Devanagari body text font for applications with constrains spaces

P2 Project Report

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I thank all my dearest friends, and batch mates who spent their valuable time with and provided me the motivation, and other relevant resources regarding this project.

This project would not be possible without my college, IDC School of Design, IIT Bombay, and people associated with it. I hereby, thank all faculty members, administrative staff, mess workers, shopkeepers, and delivery guys inside the campus.

Contents

Introduction

1.1.Packaging and Regional Languages

Packaging is the fifth largest sector in India's economy and is one of the highest growth sectors in the country. According to the Packaging Industry Association of India (PIAI), the sector is growing at CAGR 22% to 25%.

Nowadays, when information consumption is more significant than ever before, it becomes necessary to display the information to the reader about the products and services as it should be and most people in India prefer information written in their local language.

Therefore the government of India urges the industry to voluntarily adopt regional languages in packaging design to help consumers easily identity and understand the functioning of products. Many companies have started the adoption of regional languages. Devanagari being one of the important script is used in different sizes for printing instructions and information on labels. However, scripts like Devanagari, Gurmukhi, Kannada, Malayalam, Oriya, Tamil, etc., tend to be much more complex than the Latin script.

Due to the complexity of Devanagari letter forms the legibility and readability of content printed on different materials in constraint spaces at smaller size is compromised. Devanagari fonts which are designed specially for the purpose of being printed in smaller sizes are either owned by organizations or are not free for commercial use, making brands choose the economical choice of using open source fonts which are not specifically designed for smaller size and are less readable. This creates a poor user experience and the information is not communicated with 100% accuracy. Therefore, building and checking for more excellent readability of typefaces used in these conditions is essential.

1.2.Aim

The project aims at creating an open source Devanagari body text font for application in packaging design for size smaller than 9pts(3.175002 mm).

1.3.Learning Objective

As font design is a multi-faced process, I would have to undergo into the process of understanding legibility in Devanagari to achieve the desired aim.

The primary learning objective of this project for me is to learn the process of font designing. Choosing Devanagari script for type design will also give me opportunities to explore and understand legibility as a concept through the complex letter forms of Devanagari.

Why make Devanagari font for Packaging

2.1.Current scenario of Packaging Design and Printing

With the growing need of regional typefaces in various sectors there is a need of variety of regional typefaces. Printing being one such crucial sector, requires fonts in regional languages. Many companies try to make their product description or instruction manuals multi lingual to cater to a larger audience but, due to the lack of multilingual body text fonts which are specifically designed for small sizes, poorly designed labels are produced which are hard to read and follow.

There are many Devanagari fonts available on the web but, they are not enough to suffice the demand of the printing sector and only a handful of them are specifically designed for printing in small size.

These handful fonts are not free for commercial use, making brands choose the economical choice of using less readable fonts for the instructions and packaging of the product.

Img 1: MTR Ready to make food packets using Devanagari and Malayalam for instructions

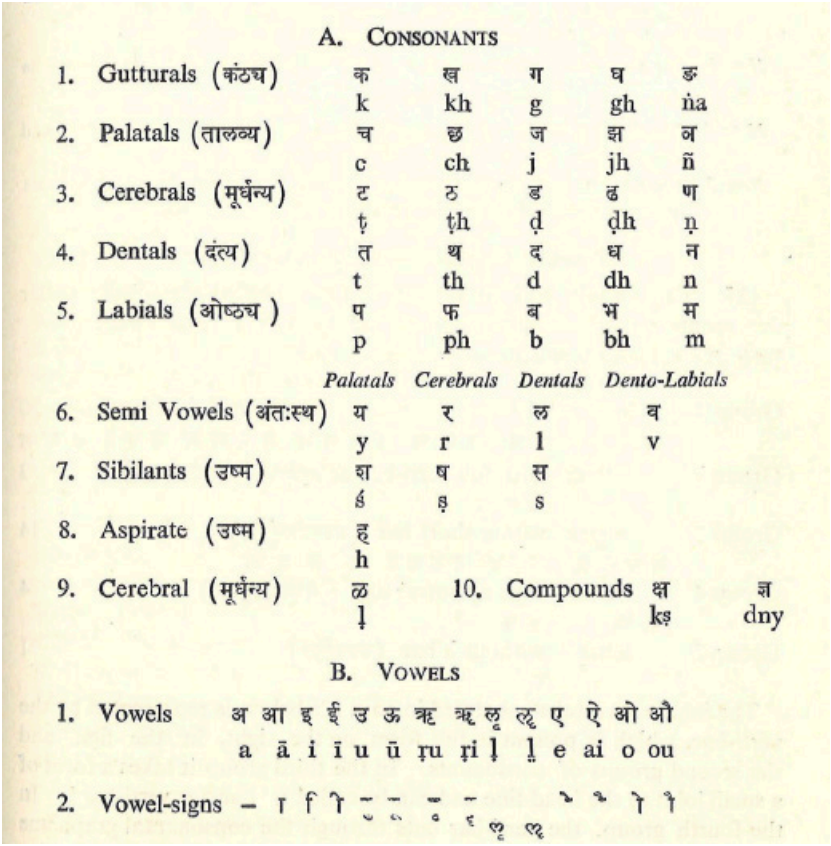
Brief history of Devanagari Script

The script is an essential part of the visual system of any culture. The Indian script is known as Lipi, a word derived from the Sanskrit root Lip, I.e. to smear. 'Devanagari' is a script of Indian national language. It is an ancient Indian script evolved from ancient Brahmi script. Devanagari is said to be a script that enables one to write any language in the world.

The Devanagari script is used for writing classical Sanskrit and its modern historical derivative, Hindi. Extensions to the Sanskrit knowledge are used to write other related languages of India such as Marathi and Nepal such as Nepali. In addition, it is used to write many other languages including Awadhi, Bihari, Braj Bhasha, Chhattisgarhi, Garhwali, Jaipuri, Konkani, Marwari, Santhali, etc.

The name Devanagari comes from the Sanskrit word Deva meaning God and Nagari meaning city, together they mean literally, the script of the 'City of the gods'. To write this particular script, one needs to hold the tool at a certain angle, with appropriate pressure and maintaining specified proportions of letter forms.

In its traditional form, Devanagari consists of 16 Swara (vowels) and 36 Vyanjana (consonants). The Tamra patra, Brich bark, wood, clay tablets, cloth, paper, till the ink and pen, the writing techniques of Devanagari has evolved and so its structure.

