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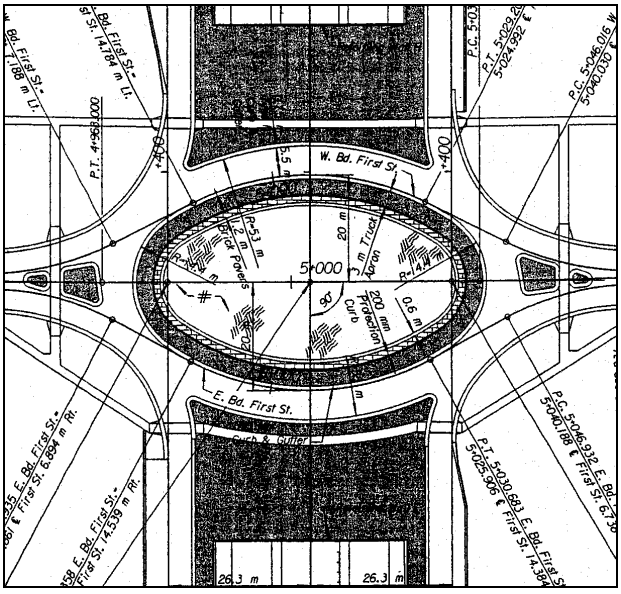
# 6.4 Curb and Pavement Design

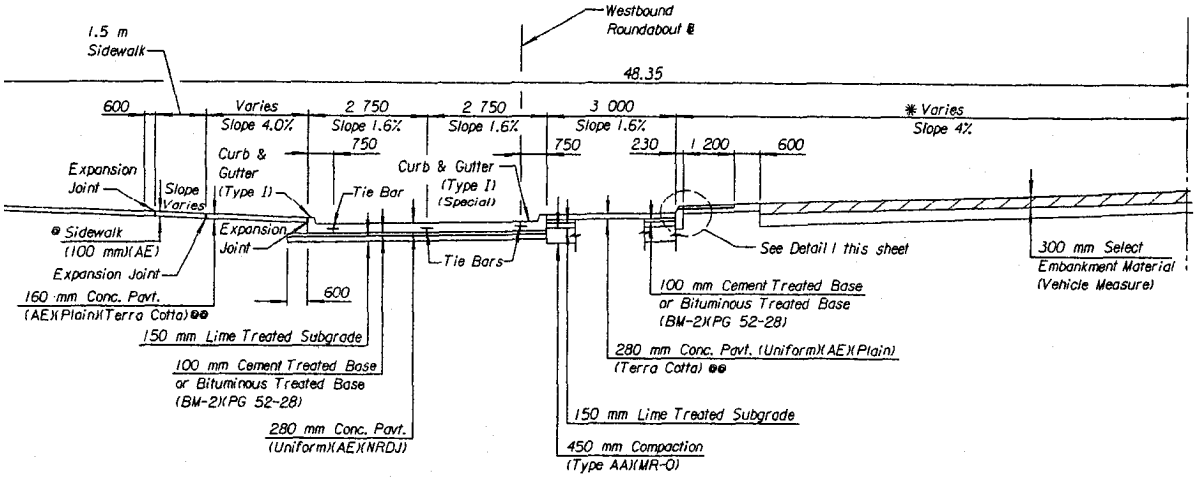
### Summary of Current Practices

In order to review current design practices related to curb and pavement design on roundabout projects in Kansas, five projects were reviewed based on plans provided by KDOT and the City of Overland Park. These projects are as follows:

### *I-135 at Broadway and Main Streets, Newton*

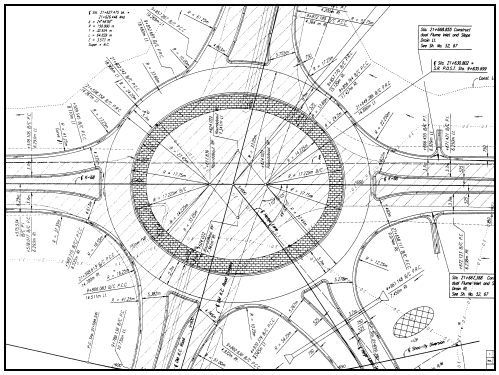
The two roundabouts in Newton are located at adjacent interchanges on I-135. One-way ramps on each side of the highway form four legs of the roundabouts with the cross street forming the other two. Both roundabouts experience significant truck traffic. The elliptical roundabouts are approximately 230 ft (70 m) east/west and 164 ft (50 m) north/south in diameter. All approach lanes and the circulatory roadway are single lane. The circulatory roadway is 16.4 ft (5.0 m) wide plus a 10 ft (3.0 m) truck apron. Pavement is concrete, with KDOT Type I curbs on the outside and inside edges of the circulatory roadway. An additional curb is provided inside the truck apron. Type I curbs are also used around the splitter islands.



