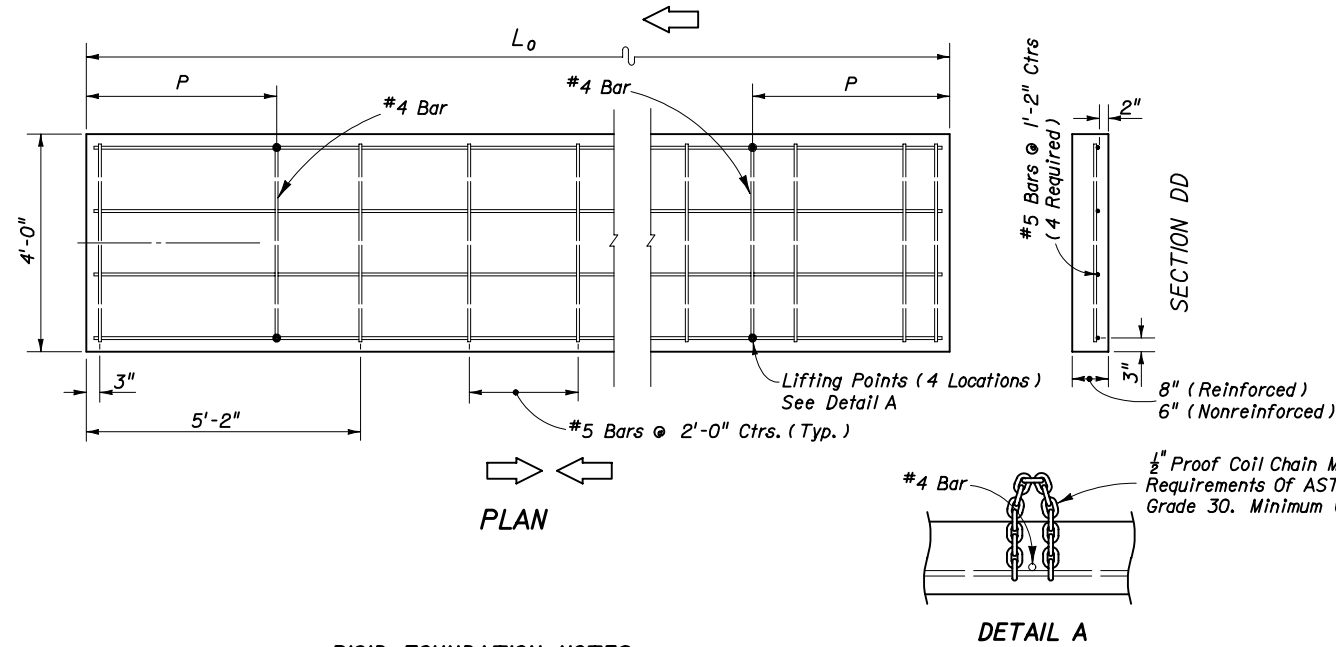
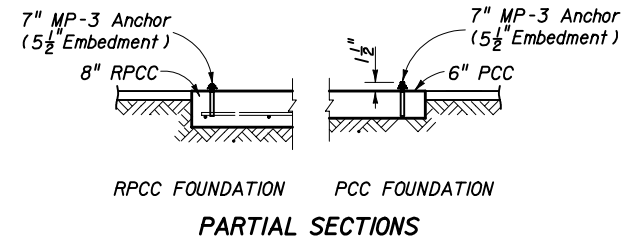
NOTES

1. The foundation depicted on this sheet is applicable to QuadGuard systems for both narrow and wide hazards, 2'-6" system shown.
2. For the number of bays required see table, Sheet 1.
3. Provision shall be made for rear fender panels to slide rearward upon impact 2'-6" min.
4. For barrier connections see 'TRANSITIONS', Sheet Nos. 4 and 5.

