

SECTION 7 - PAVING
CITY OF CARO
ENGINEERING DESIGN STANDARDS

A. Plans & Specifications - Submittal Procedure

1. The plans and specifications shall be prepared in accordance with “Section 1 - General Requirements & Submittals.”

B. Plans & Specifications – General Content

1. All plans are to clearly identify public/private dedication.
2. Provide continuous stationing.
3. Centerline curve data (radius, deflection angle, degree of curvature and total arc length) for all roads shall be indicated on the plans. All horizontal curves shall be consecutively numbered and indicated in the plan view.
4. Finish grade of all structures shall be indicated in the plan view.
5. Show a detail of all intersections and cul-de-sacs. The detail shall show layout and detailed grades. Maximum scale of the detail shall be one inch equals thirty feet (1”=30’).
6. A profile view shall be provided for all roads (pubic and private) and shall include the following:
 - a. Elevations at top of curb or at centerline, if not curbed.
 - b. Existing ground elevations at the center of the right of way and at other locations, as required for review. Elevations shall be based on USGS Datum.
 - c. Station and elevations of all high points, low points, grade breaks, curb returns and necessary information at vertical curves.
 - d. Top of curb (or centerline) elevations at each station. Grade in vertical curves must be indicated at twenty-five (25) foot intervals.

C. Requirements for Paving

1. Private roads are to be designed to Public Road Standards.

2. Street paving width shall conform to the following requirements:

Type	Minimum B/C to B/C Width (feet)	Minimum Lane Width (feet) **See Note 2	Minimum ROW Widths (feet) *See Note 1
Major Streets	28	12	70
Local Streets	26	11	66
Boulevards (per lane)	17	13	N/A
Access Drives	24 (no curb)	12	N/A
Cul-de-sacs (residential)	52 (radius)	30	75
Cul-de-sacs (industrial)	62 (radius)	40	80

* Note 1 – Right of way (ROW) width shall be adjusted as required to maintain a minimum of eighteen (18) feet from back of curb (B/C) to right of way line.

**Note 2 – For streets with parallel parking an additional six (6) foot per side shall be added.

3. The intersection of roads shall be as close to ninety degrees (90°) as possible with a variation of no more than ten degrees (10°).
4. When boulevard sections are used at the entrance, the minimum pavement widths shall be twenty-eight (28) feet (B/C to B/C), and the minimum island width shall be ten (10) feet. The edge of metal of the median shall be offset at least twelve (12) feet from the edge of lane of the intersecting street.
5. All islands and medians shall be curbed in the same manner and in accordance with the same detail for curb and gutter used elsewhere. Hour glass and other odd shaped medians are not acceptable. Material placed between the curbs shall be seeded earth, crushed limestone or other materials approved by the City.
6. Cul-de-sacs shall be avoided, unless space restraints require such usage and street shall not exceed seven hundred and fifty (750) feet in length. A reduced pavement section may be submitted for review for a temporary cul-de-sac. “T” and “L” type turnarounds shall not be permitted.
7. Soil borings, five (5) feet below existing grade (minimum), shall be taken by an independent testing laboratory or qualified professional at intervals not to exceed five hundred (500) feet. Additional borings may be required where the USDA Soil Survey or onsite inspection indicates unstable soil may be present.
8. The applicant shall remove all unsuitable soil including muck, peat and marl, as well as brush, trees, tree stumps and similar materials from the full width of the roadway. These areas shall then be backfilled with MDOT Class II Granular Material to provide a stable subgrade for the roadway construction.

9. Street cross-sections shall include curb and gutter and shall meet or exceed the minimum pavement thicknesses shown in the figures. Subsurface soil conditions shall govern exact thickness. Pavement cross-sections may have either an aggregate base or full depth asphalt. No concrete cross-sections will be allowed. All cross-sections shall be subject to the approval by the City. Phased development shall use the same cross-section throughout the entire project.
10. Minimum curb and gutter radii at intersections shall be as follows, unless otherwise approved by the City:

	Minimum Radius (Back of Curb)
Major Streets	40 feet
Local Streets	30 feet
Industrial Streets	50 feet