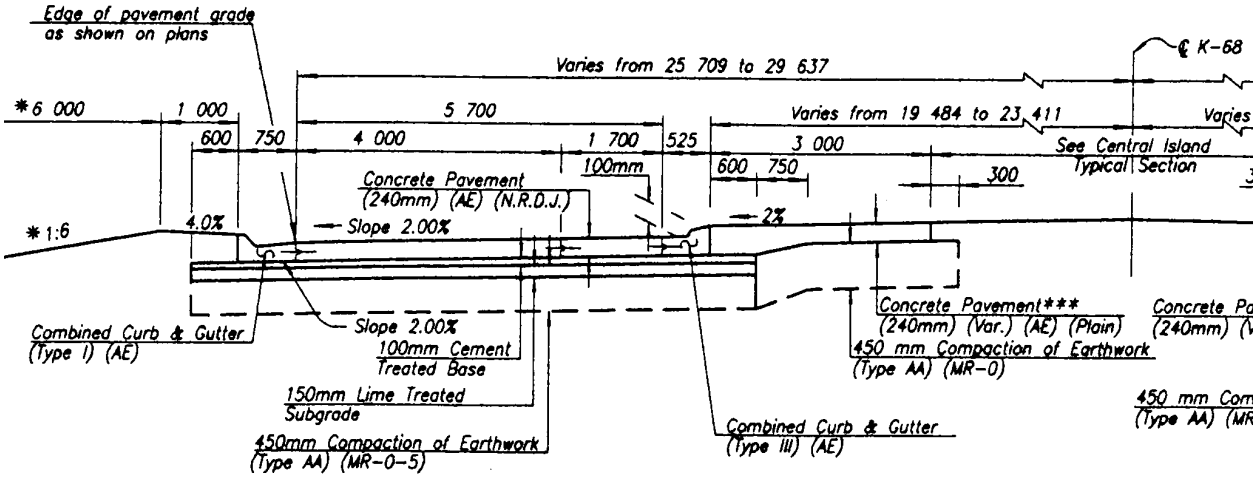



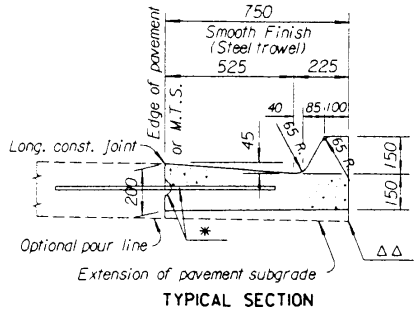

Design by: Burns and McDonnell, 2000.

### *K-68 & Old Kansas City Road, Miami County*



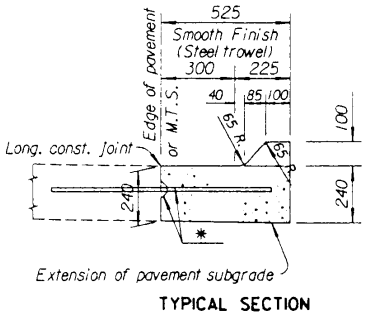
This roundabout is elliptical with five legs and is located in a primarily rural area. The diameter of the roundabout is between 151 ft (46 m) and 190 ft (58 m). All approach lanes are single lane, as is the circulatory roadway. The circulatory roadway is 18.7 ft (5.7 m) wide with a 10 ft (3.0-m) truck apron. Pavement is 9.5 in (240 mm) concrete, with a KDOT Type I curb on the outside edge and a Type III curb around the inner circle and the splitter islands.




TYPICAL SECTION

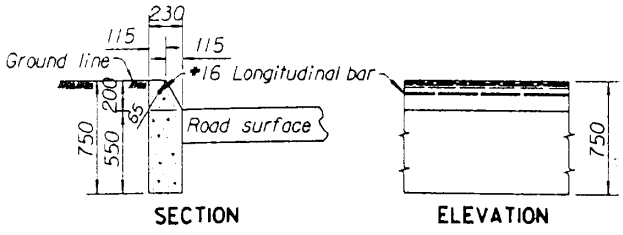
COMBINED CURB & GUTTER - TYPE I (750 mm WIDTH)




TYPICAL SECTION

COMBINED CURB & GUTTER - TYPE III (525 mm WIDTH)

*Note: Use Class "A" Concrete (AE) throughout.*
*All exposed edges shall be finished with an edging tool.*
*Place a 25 mm premoulded Expansion Joint Filler (nonextruding, Type B) at a spacing not to exceed 75 m.*