PERMANENT FOUNDATION FOR TENSION STRUT BACKUP ASSEMBLY

| STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION | | | | |
|---|---------|-----------------------------|-----------|-----------|
| QuadGuard | | | | |
| Names | Dates | Approved By | | |
| Designed By | MFG/STD | Roadway Design Engineer | | |
| Drawn By | HKH | | | |
| Checked By | JVG | Revision | Sheet No. | Index No. |
| | | 02 | 2 of 6 | 435 |

| ESTIMATED FOUNDATION QUANTITIES For Informational Purposes Only | | | | | |
|--|----------------|-------|----------------|------------------------|------------------------|
| No. Of Bays | L ₀ | P | REINFORCED | | NONREINFORCED |
| | | | Rebar Required | Concrete Required (CY) | Concrete Required (CY) |
| 3 | 12' | 3'-0" | 68'-0" | 1.2 | 0.9 |
| 4 | 15' | 3'-9" | 83'-8" | 1.5 | 1.1 |
| 5 | 18' | 4'-6" | 103'-0" | 1.8 | 1.3 |
| 6 | 21' | 5'-3" | 118'-8" | 2.1 | 1.6 |
| 7 | 24' | 6'-0" | 138'-0" | 2.4 | 1.8 |
| 9 | 30' | 7'-6" | 173'-0" | 3.0 | 2.2 |



RIGID FOUNDATION NOTES

- The reinforced portland cement concrete (RPCC) foundation is designed to make the temporary QuadGuard a transportable system. The slab foundation shall be constructed with 4000 psi min. compressive strength concrete. The slab shall be seated so the top of the slab is flush with the surface intended for approaching vehicles. In absence of other pavement the surrounding surface shall be paved with 2" of miscellaneous asphalt pavement as depicted in 'ASPHALTIC CONCRETE FOUNDATIONS'. The QuadGuard shall be anchored exclusively with the 7" MP-3 anchor system supplied with the QuadGuard unit, unless another anchor is supplied or approved by the QuadGuard manufacturer.
- The nonreinforced portland cement concrete (PCC) foundation shall be Class I concrete, having depth equal to or greater than 6". The PCC foundation utilization options are as follows: (a) Poured in place as an expendable slab, having a thickness of not less than 6"; disposal of the slab will be as approved by the Engineer, (b) Project constructed roadway PCC pavement, or, (c) Existing 9" PCC roadway pavement.

The utilization option applied shall be as approved by the Engineer on a site specific basis. The top of the foundation shall be flush with the surface intended for approaching vehicles. In absence of surrounding pavement the surrounding surface shall be paved as shown on this sheet in 'ASPHALTIC CONCRETE FOUNDATIONS'.

The QuadGuard installed on PCC pavement shall be anchored only with the MP-3 anchor system supplied with the QuadGuard unit. Holes for the 7" anchors shall be drilled in both existing and new pavements. When the QuadGuard is removed from the project pavement or from existing pavement that is to remain in place, the anchor shall be cut off flush with the top of the pavement, unless the plans call for other treatment.
- For additional information see the General Notes.

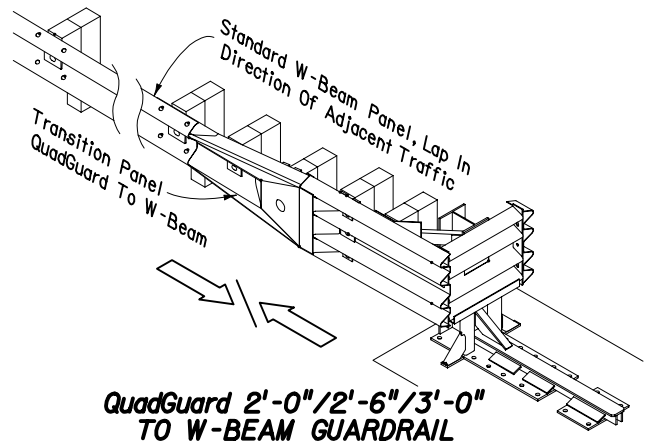
NOTES

- For the number of bays required see table, Sheet 1.
- For barrier connections see 'TRANSITIONS', Sheet Nos. 4 and 5.