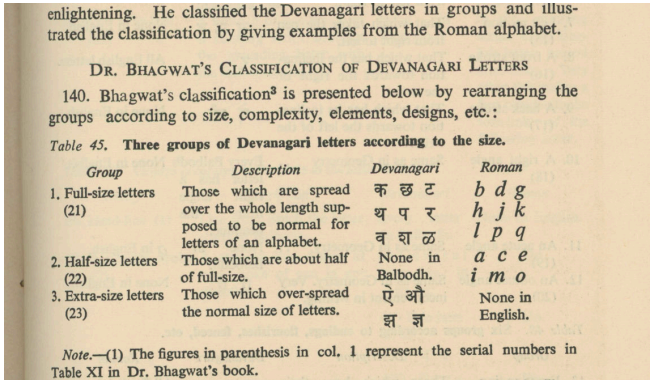


Img 2: Image source: Page 175, Typography of Devanagari by Bapurao Naik

Anatomy of Devanagari

Unlike Latin, Devanagari does not have very well-known terms that can describe its anatomy. People who work extensively in this area have developed helpful terminologies to describe the letter-forms and their structure.

S. N. Bhagwat is usually credited with doing the first graphical analysis of Devanagari letter forms, albeit these were handwritten and not typographic. In his analysis from 1961, Bhagwat divided letter forms into categories based on their construction and shape, as well as created a scheme for anatomy. A more fine-tuned version of the same approach is seen in the work of Bapurao Naik, author of the monumental three-volume work Typography in Devanagari, published a decade later in 1971.



enlightening. He classified the Devanagari letters in groups and illustrated the classification by giving examples from the Roman alphabet.

DR. BHAGWAT'S CLASSIFICATION OF DEVANAGARI LETTERS

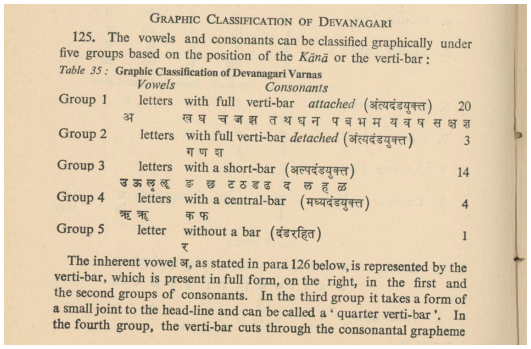
140. Bhagwat's classification[3] is presented below by rearranging the groups according to size, complexity, elements, designs, etc.:

Table 45. **Three groups of Devanagari letters according to the size.**

Group	*Description*	*Devanagari*	*Roman*
1. Full-size letters (21)	Those which are spread over the whole length supposed to be normal for letters of an alphabet.	क छ ट थ प र व श ळ	*b d g* *h j k* *l p q*
2. Half-size letters (22)	Those which are about half of full-size.	None in Balbodh.	*a c e* *i m o*
3. Extra-size letters (23)	Those which over-spread the normal size of letters.	ऐ औ झ ज्ञ	None in English.

Note.—(1) The figures in parenthesis in col. 1 represent the serial numbers in Table XI in Dr. Bhagwat's book.

Img 3: Naik, Bapurao S. Typography of Devanagari, vol. 1 Bombay: Directorate of Languages



GRAPHIC CLASSIFICATION OF DEVANAGARI

125. The vowels and consonants can be classified graphically under five groups based on the position of the *Kānā* or the verti-bar:

Table 35: **Graphic Classification of Devanagari Varnas**

	Vowels	*Consonants*	
Group 1	letters	with full verti-bar *attached* (अंत्यदंडयुक्त)	20
	अ	ख घ च ज झ त थ ध न प ब भ म य व ष स क्ष ज्ञ ग ण श	
Group 2	letters	with full verti-bar *detached* (अंत्यदंडयुक्त)	3
Group 3	letters	with a short-bar (अल्पदंडयुक्त)	14
	उ ऊ ऌ ॡ	ङ छ ट ठ ड ढ द ल ह ळ	
Group 4	letters	with a central-bar (मध्यदंडयुक्त)	4
	ऋ ॠ	क फ	
Group 5	letter	without a bar (दंडरहित)	1
		र	

The inherent vowel अ, as stated in para 126 below, is represented by the verti-bar, which is present in full form, on the right, in the first and the second groups of consonants. In the third group it takes a form of a small joint to the head-line and can be called a 'quarter verti-bar'. In the fourth group, the verti-bar cuts through the consonantal grapheme

Img 4: Naik, Bapurao S. Typography of Devanagari, vol. 1 Bombay: Directorate of Languages,

Both Bhagwat and Naik's schemes are less about letter anatomy, but instead highlight terms used for vowels and other signs.

The next notable attempt to formalize type anatomy was by Mukund V. Gokhale. An interesting aspect of his work is that he roughly used the human body — in conjunction with the thickness of a pen stroke — as a reference to define the vertical metrics of Devanagari letterforms.

Further to his 2009 paper, Anatomy of Devanagari Typefaces, Girish Dalvi has created a scheme for Devanagari letter parts and anatomy. In his paper, he points out that a previous scheme by Mahendra Patel is specific to a particular style of typeface; Dalvi tries to rectify that. For example, he not only defines parts like "knot," but also offers options for how it could be represented: open, closed, or filled, much the same way a serif can be bracketed, wedge, hairline, etc. Several terms, such as contrast, axis, terminal, and counter have been borrowed from Latin type anatomy, which makes the scheme easy to use in multi script settings.

Img 5: Vowel and other signs used in Devanagari, shown in Adelle Sans Devanagari by Pooja Saxena

Img 6: Common terms for Devanagari anatomy and vertical metrics, shown in Adelle Sans Devanagari. by Pooja Saxena

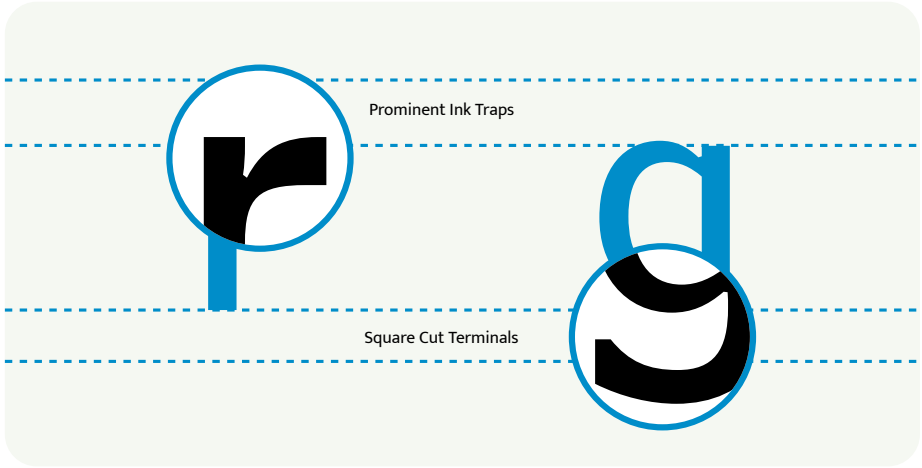
Analysing fonts Designed for Constraint Spaces