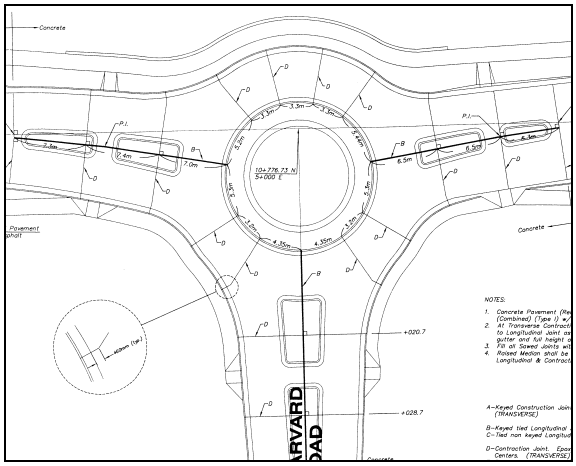



SECTION ELEVATION

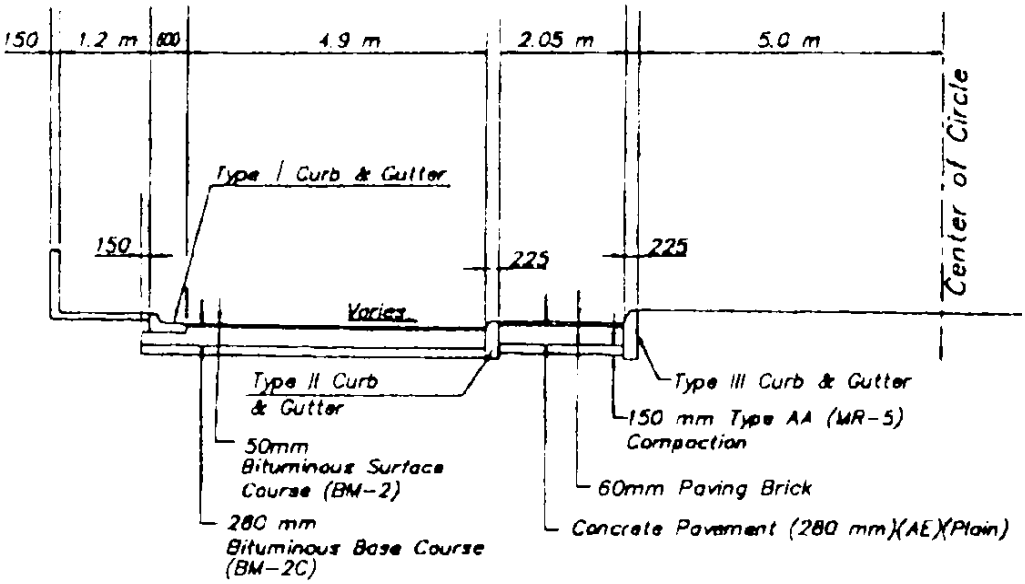
PROTECTION CURB 200 mm

Design by: Professional Engineering Consultants, P.A., 2001.

### *Harvard Road and Monterey Way, Lawrence*

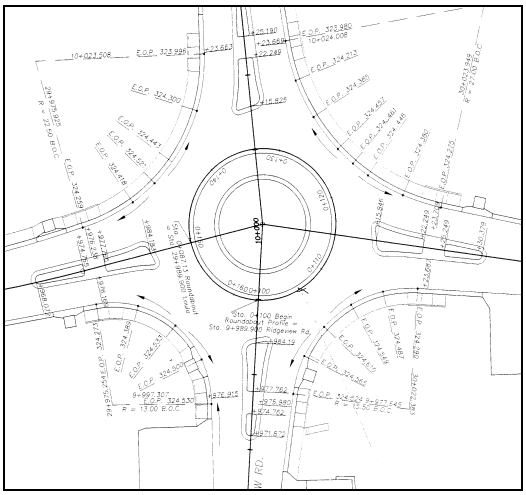


Harvard Road and Monterey Way form a "tee" intersection of two local collector streets in a residential area. The diameter of the roundabout is 85.3 ft (26 m). All approach lanes are single lane, as is the circulatory roadway. The circulatory roadway is 16 ft (4.9 m) wide with an 8.2 ft (2.5 m) truck apron. Contradictory information is provided in the plans about the type of curb and gutter utilized. The pavement in the roundabout is asphalt, with an 11 in (280 mm) base and 2-in (50 mm) surface course.

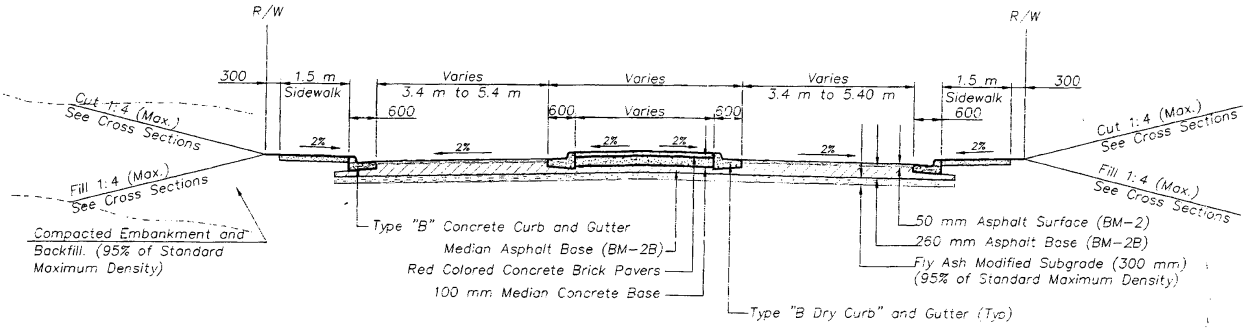



Design by: E.B.H. & Associates, 1998.

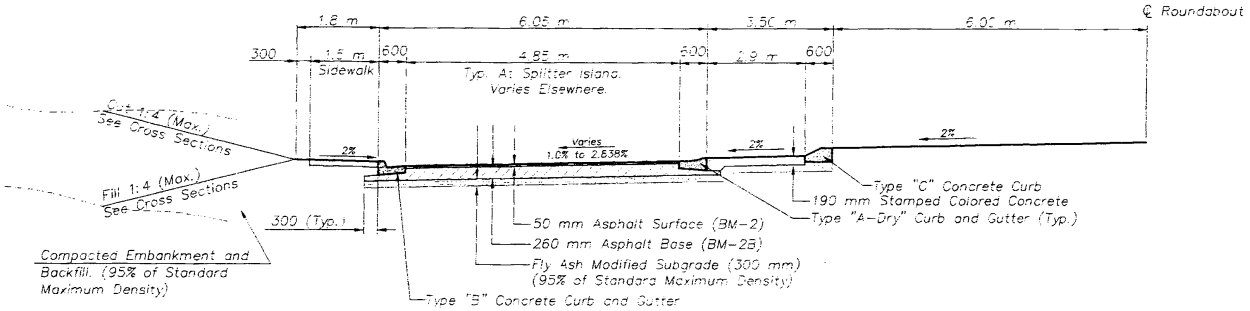
### *Ridgeview Road and Loula Street, Olathe*