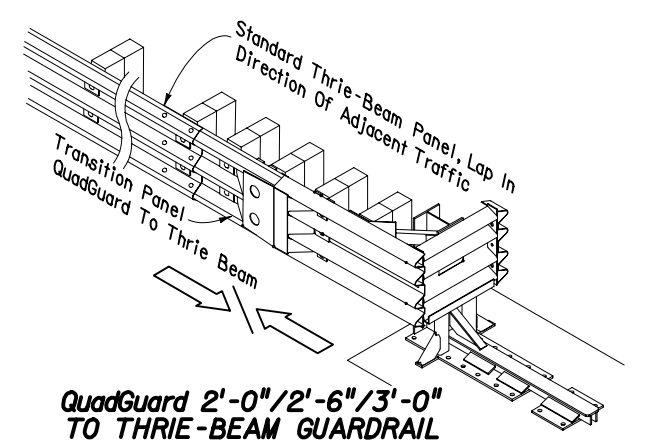
REINFORCED AND NONREINFORCED CONCRETE PAD SYSTEMS
CEMENT CONCRETE FOUNDATIONS

TEMPORARY FOUNDATIONS

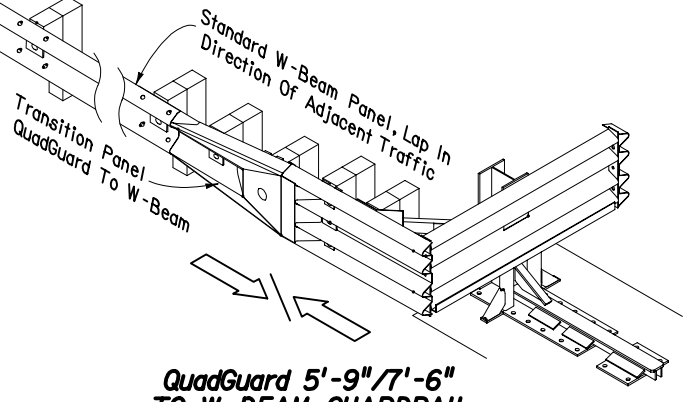
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| STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION | | | | |
| QuadGuard | | | | |
| Designed By | MFG | Dates | Approved By | |
| Drawn By | HKH | 8/97 | Revision | Sheet No. Index No. |
| Checked By | JVG | 8/97 | 04 | 3 of 6 435 |



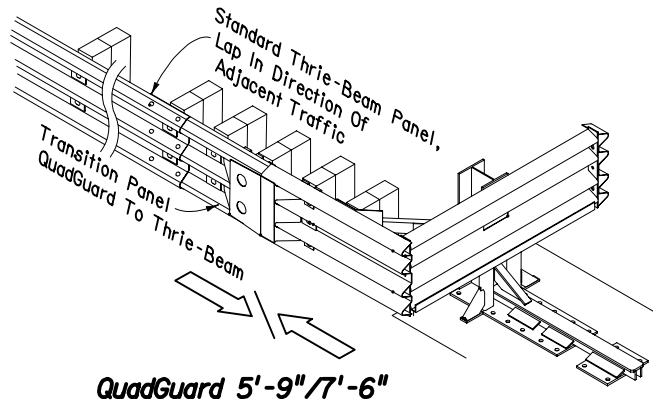
QuadGuard 2'-0"/2'-6"/3'-0" TO W-BEAM GUARDRAIL



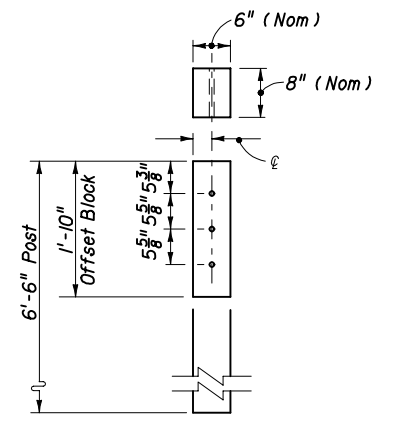
QuadGuard 2'-0"/2'-6"/3'-0" TO THRIE-BEAM GUARDRAIL



