



NEET - MDS

MASTERS OF DENTAL SURGERY

BY NBE

NATIONAL ELIGIBILITY CUM
ENTRANCE TEST

Volume - 8

Endodontics & Conservative Dentistry



CONTENT

ENDODONTICS & CONSERVATIVE DENTISTRY

1. Structure & Function of Pulp	1
2. Tooth morphology & Root Canal System	7
3. Instruments, Materials & Devices	19
4. Endodontic Diagnosis	44
5. Cleaning & Shaping/Obturation	52
6. LA in Endodontics	62
7. Peri-Radicular Surgery	65
8. Periapical Pathology	72
9. Operative Instruments	74
10. Rubber Dam Isolation	85
11. Dental Bonding	93
12. Dental Composites	104
13. Dental Amalgam	116
14. Tooth Preparation Fundamentals	132
15. Dental Ceramics	140
16. Linear & Bases	148

ENDODONTICS

Term coined by → DR. HARRY B. JOHNSON

greek word ↙ EN - Inside

 ↘ DONS - Teeth

Ⓐ Structure & functions of Pulp?

origin of pulp :- Cephalic Neural Crest.

↓
made up of ectomesenchymal cells

→ Dental pulp organized into 4 layers :-

① outermost layer (odontoblast layer)
* single layer of cells that outlines pulp.

↳ under microscope appears 3-5 layers thick.

↓
called "Pseudo Stratified" appearance.
Also k/a "Pellicled".

* Shape of odontoblast → Changes from Crown → Root

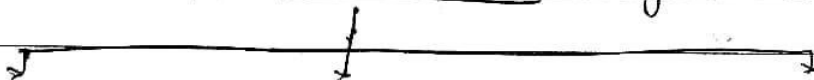
Crown → Tall columnar in shape

Mid Root → Cuboidal

Apical Root → flat squamous.

Reason :- for change of shape is No. of Dental tubules ext.

→ Connection b/w odontoblasts (3 types)



(3 types)

Gap junction
(NEXUSES)

* Made of protein
called CONNEXIN

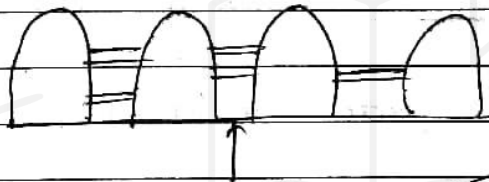
TIGHT Junction
(ZONULA
OCCLUDENS)

Regulate

Permeability of odontoblast layers.

Desmosomes
(ZONULA
ADHERENS)

→ There are 30-40nm spaces b/w odontoblasts.



Spaces contain :-

- ① Capillaries
- ② Nerve fibers
- ③ dentritic cells.

Functions:- principal secretory cells

(a) Acid phosphatase

(b) Alkaline ———

(c) Phosphoryn.

(d) Dentin sialoprotein

(e) NESTIN → Histological marker of Dentin.

(f) Collagen type I (Traces of type V)

② Cell free zone (second layer) :- zone of well :-

* 40µm wide zone below odontoblasts.

contains:-

→ Capillaries

→ Nerve fibers (Non-myelinated)

→ cytoplasmic process of fibroblast

(3) Cell-Rich zone (HOHL)

Numerous cells — (i) Fibroblast → Secrete
(most abundant cells) Collagen
└─┬─┘
type I type III

(ii) Dendritic cell (Antigen presenting cells (APC))

In case of Normal / Healthy pulp → Ent in periphery of pulp

• In Inflamed pulp → center of pulp
(Immune cells of pulp)

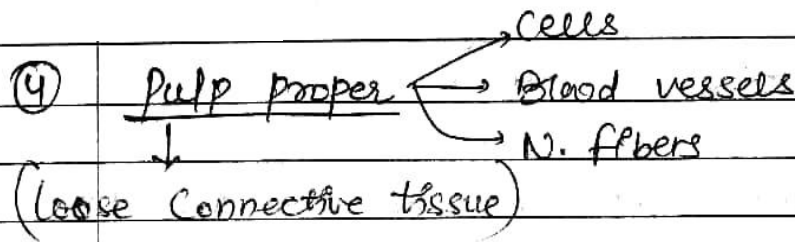
(iii) Macrophages: derived from Blood monocytes.

