Jointing Guidelines

Design Manual
Chapter 7
Pavement
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This section provides designers with an explanation of the types of joints used in a jointing plan. It also provides designers with guidelines for placing joints.

A proper jointing system serves the following purposes:

- Controls cracking.
- Divides the pavement into practical construction increments.
- Accommodates slab movements.
- Provides load transfer.

Geometrics, along with locations of items such as intakes, boxouts, and traffic islands, can have significant impacts on jointing. Designers should consider jointing early in project development. This will help to coordinate jointing with design and potentially simplify final jointing layouts.

Types of Joints

The four types of joints used in a jointing plan include:

- Transverse Contraction Joints.
- Construction Joints.
- Longitudinal Joints.
- Isolation and Expansion Joints.

Transverse Contraction Joints

Transverse contraction joints are joints that are constructed transverse to the street's centerline and spaced to control transverse slab cracking. Standard joint spacing is 17 feet for CD joints and 15 feet for C joints. If a project requires different spacing the designer should note this in the plans.

> **Note:** Typical transverse contraction joint spacing should be 24 to 30 times the pavement thickness, not to exceed a maximum spacing of 17 feet. Transverse joint spacing should also not exceed 125% to 150% of the longitudinal joint spacing.

Construction Joints

Construction joints are joints that are installed at the end of a day-long paving operation, or other placement interruption. Whenever possible, longitudinal construction joints should be installed at the location of a planned joint. Transverse construction joints are normally located between transverse contraction joints.

Longitudinal Joints

Longitudinal joints are joints that are parallel to the pavement centerline that control cracking and delineate lanes of traffic.

Isolation and Expansion Joints

Isolation and expansion joints are joints placed to allow movement of the pavement without damaging adjacent pavements, intersecting streets, drainage structures, or other fixed objects.

Jointing Guidelines

Listed below are some general guidelines to follow when laying out a jointing plan for PCC Pavement. They are listed in order of importance. If all of the guidelines outlined below cannot be met, those towards the top of the list should receive priority. Refer to the latest version of the SUDAS Standard Specifications for further guidance in urban areas.

1. Joints should be at least 2 feet long. This is the minimum length required to establish a joint.
2. Ninety-degree angles are preferred between two joints and between a joint and the free edge of the pavement. Angles as small as 70 degrees may be used, but angles less than 70 degrees should not be used.
3. The number of joints intersecting at one point should not exceed four.
4. Longitudinal joints should be placed according to the Typical Components. For mainline pavements, longitudinal joints are spaced at lane pavement width – 12 feet. Consult the Pavement Design Engineer for special cases.
5. The pavement width should be kept the same throughout a project, if possible, to simplify construction and jointing. Standard paving widths need to be in 1 foot increments.
6. The C transverse joint is the primary transverse joint used when the pavement thickness is less than 8 inches. It normally has a maximum spacing of 15 feet. However, the spacing of C joints used in shoulders should match the spacing of the mainline joints, even if the mainline joint spacing is greater than 15 feet.
7. The CD transverse joint is the primary transverse joint used when the pavement thickness is 8 inches or greater. It has a maximum spacing of 17 feet. If the joint length is 2 feet, a C joint should be used instead of the CD.
8. On non-primary side roads and intersection returns connecting to the mainline, C joints may be used if the design year truck volumes are less than 200 vpd (regardless of the pavement thickness). Consult the Pavement Design Engineer for the appropriate transverse joint to use on primary routes with design year truck volumes less than 200 vpd.
9. A minimum spacing of 12 feet for transverse joints should be used.
10. Avoid unnecessary angles and bends in the length of a joint. This complicates the design and makes it difficult to construct. Angles can lock joints that are meant to move.
11. If possible, maintain a joint as either working or non-working throughout its length. Joints that allow movement are considered working and joints that prevent movement are considered non-working. See the Thermal Movement column in Tables 1 and 2.
12. Any section that may be manually paved (crossovers, intersection returns, etc.) should be able to be broken up so the entire area does not have to be paved all at one time. Use jointing that gives the contractor the option to pave the area in sections.
13. The Pavement Design Engineer should be consulted to determine if a KT-3 or an L-3 longitudinal joint is required if the pavement width is greater than “W” given a pavement thickness of “T”.