The Ridgeview Road and Loula Street roundabout has a circular shape with a 100 ft (30 m) inscribed circle diameter. All approach lanes are single lane, as is the circulatory roadway. The circulatory roadway is 16 ft (4.85 m) wide with a 9.5 ft (2.9 m) truck apron. The design utilizes Type "B" concrete curb and gutter along the outside edge of the approaches and along the outside of the circulatory roadway. Type "B Dry Curb" and gutter are used along edge of the splitter islands, with Type "A-Dry" curb and gutter along the inside edge of the circulatory roadway. The pavement for this roundabout is a 2 in (50 mm) asphalt surface with a 10.25 in (260 mm) asphalt base.




TYPICAL SECTION AT SPLITTER ISLAND
(Not to Scale)




LOULA AND RIDGEVIEW SECTION – ROUNDABOUT
(Not to Scale)

Design by: Olsson Associates, 2002

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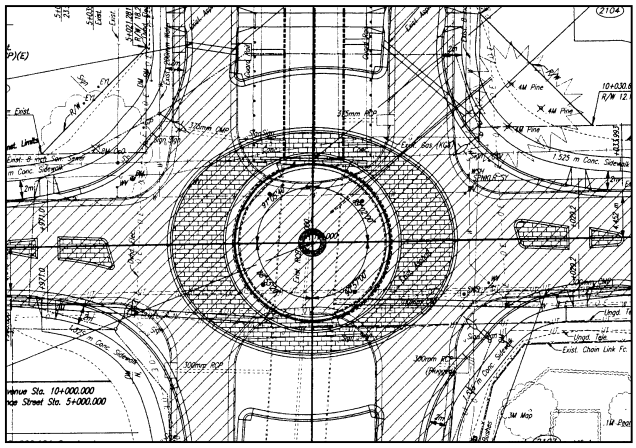
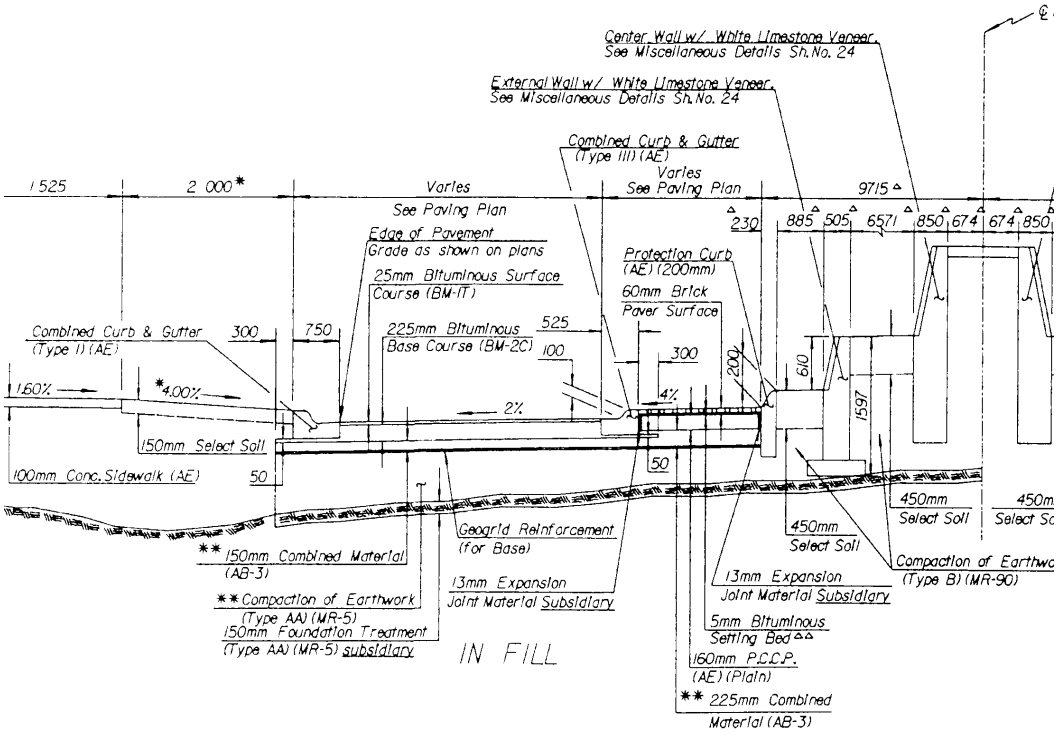
### *23rd Street and Severance Street, Hutchinson*