2 function
└─┬─┘
Principal (phagocytosis) 2^o (Immunity)

(iv) Lymphocytes
└─┬─┘
⊗ B ⊙ T
 ↓
 [Immune cells] majority T_H Suppressor cells.

(v) UDMSC: undifferentiated mesenchymal stem cells.
(Multipotent)

(vi) Mast cells → ⊗ Normal pulp
 ⊙ Inflamed pulp.
 ↳ contain granules
 release → ⊕ Heparin (Anti-coagulant) (Cause vasodilation)
 ⊗ Histamine → mediate pain



Pulpal Innervation

Sensory / AFFERENT

MOTOR / EFFERENT

Trigeminal

③ post. ganglionic Sympathetic fibers.

A-fibers

C-fibers

⊗ parasympathetic

①

②

Sensory fibers

A (myelinated)
(20%)

C (Non-myelinated)

→ ⊕ Out on periphery of pulp

→ 80%

→ Centre.

A β

A δ

10%

90%

Carry sensation

of pressure → (proprioception)

Touch.

→ Carry sensation of Pain, Temp., Touch

(Short, sharp)

C-fibers?

Carry sensation of pain only.

(Principal Nociceptors.)

↳ polymodal nociceptors.

stimulated by $\left\{ \begin{array}{l} \text{PH} < 6 \\ \text{Temp} > 110^\circ \text{F} \\ \text{Chemicals (capsaicin)} \end{array} \right.$

Pain \rightarrow Dull, Aching pain (less Bearable)

* Phantom tooth pain (De-Afferentation)

\rightarrow Incidence of 3-6%

\rightarrow Due to up-regulation of C-fos gene.

\rightarrow * Removal of sensory nerve fibers & Pt causes persistent pain.

pulp circulation? Maxillary artery \rightarrow Br. of ECA.

* Resting Rate of Blood flow?
15-60 ml/min/100gm tissue.

* Rate of oxygen consumption?
 3.2 ± 0.2 ml/min/100 gm tissue.

material like? $\left\{ \begin{array}{l} \text{Calcium hydroxide} \\ \text{ZOE} \\ \text{Amalgam} \end{array} \right. \left. \begin{array}{l} \downarrow \text{se rate of} \\ \text{oxygen consumption} \\ \downarrow \text{also says} \\ \text{less Blood flow.} \end{array} \right.$

* Intra-pulpal pressure?

Normal \rightarrow 10-2 mmHg

(14 cm of H₂O)

During inflammation: pressure \uparrow 30-35 mm of Hg.

During Inflammation of Pulp

- ① \uparrow vascular permeability ② vasodilation

Both \uparrow Intra-pulpal pressure.

* Interstitial fluid volume of $0.6 \pm 0.03 \text{ ml/gm}$.

* Average Capillary density $\rightarrow 1400/\text{mm}^2$.

* Pulpal Neuropeptides :-

Chemical secreted by nerve fibers :-

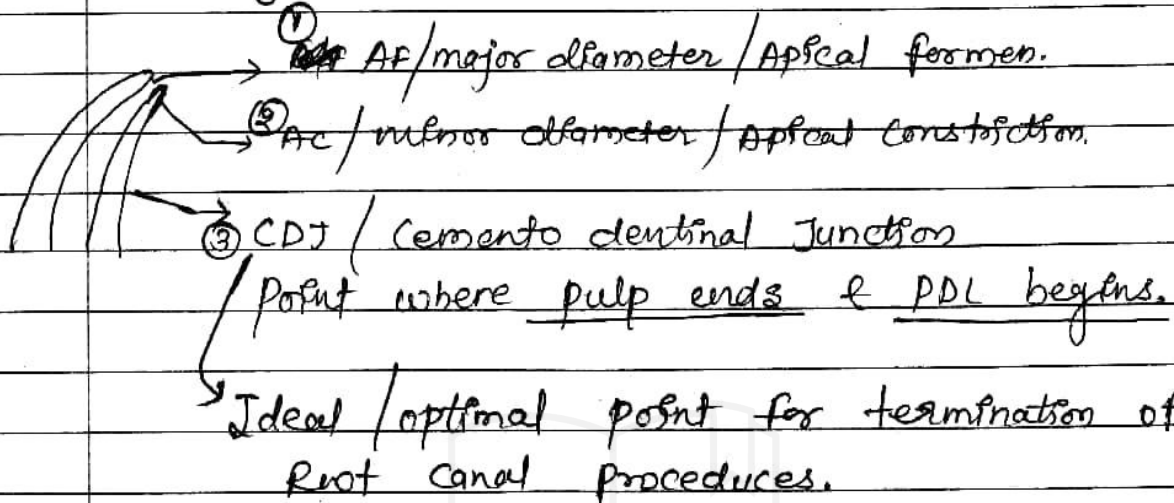
- e.g. (A) CGRP \rightarrow Calcitonin gene related peptide.
(B) Substance P
(C) Neuropeptide Y
(d) Neurokinin A.