QuadGuard 5'-9"/7'-6" TO W-BEAM GUARDRAIL



QuadGuard 5'-9"/7'-6" TO THRIE-BEAM GUARDRAIL

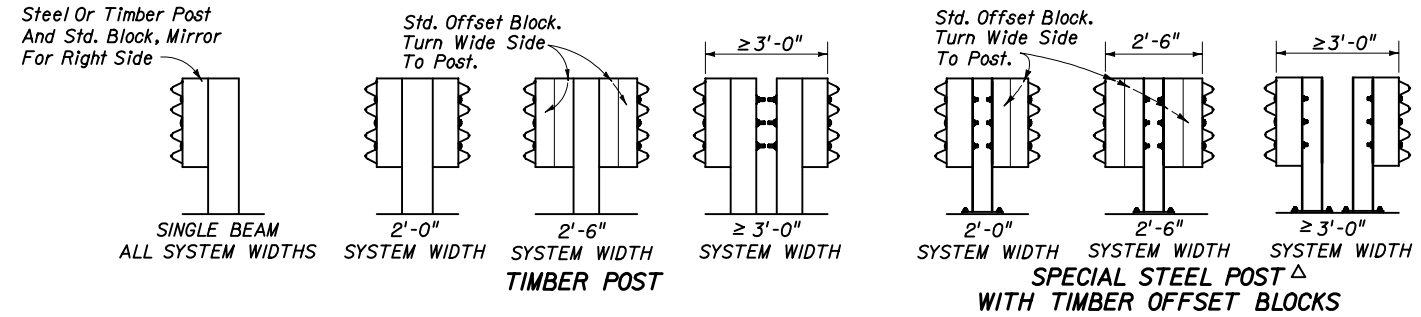


TIMBER

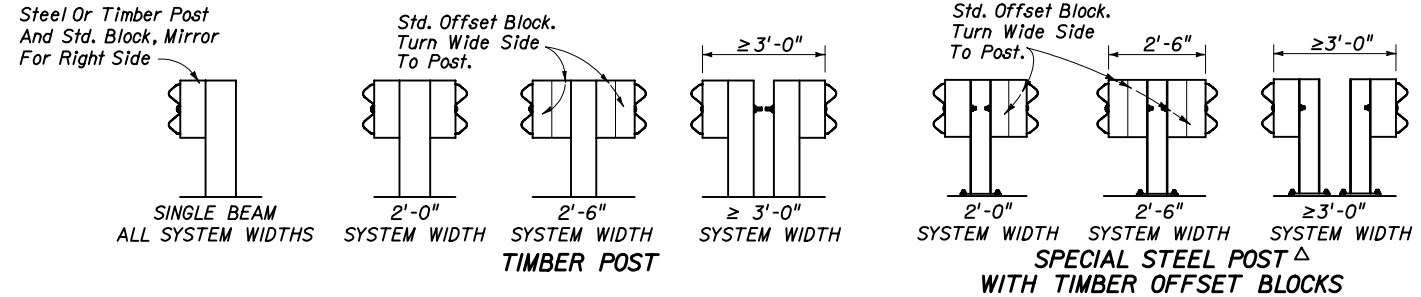
NOTES

- All holes $\frac{3}{4}$ " \varnothing .
- When using a special steel post with a timber offset block at location #2, field drill matching attachment holes in block and in post flange. When drilling special steel posts metalize holes in accordance with Index No. 400.
- For double face guardrail applications with special steel posts and 2'-0" or 2'-6" system widths, and, with timber posts and 2'-6" system widths, turning wide side of standard offset block to post or field trimming will be required, see Sections right.

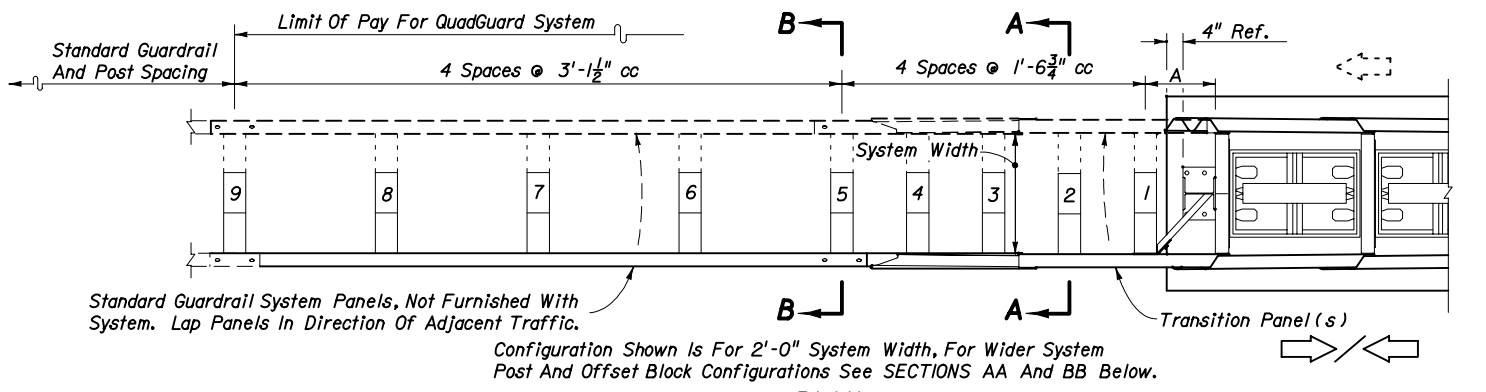
POSTS AND OFFSET BLOCKS FOR LOCATIONS #1 AND #2