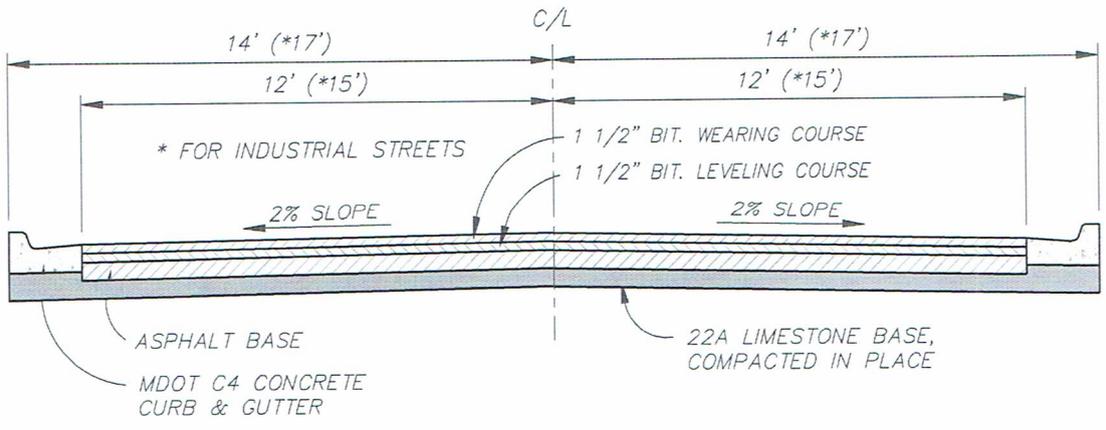
Entrances (residential, commercial or industrial) shall be designed to accommodate the larger vehicles anticipated to use the site and stay within their lane.

11. Maximum allowable pavement grade shall be six percent (6%) and the minimum allowable(s) shall be as follows:

Concrete gutter grades	= 0.40%
Concrete gutter return at intersections	= 1.00%
Pavement surface grade to gutter line	= 1.00%
Typical cross-slope	= 2.00%

12. At the intersection of two (2) roadways, the maximum grade shall be three percent (3%) for a distance of one hundred (100) feet from the point of intersection.
13. All streets shall be designed for a minimum design speed of thirty (30) mph (posted speed 25 mph). Design criteria (AASHTO and Design Speed) shall be noted on the plans.
14. The minimum sight distance for all roads shall be three hundred (300) feet for streets with design speeds of thirty (30) mph. Higher design speeds shall be designed according to AASHTO (latest edition).
15. Whenever a change in the vertical centerline grade of one percent (1%) or more occurs, provide a vertical curve. The minimum length of vertical curve shall be one hundred (100) feet and shall be rounded to the nearest fifty (50) feet thereafter. For a thirty (30) mph design speed, the minimum crest "K" value shall be thirty (30) and the minimum sag "K" value shall be forty (40). Higher design speeds shall be designed according to AASHTO (latest edition).
16. Left turn lanes and bypass lanes should be considered on streets where traffic volumes are high enough or safety considerations are sufficient to warrant them. Such usage shall be determined on a case by case basis at the City's discretion.

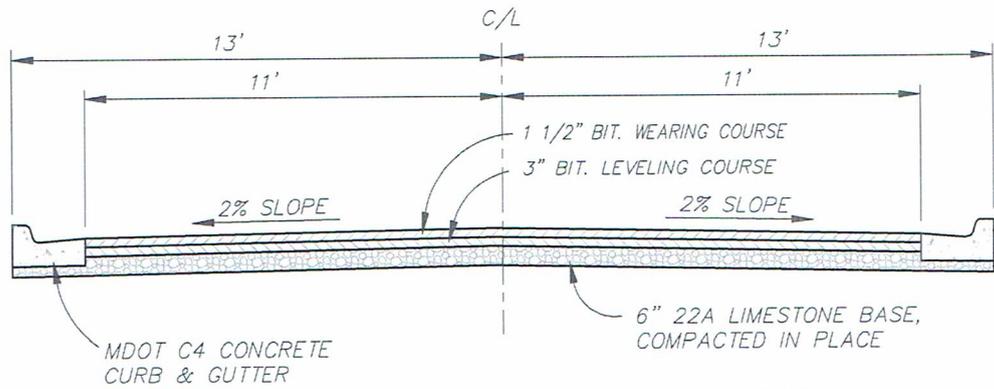
17. All curbing shall be concrete meeting the details provided in the figures unless otherwise approved by the City. The curb detail shall be approved by the City prior to placing.
18. All curbing shall drain to catch basins in the curb. Catch basins shall be spaced as specified in the Storm Drainage System Section.
19. Edgedrain shall be used at the low points in the road. Edgedrain shall be placed for a minimum distance of twenty-five (25) feet in both directions from the catch basin. Additional or continuous edgedrain may be required, as directed. Edgedrain shall be a minimum of four (4) inch diameter pipe wrapped with a geotextile fabric and backfilled with a granular material or clean crushed stone. Edgedrain shall be connected to catch basin.
20. Streetlights: The City may require street lighting at street intersections or other locations to serve purposes of safety and/or security. When required, the intensity and type of illumination, location and types of poles, bases, etc., shall be coordinated with the existing and future street lighting within the area.
21. The Owner/Developer shall provide and properly maintain, until accepted by the City, all traffic and pavement markings which the City may determine necessary for the proper operation of the roadway/driveway/curb cut. Only those traffic signs and pavement markings specified by the City (or jurisdictional authority) may be used within the road right of way. All signs and pavement markings shall conform to the current Michigan Manual of Uniform Traffic Control Devices (MMUTCD). The Developer will be responsible for constructing all required signs and pavement markings.