function :- \uparrow Nerve differentiation.
 \uparrow Pulp circulation.

Q. Non-vital teeth difficult to move orthodontically -?
Ans: Becoz lack of Neuropeptides.

② Tooth Morphology & Root Canal System

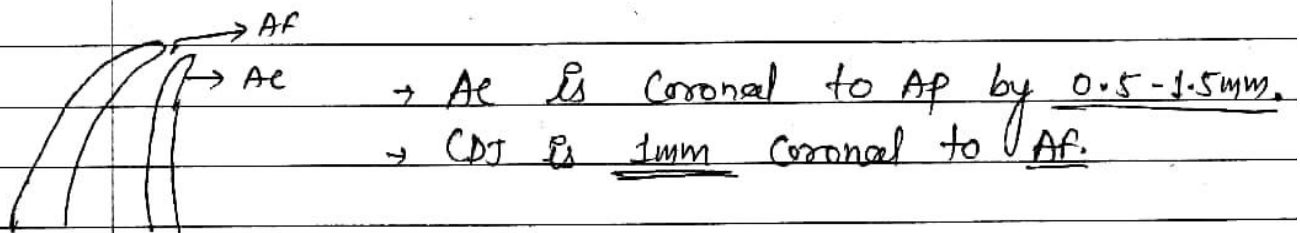
Anatomy of Root Apex?



CDJ → Histological landmark

- ⊗ Clinically
- ⊗ Radiographically

→ Best practical point for termination of Root Canal procedure is Ac (minor diameter)

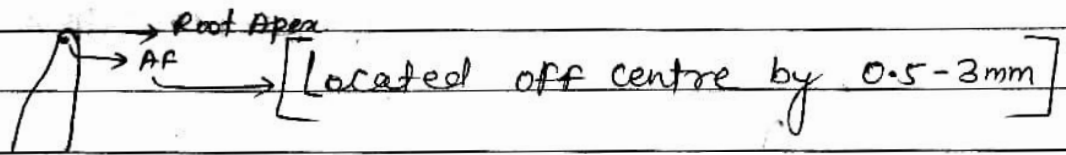


[Af is size ↑ ses ↑ Age] Due to deposition of cellular cementum.

→ Space b/w ~~Ac~~ & Af has that shape of

"funnel", "Hyperbolic", "Morning Glory" (flower)

→ AF coincides \bar{c} Root Apex in 17-48% Cases.



④ ISTHMUS / Anastomosis :-

↳ Narrow Ribbon Shaped communication b/w 2/more canals that contains pulp / pulpally derived tissue.

↓

Classification (Kfm)

Type I → Incomplete Isthmus b/w 2 canals. (60)

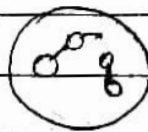
Type II → well defined, complete Isthmus b/w 2 canals



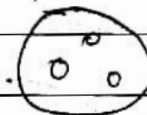
Type III → very short, complete b/w 2 canals.



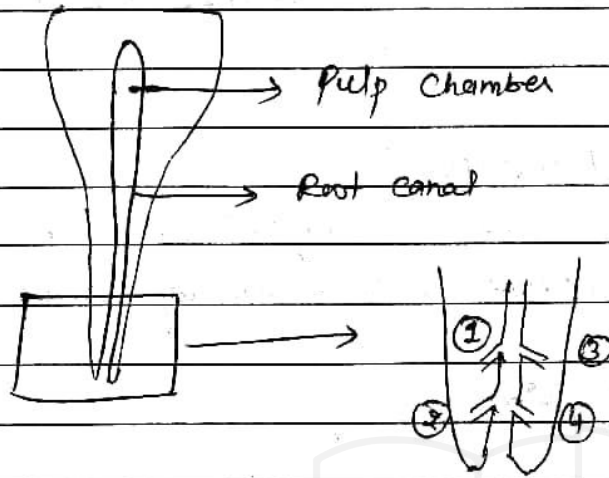
Type IV :- 3/more canals \bar{c} complete / Incomplete Isthmus b/w them.