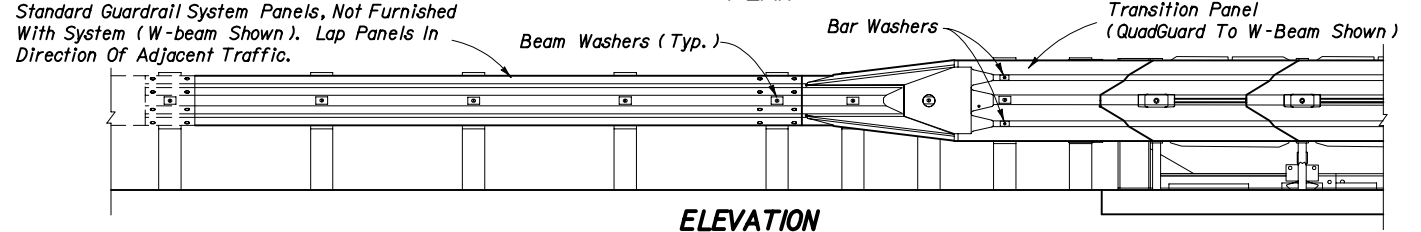
SECTION AA (POSTS #1 AND #2)



SECTION BB (POSTS #3 THRU #9)



PLAN



ELEVATION

NOTES

- Transitions are required when connecting the QuadGuard to any guardrail system.
- Post spacing identical for W-beam or thrie-beam, W-beam shown.
- Post #1 is not bolted directly to transition panel(s).
- Install beam washers on post bolts on posts #2 thru #9, with supplementary bar washers at post #2.
- W-Beam Transition:
 Posts #1 and #2 - Posts and offset blocks as shown below.
 Posts #3 thru #9 - Standard W-beam posts and offset blocks, see Index No. 400.
 Thrie-Beam Transition:
 Posts #1 and #2 - Posts and offset blocks as shown below.
 Posts #3 thru #9 - Standard thrie-beam posts and offset blocks, see Index No. 400.
 Transitions using steel posts: Use limited to rigid surface mounting (decks and slabs). See Index No. 400 for special steel guardrail posts. See section below. Δ