NOTE: MAJOR STREETS DESIGN SHALL BE AS APPROVED BY THE VILLAGE

MAJOR STREETS

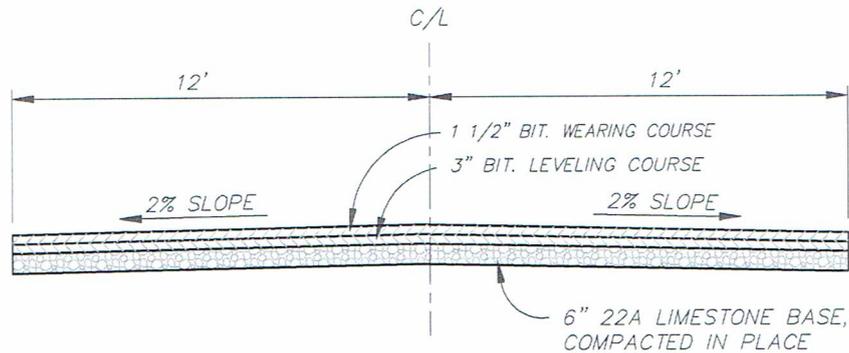
NOT TO SCALE



LOCAL STREETS

NOT TO SCALE

NOTE: FULL DEPTH ASPHALT PAVEMENT MAY BE SUBSTITUTED FOR THE LOCAL STREET CROSS SECTION



ACCESS DRIVES

NOT TO SCALE

DATE: FEB 2015