5.1.Latin

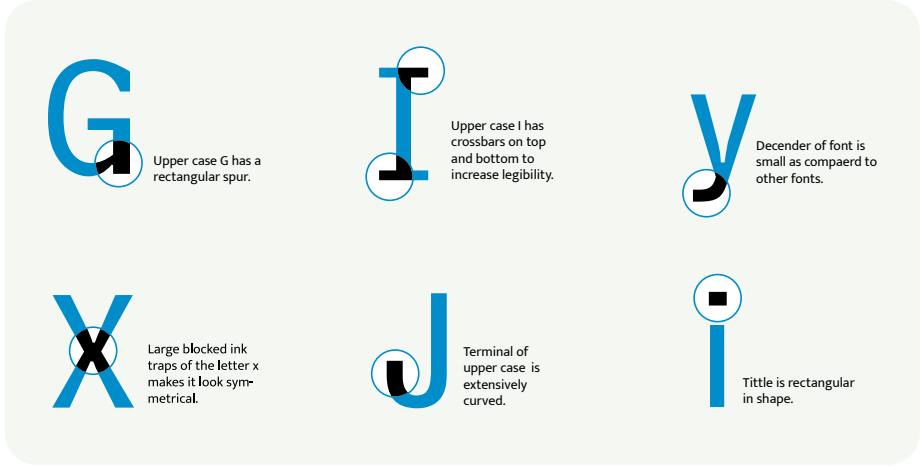
Four Latin fonts which are designed for printing in small sizes were studied - Bell Gothic, Bell Centennial, Amplitude and Griffith Gothic.

Bell Gothic and Centennial were designed to be used in phone books at very small sizes(8pt-6pt) and poor quality paper so prominent ink traps is a highlighting feature of the two. Later Amplitude and Griffith Gothic were designed for font bureau and they were considered as fonts which have turned function into style.

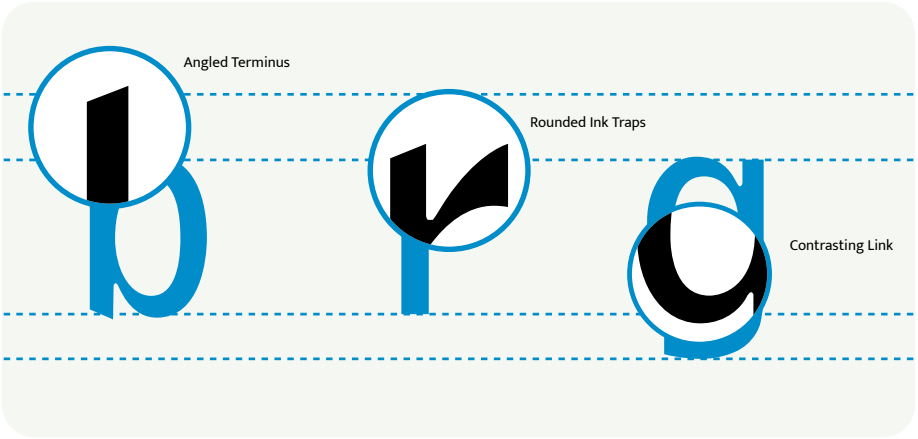
A critical analysis all four was done and feature which are very specific to the fonts individually and features which increase their legibility at a smaller size were noted down(*Img7 - Img14 are sample images of features observed*).



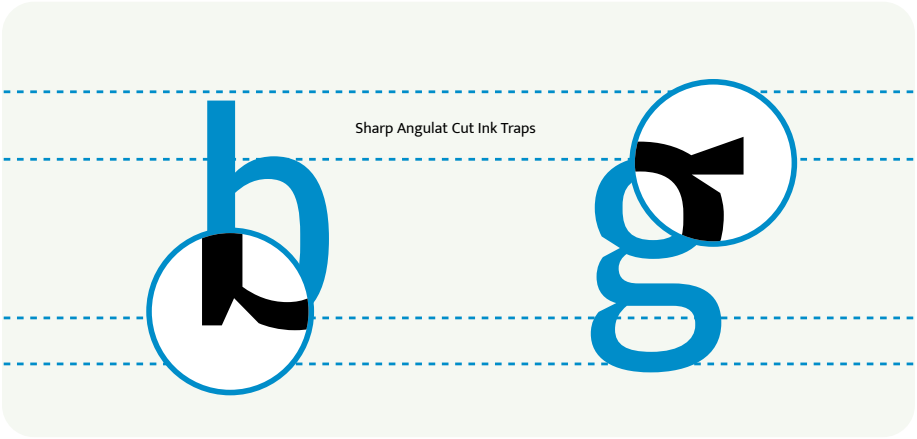
Img 7: Features specific to Bell Centennial



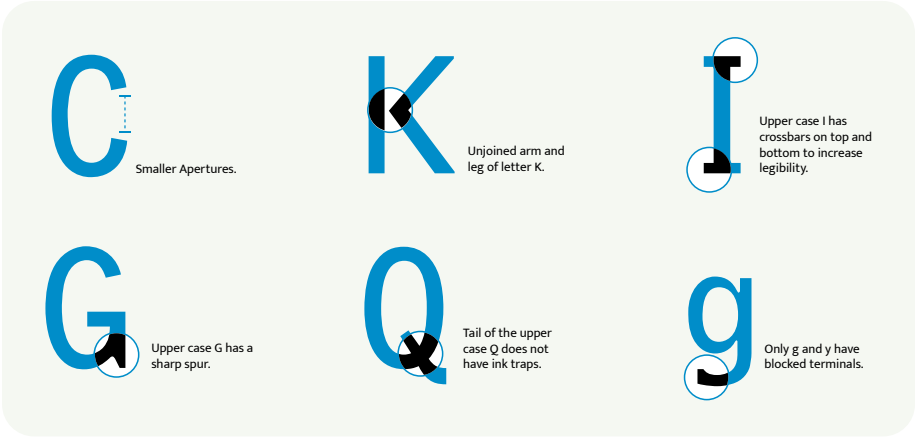
Img 8: Distinct Characters which make Bell Centennial Legible at small size