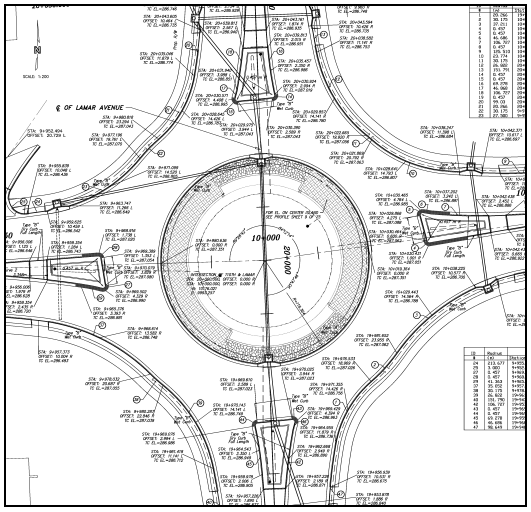


Twenty Third Street and Severance Street are both minor arterial streets. Severance Street has a large drainage channel that runs between the north and southbound lanes, resulting in a median that is approximately 55.8 ft (17 m) wide. The roundabout is elliptical, with a diameter of approximately 145 ft (44 m) east-west and 125 ft (38 m) north-south. All approaches are single lane, as is the circulatory roadway. The circulatory roadway is approximately 23 ft (7 m) in width. A truck apron is provided, varying in width from about 6.5 ft (2 m) to about 16.4 ft (5 m). The outside curb around the roundabout is a KDOT Type I; the inside curb is a KDOT Type III. The curb around the splitter island is a 9-in (230-mm) wide KDOT protection curb, modified to 6 in (150 mm) in height. The pavement in the roundabout is asphalt, with a 9-in (225-mm) base and 1-in (25-mm) surface course.

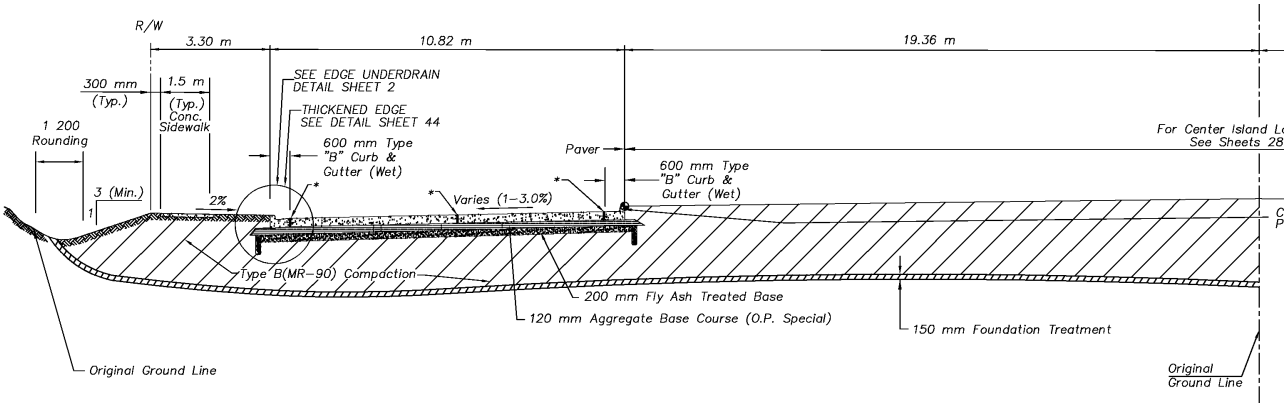


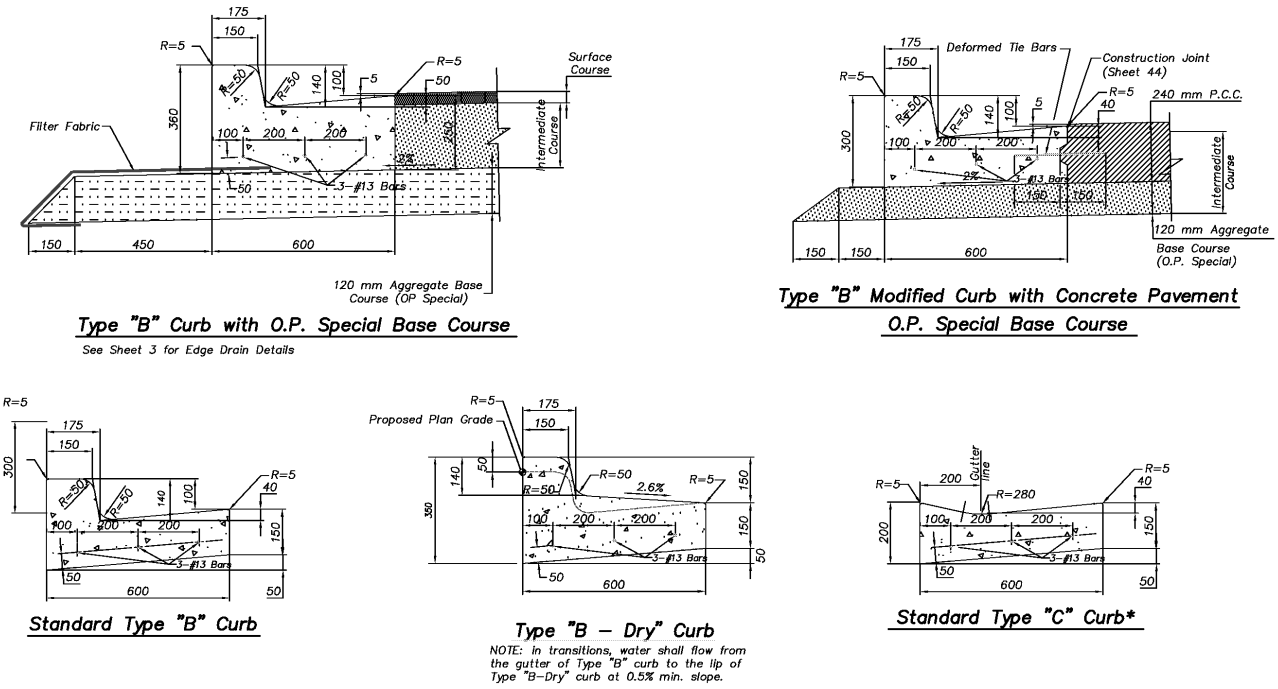

Design by: Professional Engineering Consultants, P.A., 2000.