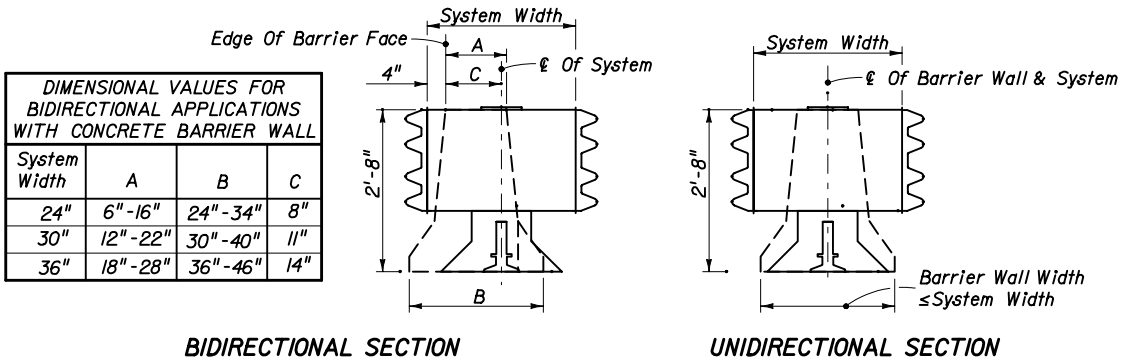
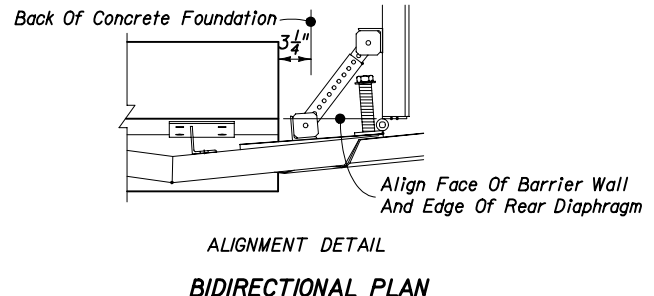
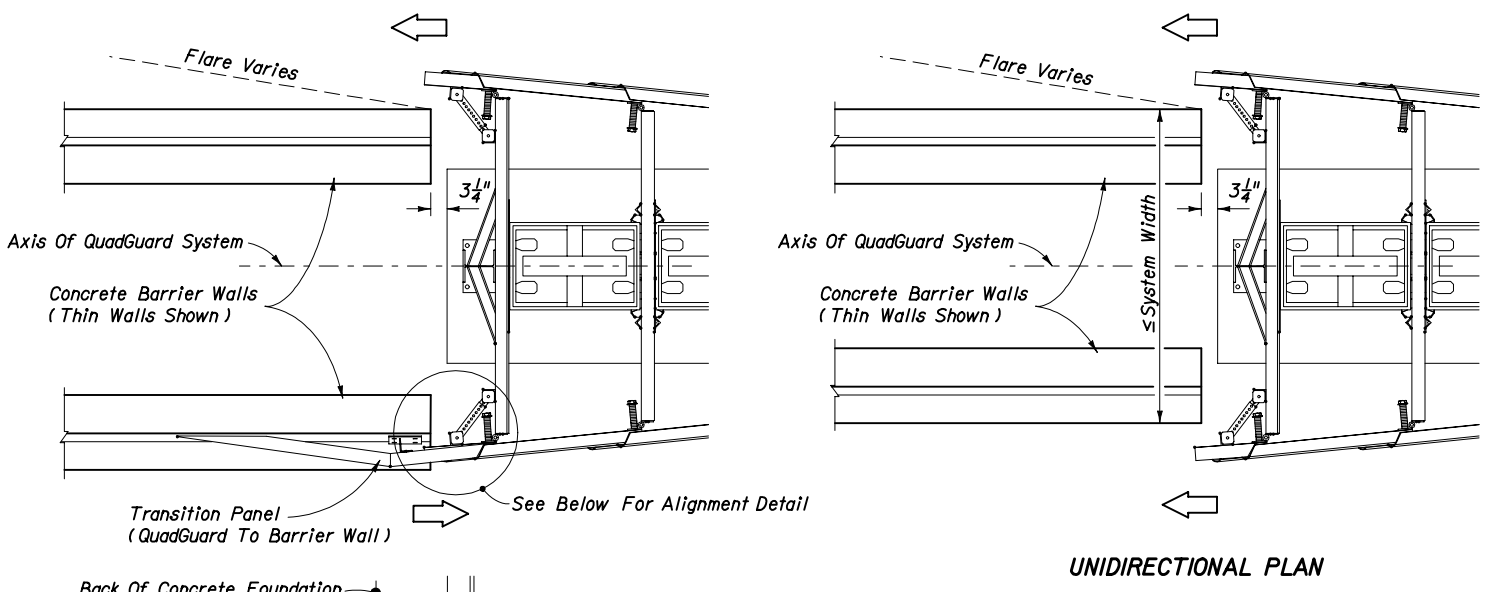
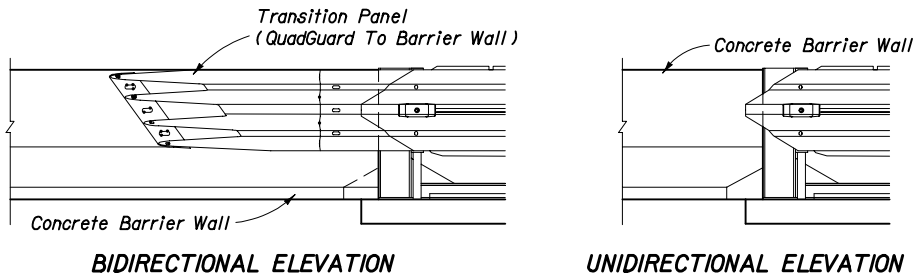
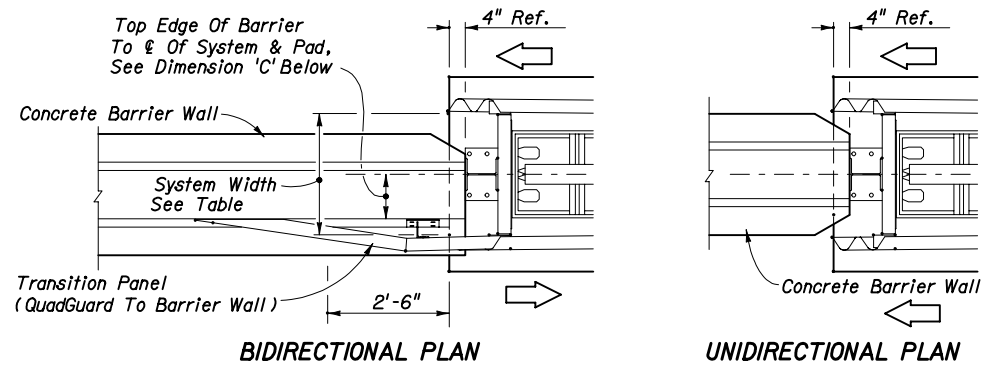
| System Width | A |
|-------------------|--------|
| 2'-0"/2'-6"/3'-0" | 18.7" |
| 5'-9"/7'-6" | 21.93" |