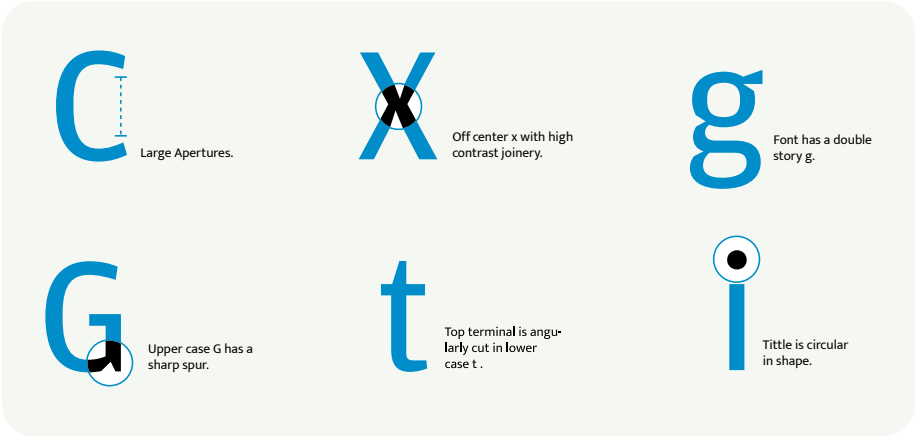
Img 9: Features specific to Bell Gothic



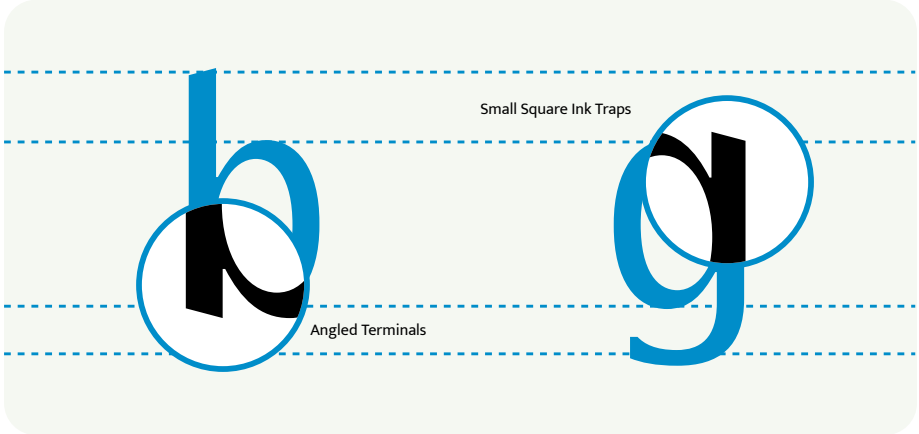
Img 11: Features specific to Amplitude



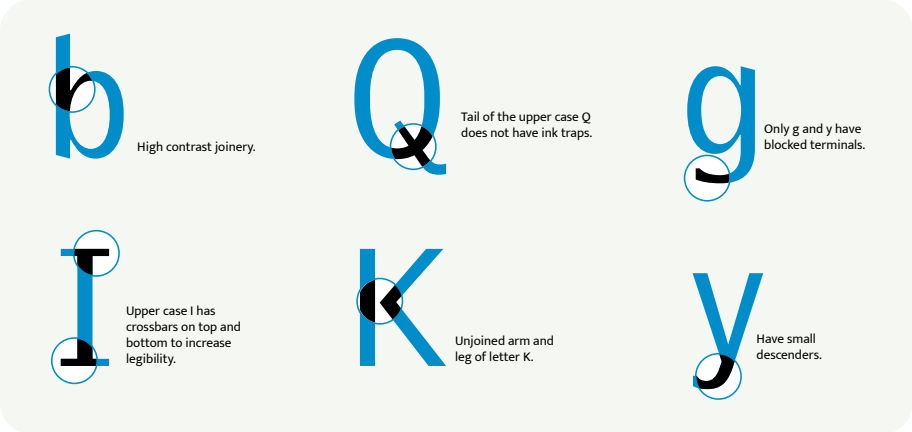
Img 10: Distinct Characters which make Bell Gothic Legible at small size



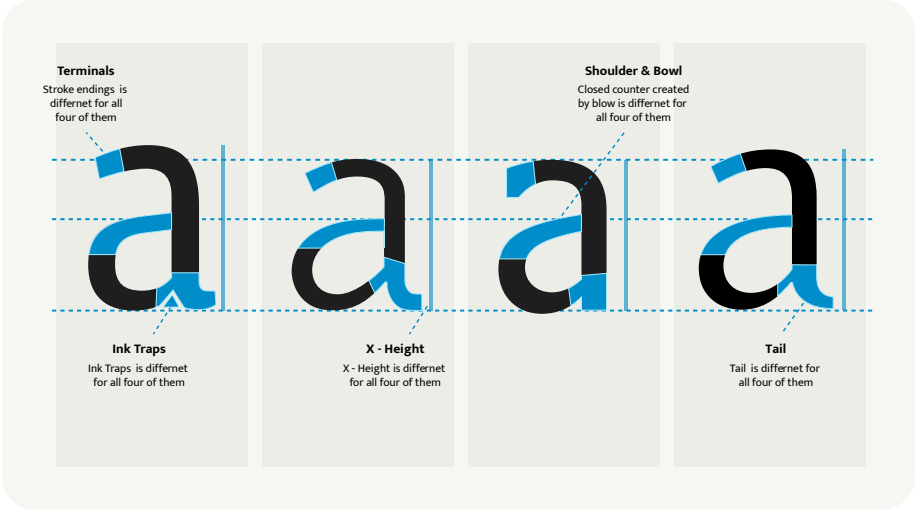
Img 12: Distinct Characters which make Amplitude Legible at small size