Type V :- 2-3 canals \bar{c} out visible connections.



→ Root Canal patterns → Distribution Canal Anatomy
& Configurations



Branches ① & ③ → Apical Ramifications
⊗ Communicate \bar{c} Pdl

② & ④ → Lateral / Accessory Canals
⊙ Communicate \bar{c} Pdl

→ most

Out on Apical $\frac{1}{3}$ of Root 76%

→ Cervical $\frac{1}{3}$ — 14%

least → middle $\frac{1}{3}$ — 11%

No. on

1.36

Mandibular I Molar

• 13% Cases have single lateral canal / Accessory canal.





23% Cases → single furcation canal

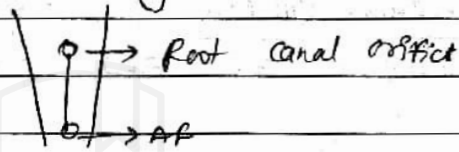
↳ Accessory Canal at furcation area.

10% Cases → both furcation + Accessory Canal.

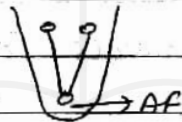


→ (Root Canal Configurations / Patterns)
Vertucci's Classification - 8 types

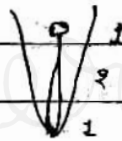
Type I (1)



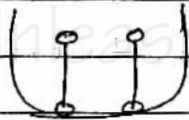
Type II (2-1) →



Type III (1-2-1) →



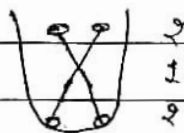
Type IV (2)



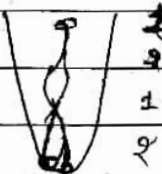
Type V (1-2)



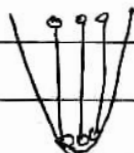
Type VI (2-1-2) →



Type VII (1-2-1-2) →



Type VIII (3)

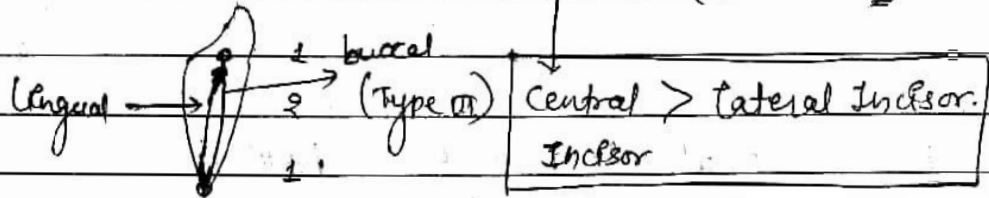


* Maxillary II Premolar → Shows all possible 8 Configurations.

Individual Canal variations

(a) mandibular Incisors usually 1 Canal / Type I

variation → 2 canals → Incidence (29-40%)



(b) mandi. Canine :- Highest Incidence of 2 canals Amongst all Ant. teeth.

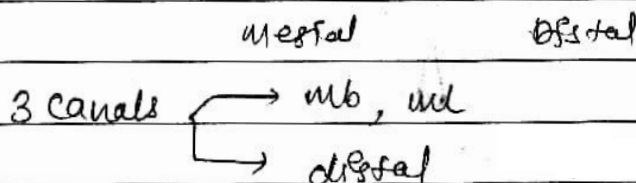
Mandi. Canine > Central Incisor > lateral Incisor
* Incidence of 2 canals in Ant. teeth.

(c) mandi. Premolars → Highest Incidence of Accessory Canals/roots Amongst All teeth.