### *110th Street and Lamar Avenue, Overland Park*



Lamar Avenue is a collector street, while 110th Street serves an adjacent business park and the Overland Park convention center. All approaches are two lanes, with a two lane circulatory roadway. The roundabout is 197 ft (60 m) in diameter with a 36-ft (11-m) circulating roadway. The roundabout was designed to be constructed as either 9.5-in (240-mm) concrete pavement or asphalt with an 8-in (205-mm) base course and a 2-in (50-mm) surface course. Ultimately the roundabout was constructed as concrete. The inner and outer curbs around the roundabout as well as around the splitter islands are Overland Park Type B curbs. The Type B curb has a curb height of 5.5 in (140 mm).






Design by: Olsson Associates, 2001.

## Discussion

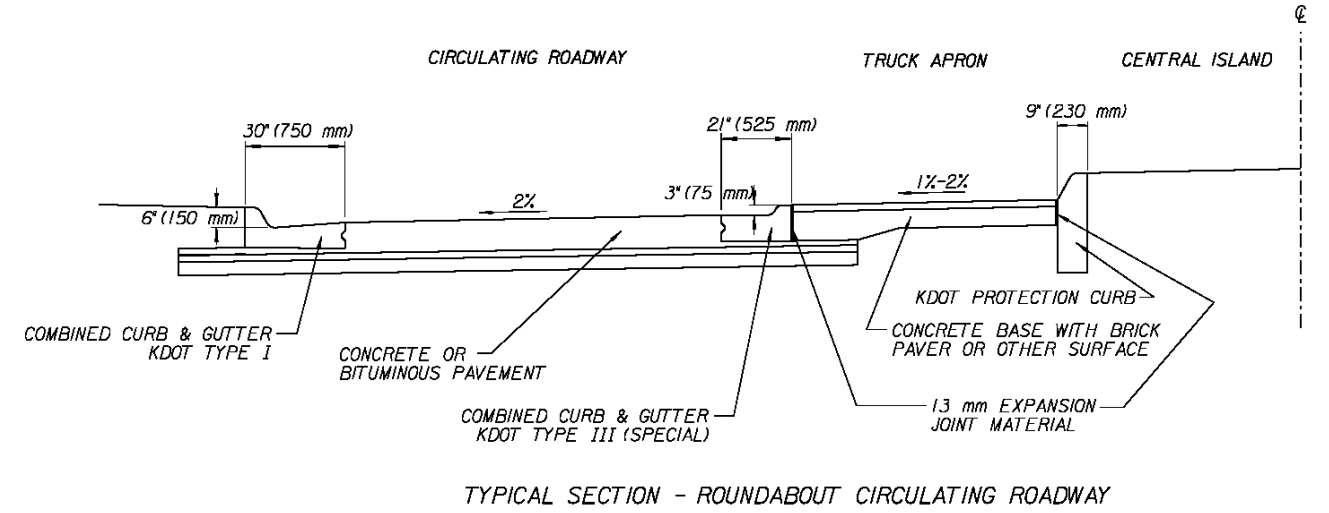
*Curb Types*

Generally, the curb and gutter type around the outside edges of all of the roundabouts are a KDOT Type I or similar. This type has a curb height of 6 in (150 mm). Around the central island the majority of the designs either used the Type I or Type III curb and gutter. The Type III is similar to Type I, but is 1.75 ft (525 mm) wide, as opposed to 2.5 ft (750 mm). Generally, this was a "dry" type curb, with the exception of the Overland Park roundabout, where a "wet" type curb was used to capture runoff from the central island. Heights of these curbs varied from 4 to 6 in (100 to 150 mm). Around the splitter islands, the KDOT Type III or Protection curb were utilized which generally have a curb height of 6 to 8 in (150 to 200 mm). In those cases where a curb was provided on the inside of the truck apron, generally an 8-in (200-mm) protection curb was utilized.