Img 13: Features specific to Griffith Gothic



Img 14: Distinct Characters which make Griffith Gothic Legible at small size

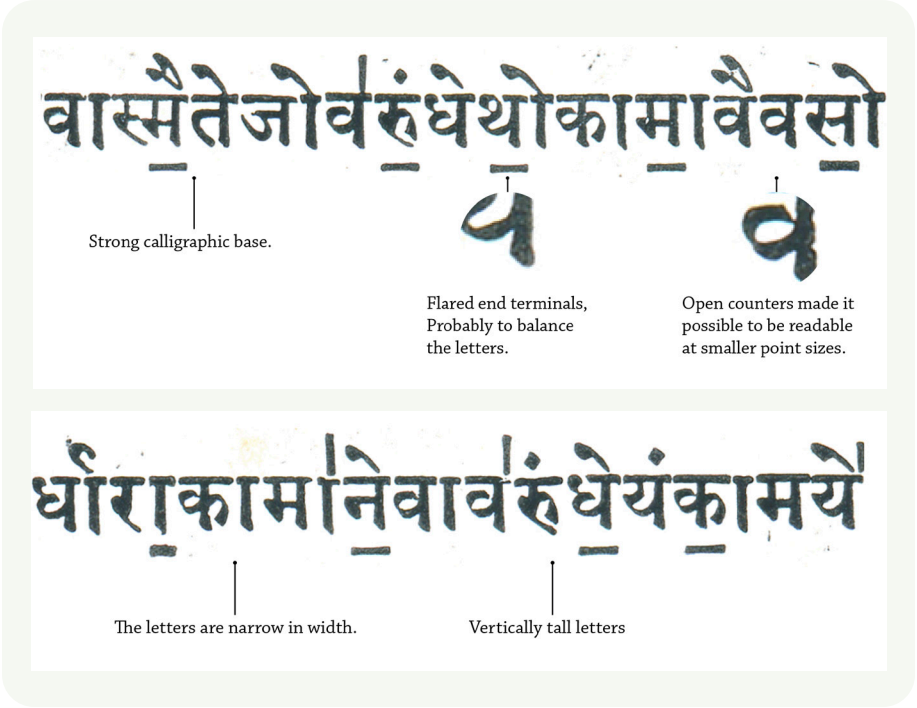


Img 15: Comparison of the four fonts

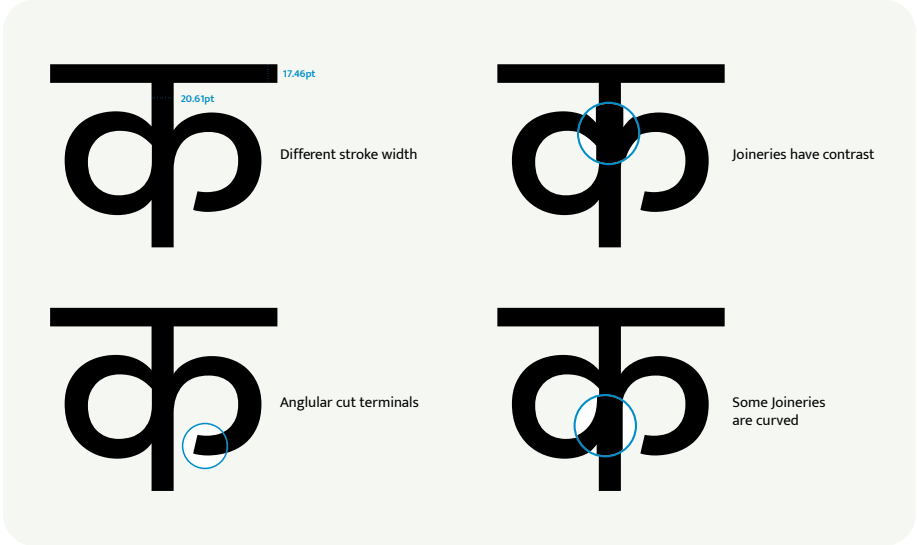
The unique details of letters were compared(Img 15) individually and as paragraphs in printed format to understand how these unique details affect the grey value of a font. With the advancement in printing technology, larger ink traps and high contrasting stroke width are no more a necessity at a small point size however, these factors do affect legibility and a minor difference in the grey value of the four fonts was observed.

5.2.Devanagari

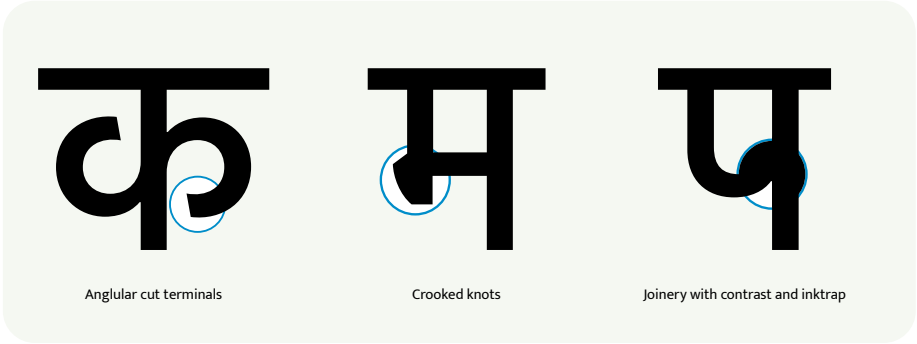
Nirnay Sagar along with Ranoji Aru cast some of the finest text typefaces casted in History of Devanagari printing. Great Primer No. 2 which is one of the most trend setting and standardized specimen of Devanagari printed letters was studied(Img 16). Further present day digital fonts which work well or are accurately designed for small size were studied(Img 17 - Img 20).



Img 16: Study of letterpress sample by Snehal Patil



Img 17: Study of Ek Mukta



Img 18: Study of Kohinoor

Img 19: Study of ITF Devanagari

Img 20: Study of Munshi

Ek Mukta, Kohinoor, ITF Devanagari and Munshi were studied and the distinct character of the four fonts were noted down. Vertical spacing, stroke contrast, joineries, knots, loops and counters are major factors which contribute to the legibility and readability of a Devanagari font.

Understanding Legibility

6.1.Factors Affecting legibility in Devanagari

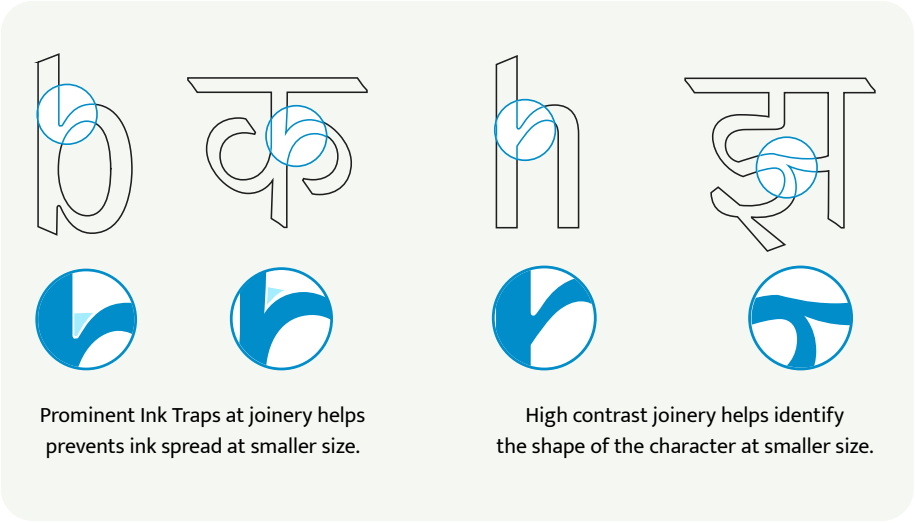
Legibility becomes the most crucial aspect of consideration while describing a good body text font. The font should be highly legible i.e., the reader should easily identify the characters at smaller point sizes, and hence the proportional decisions become essential. In the body text, letters come in a cluster, and hence the modulation and irregularity in the letter structure are important for better identification.

As described above, the objective is to build a font with increased legibility. There have been many studies on how fonts can be constructed while keeping legibility in mind. The key idea is to keep the skeleton of the letterforms to be as recognizable and straight forward as possible. Reasonably successful attempts of such designs have been made in Latin. However, a script like Devanagari has a lot more complexity in its forms and the attempts made so far have compromised with the form of the letter in some cases to increase legibility. Therefore, the major focus is on keeping the letter form intact and designing a more legible font.

Based on the study done above prominent ink traps and high contrasting joineries are two characteristics which substantially increase the legibility for both the scripts Latin and Devanagari.