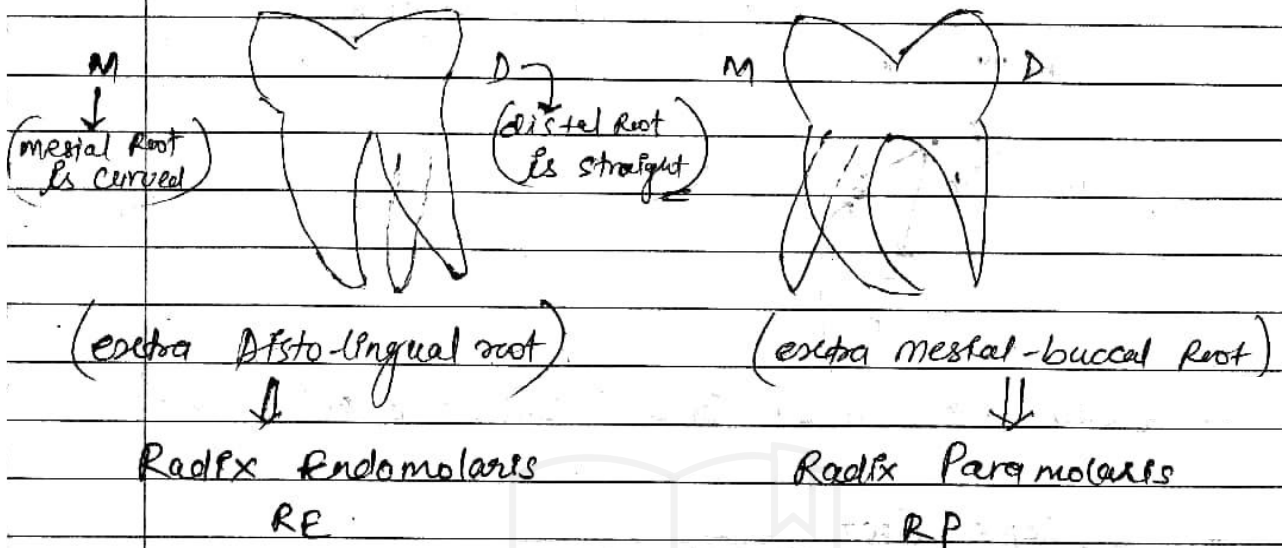
Mandi. I premolar > II premolar
↓
"Endodontists dilemma" → problem

→ usually → single root, but they can have Accessory Root
↓
"Tome's Root"

(d) mandi. I molar :- usually 2 roots



→ No. of Roots → Extra root

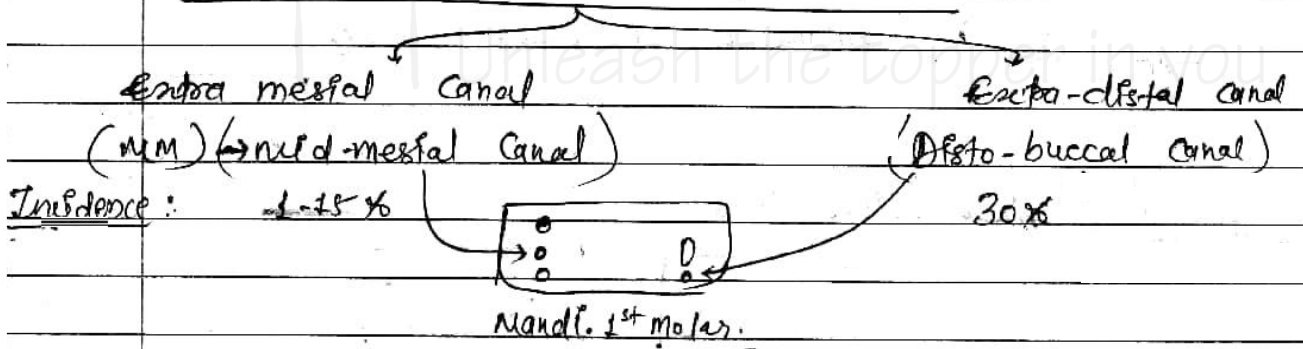


Incidence RE > RP

ethnic variations: Asians > Caucasians.