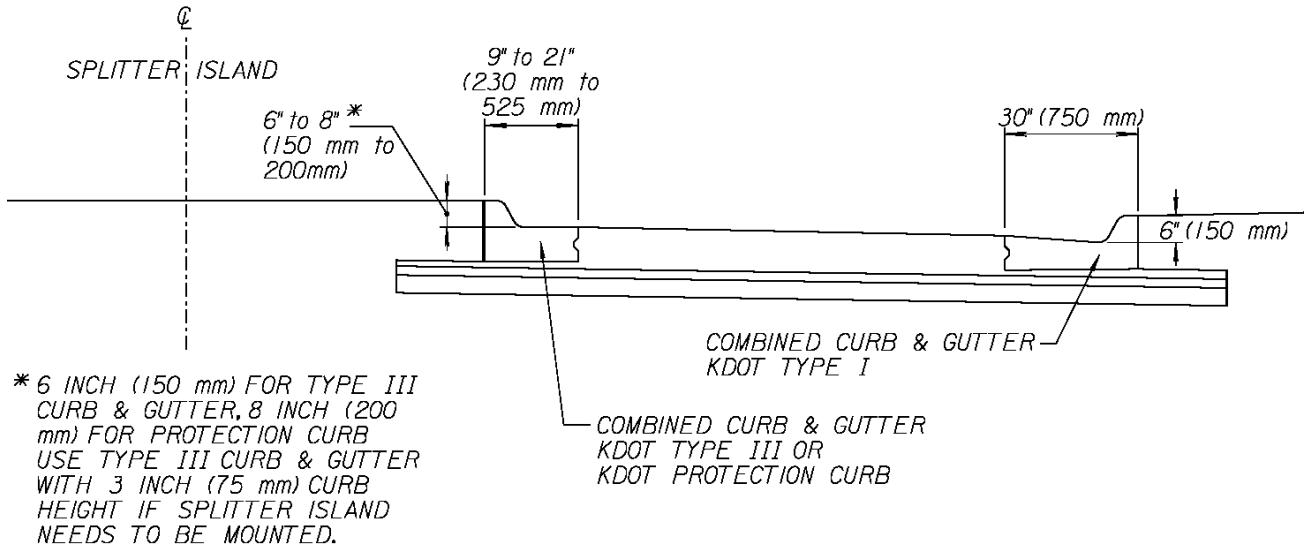
It is generally recommended that a 6-in (150-mm) high curb be used around the outside of the roundabout, the central island and the splitter islands, as one of the important elements of these features is to force deflection in vehicles traveling through the roundabout. If the curb is considered to be mountable by drivers, this effect is lessened. The barrier curb on the approach and in the splitter island also provides better protection for the pedestrian. However, most roundabouts must also be designed to accommodate large trucks. In this case, it is recommended that a 3-in (75-mm) curb height be used, as necessary, on the splitter islands, truck apron, or central islands. On occasion, trucks may also need to mount the outside curb; curb height will also need to be a consideration in these cases. Cross slopes on the circulating roadway are recommended to be 2 percent. On the truck apron, it is recommended that the cross slope be 1 to 2 percent to help prevent load shifting in trucks.

Exhibit 6-23 illustrates the recommended typical sections through the roundabout and the approach lanes.