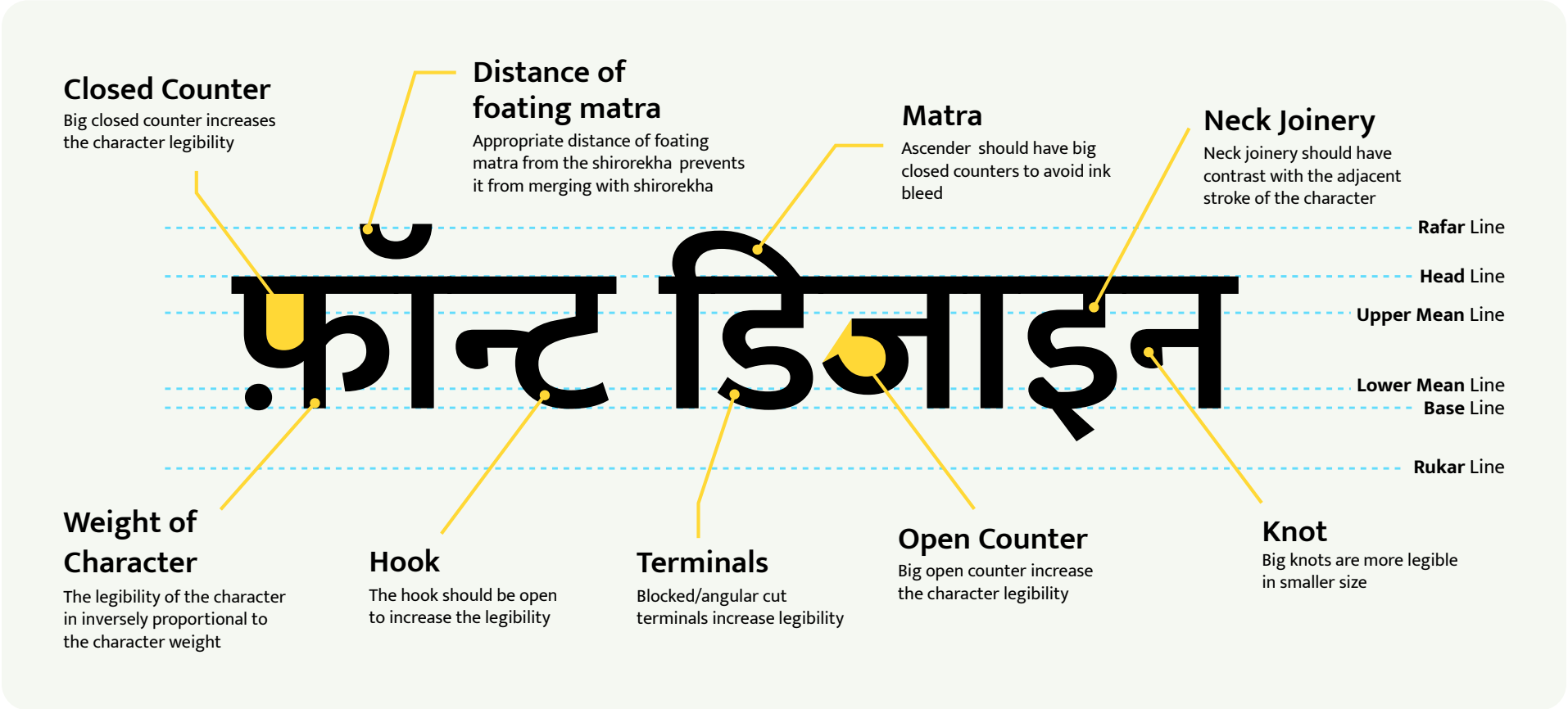
Prominent ink traps holds the excess ink and helps prevent ink spread at joineries at small size (Img 21).

Contrasting stroke width plays a important role as it helps identify the shape of the character and is responsible for the grey value of the font (Img 21).



Img 21: Study of letterpress sample by Snehal Patil

Based on all the observations a Visual Map(*image below*) of the factors which affect legibility in Devanagari fonts was made(Img 22).



Img 22: Visual Map of the factors affecting legibility in Devanagari fonts

6.2.Choosing between Monolinear and Modulated fonts

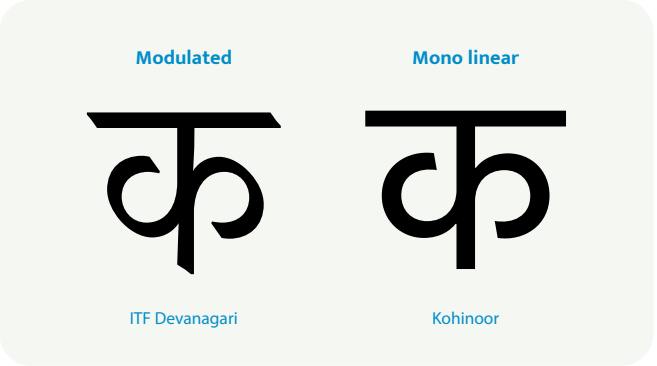
The form and structure of the characters play an important role in character identification. Based on the form, , the typefaces could be extensively grouped into two classes for i.e. mono linear and modulated.

Monolinear typefaces are the ones which have or at least appear to have similar thickness of strokes. These includes many sans serif typefaces like Helvetica, Montserrat, Poppins, Futura, etc.

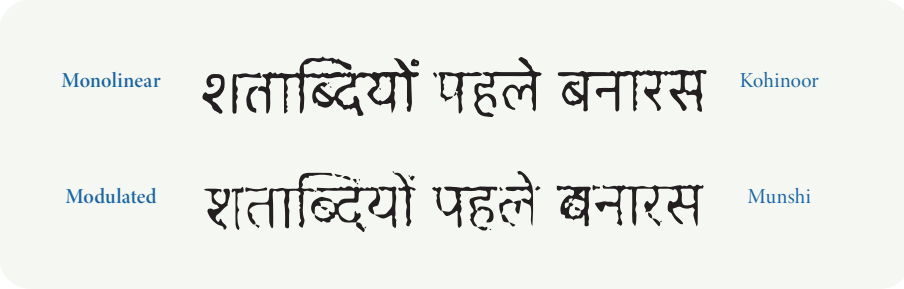
Modulated typefaces are the ones that have significant difference in their stroke thickness like Garamond. These have resemblance to the strokes that are produced from an angle cut/ chizeled writing tool.

The image on the right(Img 23) shows the examples of both monolinear & modulated Devanagari font. The one on the right is Kohinoor by Indian Type Foundry, which is an example of monolinear Devanagari font whereas the one on the left is ITF Devanagari by Indian Type Foundry, which greatly demonstrates the modulated nature of the font.