Chinese (highest)

→ Variations in No. of Canals



* Maxillary Premolars → I PM ? Incidence of 6% for 3 Roots
(Normally 2 roots) → I PM

* Maxillary I Molar: usually 3 Roots (mb, db) 3 Canals palatal

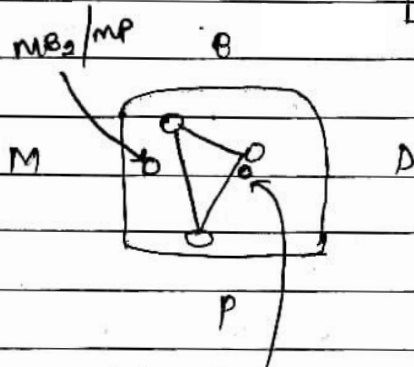
Variations

(A) Extra roots → (Extra palatal Root) → 1-4%

(Radix mesiolingualis) mesially (RMP) Distally (RDP) (Radix disto-lingualis)

→ Extra Canals :- Extra-mesio buccal Canal (MB₂)
MP Canal (mesio-palatal canal)

Incidance > 90%



→ Extra-distobuccal Canal :- Incidence of (1-9%)

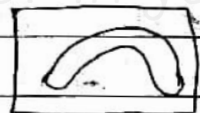
* C-shape Root Canal :-

↳ cervical shape of Root Canal office.

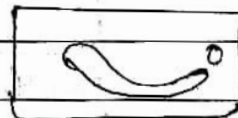
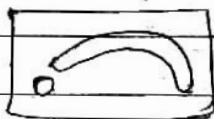
First Identified by COX & COOKE

Classified by :- SELTZER & MELTON (3 types)

Type I :- Continuous C-shape Canal.



Type II :- Semi closed shape.



Type III :- 3/more Canals arranged in form of L.



Type IV & Type V :- given by FAN & FAN.

↳ single oval Canal in the . Central.



Type V :- C Shape groove -> No Canal office is visible.



Most common :- Mandi. II molars.

(1)

also found in mandi. I molar

(2)

mandi. I premolar

(3)

max. $\begin{cases} \rightarrow \text{I M.} \\ \rightarrow \text{II M.} \end{cases}$

(4)

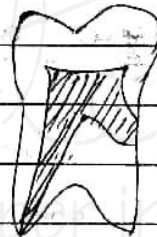
(5)

Radiographic Classific^c of C shape Canals

Merging

Symmetrical

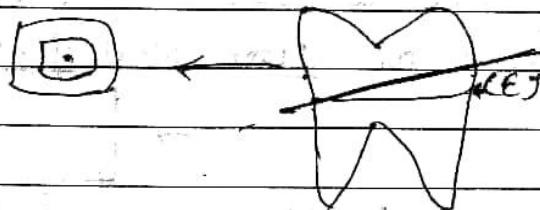
Asymmetrical



Access Cavity Preparations :-

Principles -> (9) (KRASNER & RAN^KLOW)

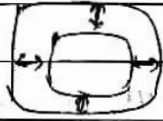
I -> Law of Centrality & Pulp Chamber is out in the centre of tooth outline at the JAW level of CET.



II^P - Law of CONCENTRICITY :-

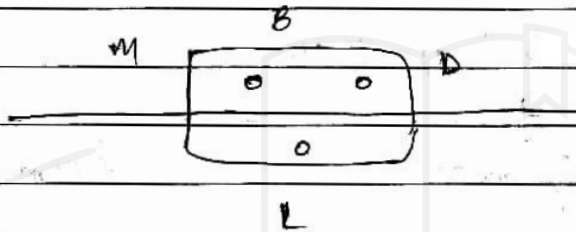
-> pulp chamber is concentric - tooth outline at the level of CET.

III : Law of CEJ :- wall of pulp chamber are equidistant from tooth external outline at the level of CEJ.



IV : Law of Symmetry - I :- (X) maxillary molars

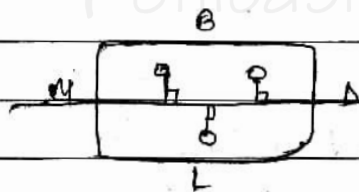
↓
 Root Canal orifice are equidistant from a line in the centre of floor in mesio-distal dir.



V : Law of Symmetry - II :- does not apply to

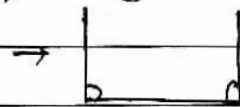
(X) maxi. molars.

↓
 Root Canal orifice are ⊥ to a line drawn in centre of floor in mesio-distal dir.



VI : Law of color change :- floor of pulp chamber is darker than walls.

VII : Law of orifice location 1 :- Root Canal orifice are located at floor/wall junction



VIII : Law of orifice location - 2 :-

Root Canal orifice are located at an angle b/w b/w floor / wall junction.