QuadGuard TO GUARDRAIL TRANSITIONS

STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION

QuadGuard

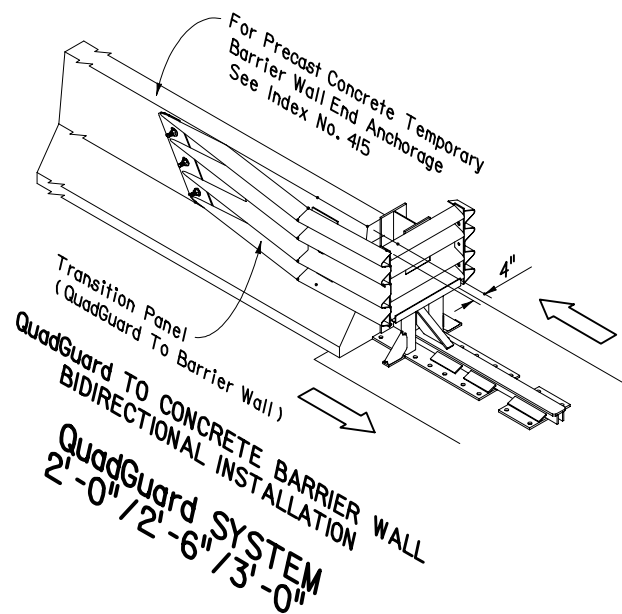
| Names | Dates | Approved By |
|----------------------|---------------|-------------|
| Designed By: MFG/JVG | 09/97 | |
| Drawn By: HKH | 09/97 | |
| Checked By: JVG | 09/97 | |
| Revision: 00 | 09/97 | |
| Sheet No. 4 of 6 | Index No. 435 | |



| DIMENSIONAL VALUES FOR BIDIRECTIONAL APPLICATIONS WITH CONCRETE BARRIER WALL | | | |
|--|-----------|-----------|-----|
| System Width | A | B | C |
| 24" | 6" - 16" | 24" - 34" | 8" |
| 30" | 12" - 22" | 30" - 40" | 11" |
| 36" | 18" - 28" | 36" - 46" | 14" |

The axis of the QuadGuard relative to concrete barriers will be established on site specific basis. The QuadGuard supplier shall furnish dimensional data for setback between the barrier wall end and the system foundation, and for the alignment between the face of the barrier wall and the rear diaphragm where dimensions other than those above apply.