To select between the two types a study was conducted where 2 modulated and 2 monolinear fonts were printed on a low-quality paper using an inkjet printer in different sizes and were compared(Factors like the paper, ink and printer quality are intangible therefore, the study was done while keeping in mind the worst case scenario). Based on the study Modulated fonts have low grey value but, as shown in Img 24, due to high stroke contrast, modulated fonts do not get printed with accuracy in smaller size leading to crooked letter forms which are harder to read. Whereas, monolinear fonts are much cleaner and crisp. Therefor, the current project would be focusing on designing a monolinear font.



Img 23: Example of Modulated and Monolinear



Img 24: Comparison between monolinear and modulated font

6.3.Desirable Qualities of the font

Along with the legibility, the font should play a silent role not to draw the reader's attention. However, at the same time, it should make a subconscious aesthetic impression to transmit complex media concisely. Based on the studies and comparisons done above a list of the desirable qualities was made which is as follow -

1. Large kana-height (Base character height).
2. Large inner counters.
3. High contrast between width of kana and shirorekha.
4. Large apertures and open counters.
5. Ink Traps at joineries.
6. Slightly condensed structure of characters to allow more text efficiency.
7. Converting maximum frequently used conjuncts into Akhanda conjunct ligatures, so that the right balance of counter spaces can be achieved in conjuncts also.
8. Consideration of Hindi, Marathi and basic Sanskrit language while developing a glyph set.

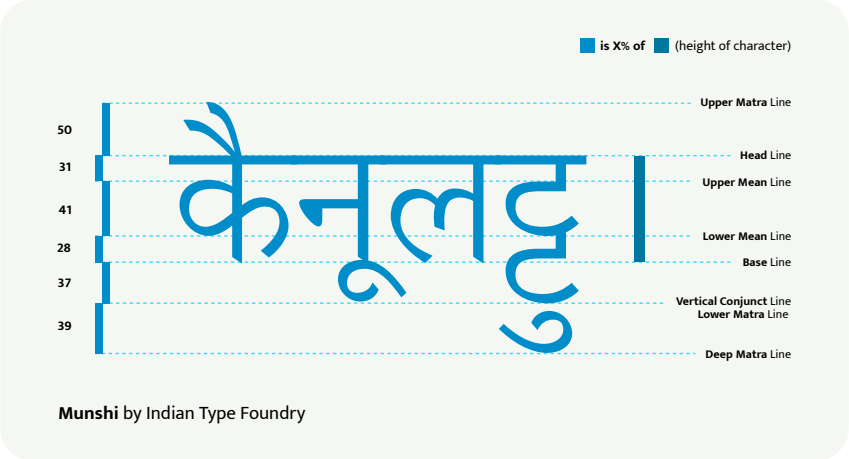
Designing the Font

7.1.Understanding the Vertical Spacing

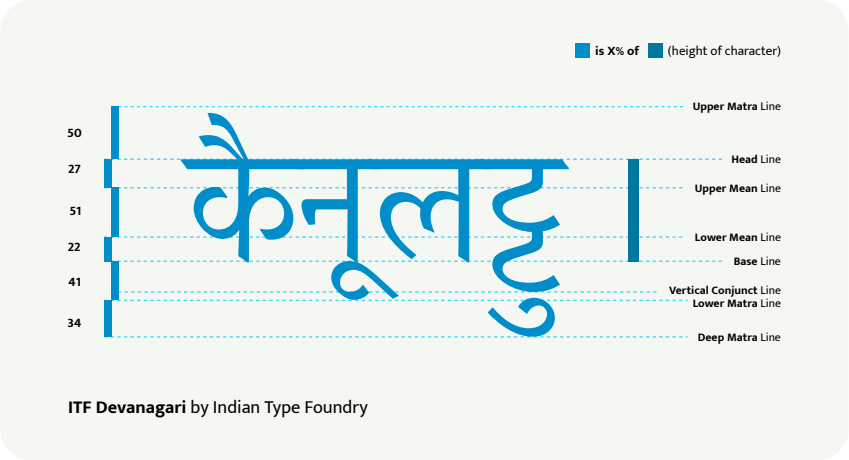
Due to the absence of uppercase and lowercase characters, Devanagari does not have x-height or cap height like Latin. All characters in Devanagari have the same height, and the majority of a letter's distinctive features can be found within that height. Therefore, it may be claimed that the font's overall height or vertical spacing determines how big it appears to be.

In order to better understand vertical space in Devanagari fonts, four Devanagari fonts were studied by segmenting them in accordance with Pooja Saxena's Anatomy of Devanagari (Img 25) . The percentages of each segment of the font was compared in relation to its overall height(Img 26 -Img 29).

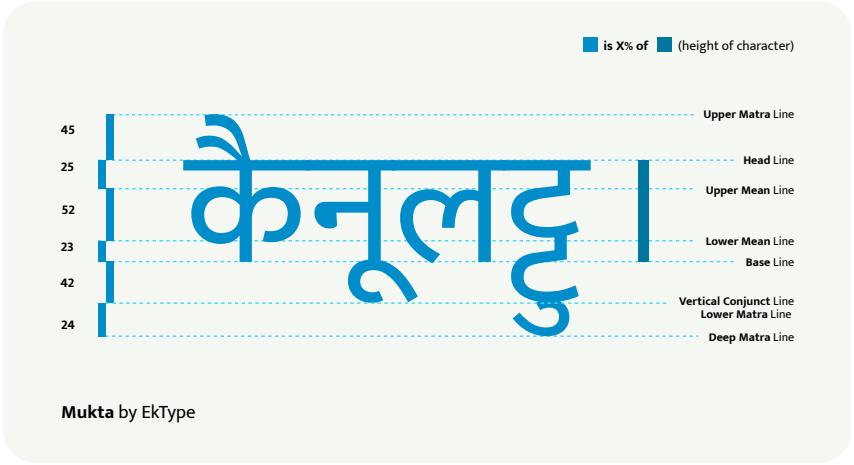
Img 25: Comparison between monolinear and modulated font