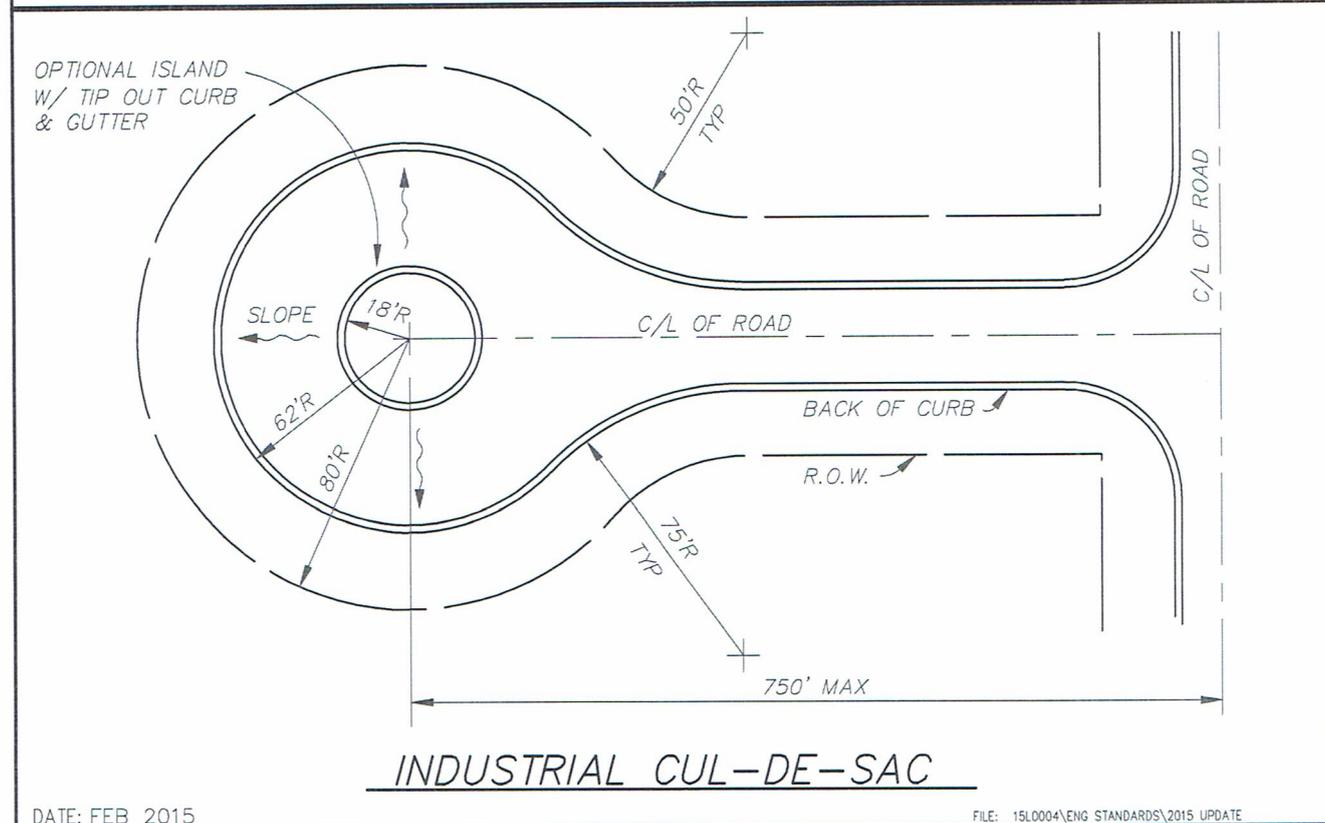
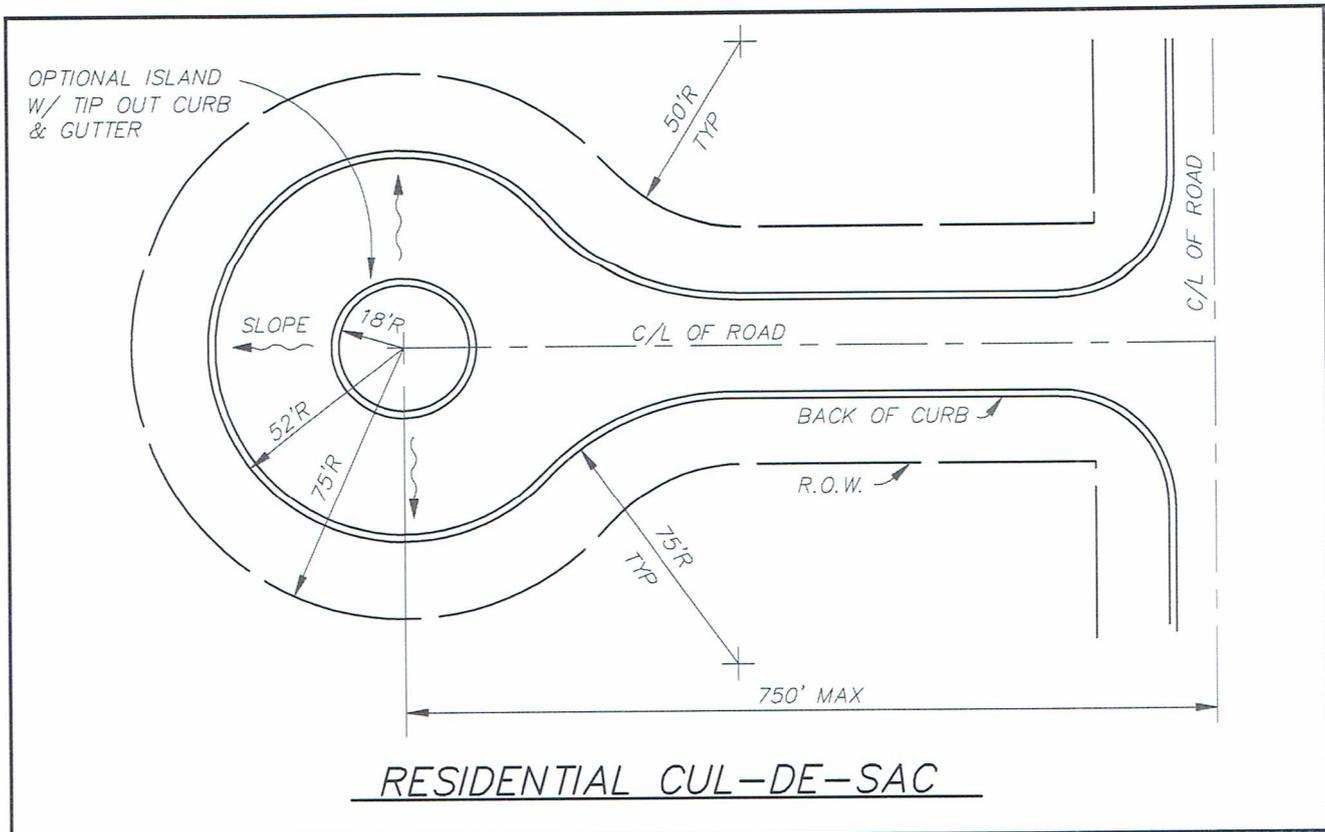
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ROWE PROFESSIONAL SERVICES COMPANY

128 N. Saginaw St. Lapeer, MI (810)-664-9411

CITY OF CARO
SECTION 7 - FIGURE 1



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CITY OF CARO
SECTION 7 - FIGURE 2