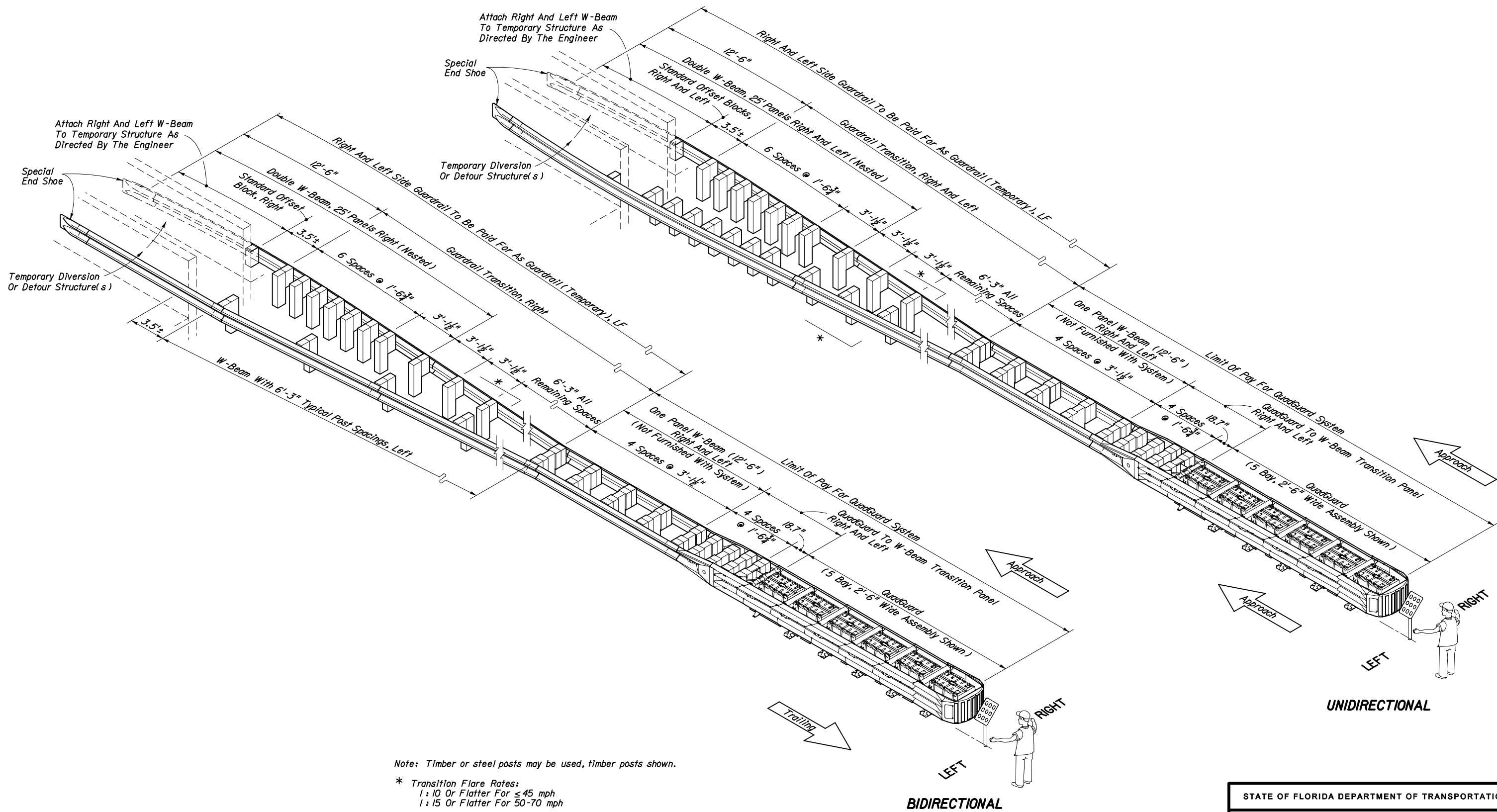
QuadGuard SYSTEM
5'-9" / 7'-6"



BARRIER WALL TRANSITION NOTE
Barrier wall free end must be reinforced in accordance with Index No. 410 and temporary walls must be adequately anchored for proper impact performance in accordance with Index No. 415.

QuadGuard TO CONCRETE BARRIER WALL TRANSITIONS

| | | | | |
|---|---------|-------------|-------------------------|---------------|
| STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION | | | | |
| QuadGuard | | | | |
| Names | Dates | Approved By | | |
| Designed By | MFG/JVG | 09/97 | Roadway Design Engineer | |
| Drawn By | HKH | 09/97 | Revision | Sheet No. |
| Checked By | JVG | 09/97 | 00 | 5 of 6 |
| | | | | Index No. 435 |



Note: Timber or steel posts may be used, timber posts shown.
 * Transition Flare Rates:
 1:10 Or Flatter For ≤ 45 mph
 1:15 Or Flatter For 50-70 mph

GUARDRAIL TRANSITION TO TEMPORARY DIVERSION OR DETOUR STRUCTURES

| | | | | |
|---|---------|--------------------------------|-----------|-----------|
| STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION | | | | |
| QuadGuard | | | | |
| Names | Dates | Approved By <i>[Signature]</i> | | |
| Designed By | MFG/STD | Roadway Design Engineer | | |
| Drawn By | HKH | Revision | Sheet No. | Index No. |
| Checked By | JVG | 00 | 6 of 6 | 435 |