**Exhibit 6-23**
**Circulatory Roadway and Approach Typical Sections**




TYPICAL SECTION - ROUNDABOUT CIRCULATING ROADWAY




TYPICAL SECTION - ROUNDABOUT APPROACH

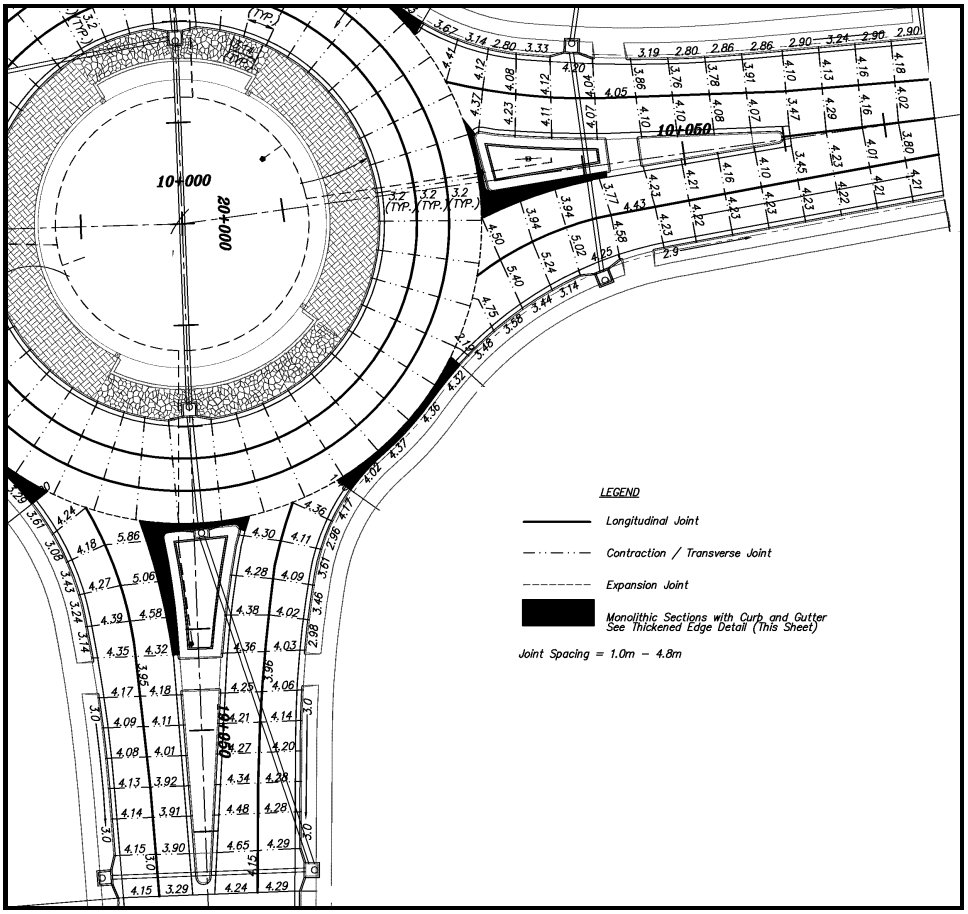
*Pavement Type*

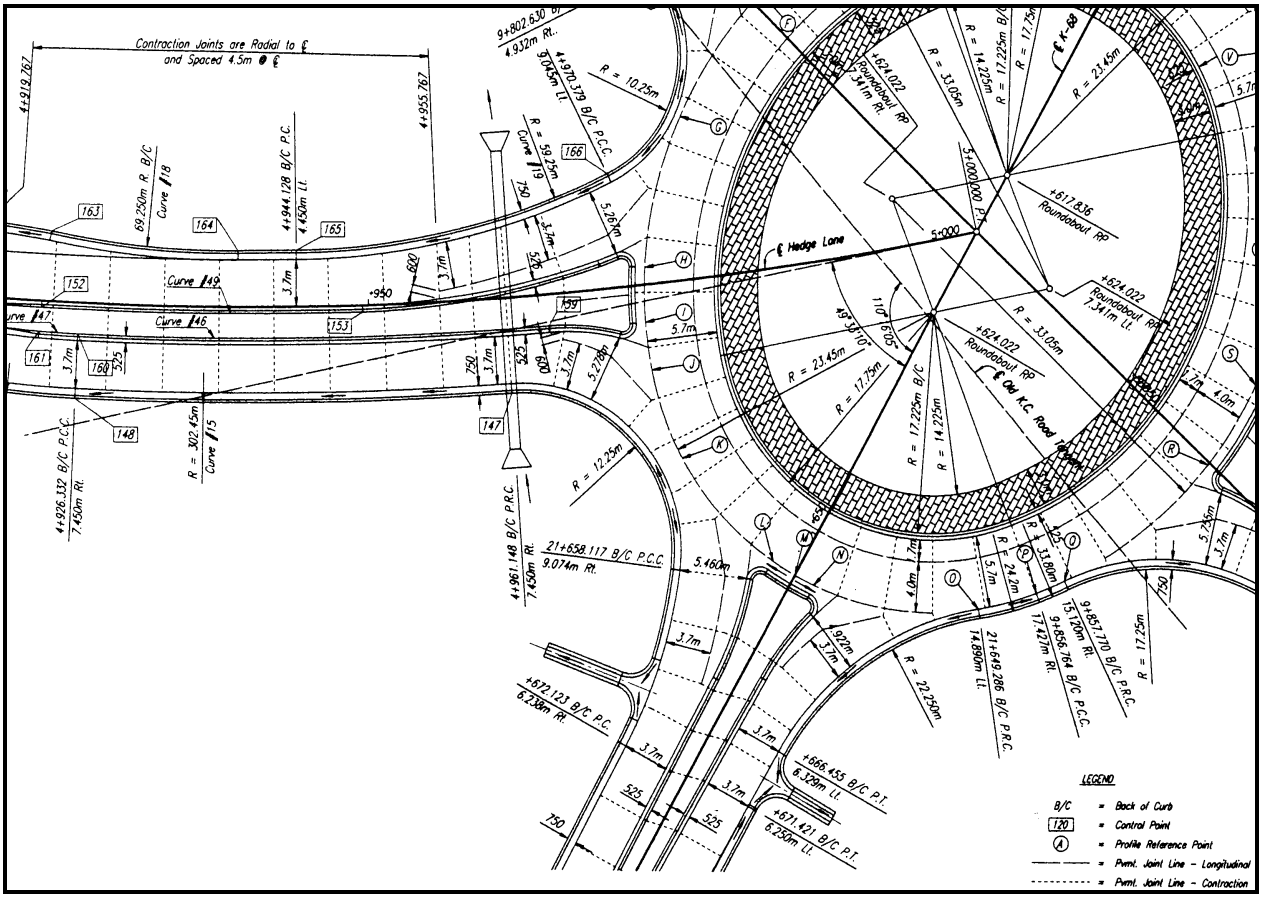
Both asphalt and concrete pavements were used in the roundabouts reviewed. This is unusual nationally and internationally, where the vast majority of roundabouts are constructed using asphalt. The decision whether to utilize asphalt or concrete will depend on local preferences and the pavement type of the approach roadways. Concrete generally has a longer design life and holds up better under truck traffic. However, national experience has been that rutting has not been a problem with well-constructed asphalt pavement. Constructability is also a consideration in choosing pavement type. Generally, if the roundabout is to be constructed under traffic,

asphalt pavement will need to be used. For the truck apron, all of the projects utilized concrete pavement, generally 11 in (280 mm) in depth, or concrete pavement with a brick paver surface. Other options for the truck apron would include using large (4 in [100 mm]) river rocks embedded in concrete that can be traversed by trucks but are uncomfortable for smaller vehicles or pedestrians. A geogrid type material can also be used to provide a more landscaped type appearance but hold up to occasional encroachment by large trucks. The material used for the truck apron should be selected so as to not look like the sidewalk. This will help to keep pedestrians off the truck apron and central island. If the truck apron is constructed under traffic, high early strength concrete should be used to minimize the amount of down time for the intersection.

If concrete pavement is used, joint patterns should be concentric and radial to the circulating roadway within the roundabout. Ideally the joints should not conflict with pavement markings within the roundabout, although concrete panel sizes may control this. On multilane roundabouts, circumferential joints within the circulating roadway should follow the lane edges. Jointing and dowel details should generally utilize KDOT standards RD651 and RD682. Additional information and publications regarding jointing is available from the American Concrete Paving Association (www.pavement.com). Examples of jointing plans are shown below in Exhibit 6-24.

**Exhibit 6-24**
**Example Jointing Plans**






Cracking has been found to be a problem in some roundabouts, particularly around the outside of the circulating roadway in the vicinity of the outside curbs and splitter islands, so special care needs to be taken to provide the necessary relief. In the top example above, the City of Overland Park, based on their research of existing roundabouts, isolated the circulating roadway with an expansion joint and constructed special monolithic sections in key areas.