T (inches)	W (feet)
8	60
9	56
10	52
11	48
12	44
13	40

14. Joint dimensions are normally rounded to the nearest foot.

The DW joint is not shown on the jointing layout. Using the DW joint to aid in the placement of concrete is the contractor’s option.

Transverse and Longitudinal Joint Characteristic Summaries

Tables 1 and 2 summarize information on the various joints used by the Iowa DOT, including the joint type, the method of load transfer, and whether the joint allows or prevents thermal movement.

Table 1: Summary of Transverse Joints

Joint		Method of Load Transfer			Thermal Movement				Comments
	Expansion	Aggregate Interlock	Tie Bar	Dowel Bar	Doweled to allow movement	Tied to prevent movement	Expansion joint allows movement	Lack of reinforcing allows movement	
B								**x**	Used between dissimilar materials or when other joints are not suitable.
C		**x**						**x**	Transverse joint used when T < 8”. May also be used on non-primary routes if design year truck volume is less than 200 vpd.
CD		**x**		**x**	**x**				Transverse joint used when T ≥ 8”. Use C joint when joint length is 2’.
CT		**x**	**x**			**x**			Specialty tied contraction joint.
DW			**x**			**x**			Used by contractor as a stopping point.
HT			**x**			**x**			Used at the end of rigid pavement prior to placement of second slab.
RD				**x**	**x**				Joint between new and existing pavements, dowels are used.
RT			**x**			**x**			Joint between new and existing pavements, tie bars are used.
CF-1	**x**						**x**		2” expansion joint.
CF-2	**x**						**x**		2½” expansion joint.
CF-3	**x**						**x**		3” expansion joint.
CF-4	**x**						**x**		3½” expansion joint.
E	**x**						**x**		1” expansion joint.
ED	**x**			**x**	**x**		**x**		1” doweled expansion joint.
EE	**x**			**x**	**x**		**x**		2” doweled expansion joint.
EF	**x**			**x**	**x**		**x**		3½” doweled expansion joint.
ES	**x**						**x**		Used in curb to match expansion joint in pavement.

Table 2: Summary of Longitudinal Joints

Joint	Method of Load Transfer				Thermal Movement				Comments*
	Aggregate Interlock	Keyway	Tie Bar	Dowel Bar	Doweled to allow movement	Tied to prevent movement	Expansion joint allows movement	Lack of reinforcing allows movement	
B								**x**	Used between dissimilar materials or when other joints are not suitable.
BT-1						**x**			Longitudinal joint used when T < 8”.
BT-2						**x**			Used when L-2 and the KT-2 are not possible, T ≥ 8”.
BT-3						**x**			Joint used between new and existing pavements, tie bars are used.
BT-4						**x**			Joint used between new and existing pavements, tie bars are used.
BT-5						**x**			Joint used between new and existing pavements, tie bars are used.
E									1” expansion joint.
K		**x**						**x**	T > 8”, minimal usage.
KS-1		**x**				**x**			Used in single reinforced pavements.
KS-2		**x**				**x**			Used in double reinforced pavements.
KT-1		**x**				**x**			Longitudinal joint used when T< 8”
KT-2		**x**				**x**			Longitudinal joint used when T ≥ 8”.
KT-3		**x**				**x**			Longitudinal joint used with pavements of large width.
L-1	**x**					**x**			Longitudinal joint used when T < 8”.
L-2	**x**					**x**			Longitudinal joint used when T ≥ 8”.
L-3	**x**					**x**			Longitudinal joint used with pavements of large width.

*Note that some joints may be used interchangeably depending on the paving sequence. Refer to PV-101 for further details.

Chronology of Changes to Design Manual Section:

007A-002 Jointing Guidelines

6/25/2019 Revised

Changed 20 foot transverse joint spacing to 17 foot transverse joint spacing to reflect policy change.

12/3/2015 Revised

Removed skewed joints from Tables 1 and 2. Added CF-4 joint to Table 1. Changed EF joint to be 3.5".

1/31/2013 Revised

Added language suggesting jointing be considered early in the design process.

12/30/2011 Revised

Added descriptions of transverse contraction joints, construction joints, longitudinal joints, and expansion and isolation joints. Updated references to standards, created hyperlinks to other sections, and removed metric elements. Removed reference to extend jointing details to the first skewed joint past the detailed area. Added definitions for working and non-working joints.

2/26/1999

New material.