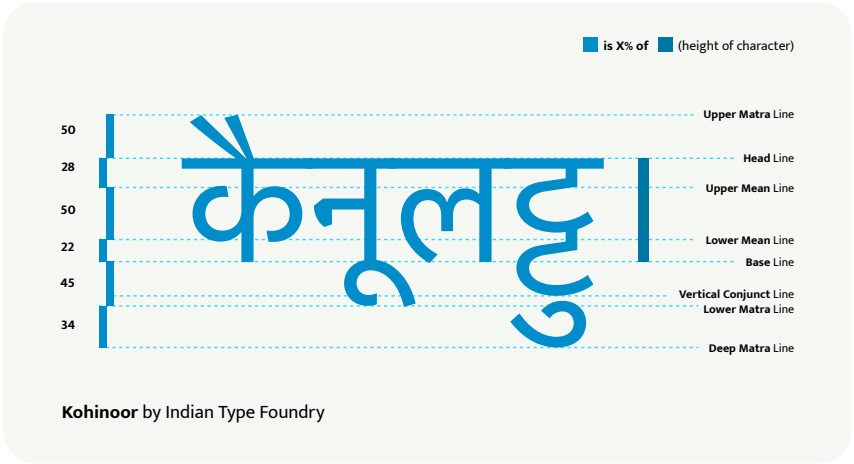
Img 26: Vertical Spacing of Munshi



Img 27: Vertical Spacing of ITF Devanagari



Img 28: Vertical Spacing of Mukta

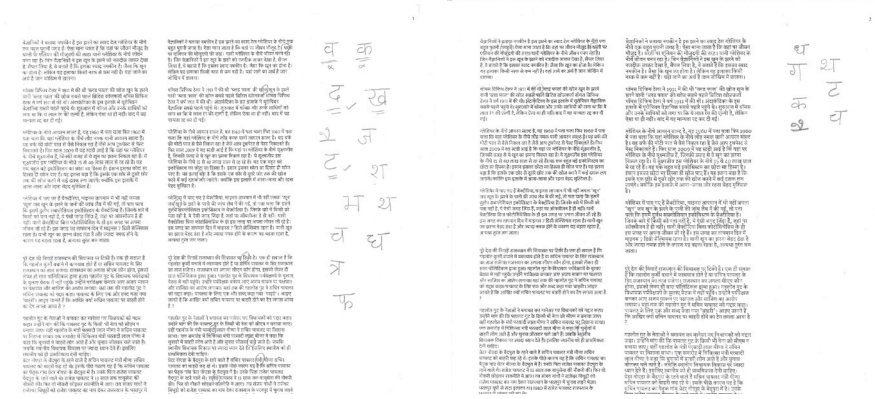


Img 29: Vertical Spacing of Kohinoor

Further all the four fonts were printed and the vertical spacing and the grey value of all were compared in different sizes (Img 30) and following observations made -

1. Munshi has the highest character height, whereas mukta has the shortest character height.
2. The vertical height is directly proportional to legibility and readability as higher the vertical height less is the grey value of the text.
3. The proximity of the closed counters to the shirorekha affects legibility.
4. Lower mean line should not be too close to the base line.

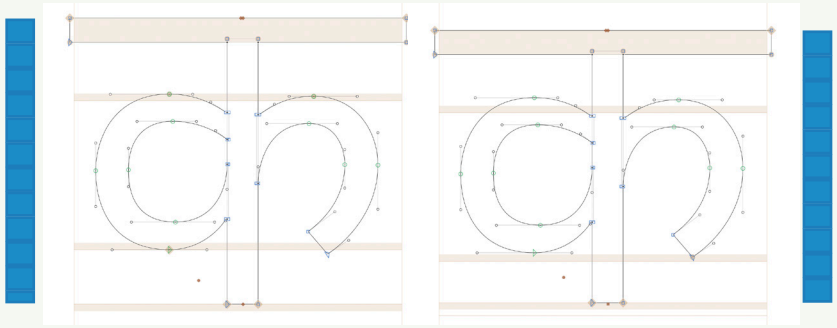
Understanding and setting the stroke-to-height ratio was crucial before finalising the vertical spacing.



Img 30: Comparison of Vertical Spacing

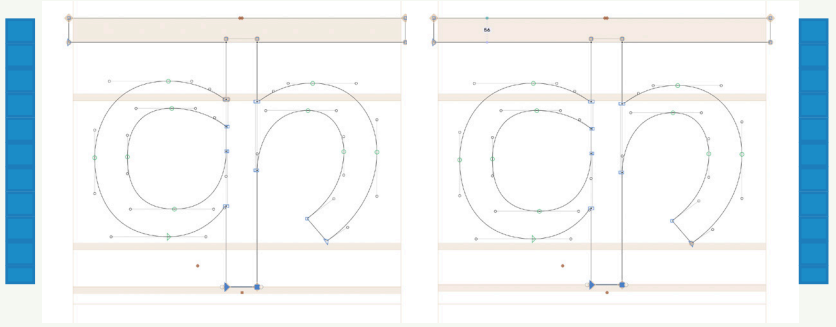
7.2.Stroke to Height Ratio

Several variations of the letter क with different stroke and height contrast were made and compared with Kohinoor and Munshi. The images shown below are samples of images of the designed character where the width and height of the vertical stroke vary respectively.



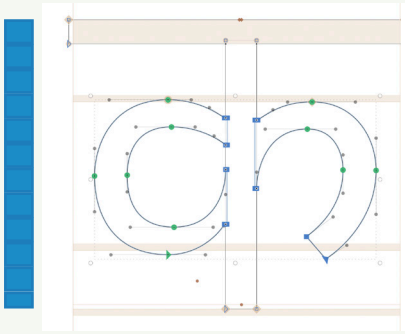
Img 31: Stroke-to-height ratio of *1:11.6*

Img 32: Stroke-to-height ratio of *1:11*

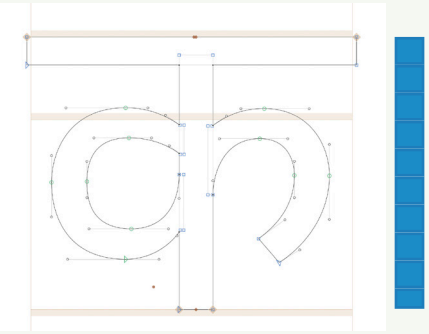


Img 33: Stroke-to-height ratio of *1:10.5*

Img 34: Stroke-to-height ratio of *1:10.7*

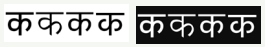


Img 35: Stroke-to-height ratio of *1:11.5*



Img 36: Stroke-to-height ratio of *1:10.6*

Img 37: Comparison of stroke-to -height ratio with munshi and kohinoor at 225pt



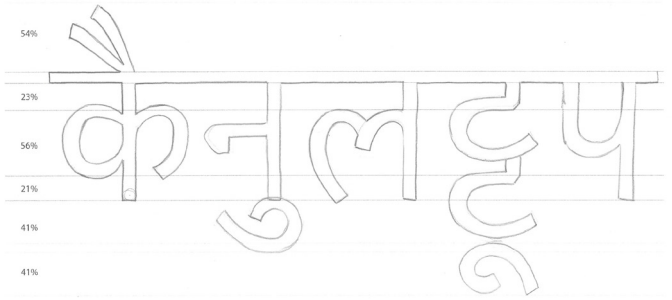
Img 38: Comparison of stroke-to -height ratio with munshi and kohinoor at 10pt

Based on the observations and comparisons, 1:11.6 stroke-to-height ratio which is very close to munshis's ratio(1:11.5) was finalised.

7.3.Finalising the Vertical Spacing

In order to finalise the vertical spacing, several sketches with different variations were made initially. All the variations had segments divided with respect to the total character height. The images shown below are different development stages of different vertical spacing.

Img 39: Sketches of vertical spacing variations

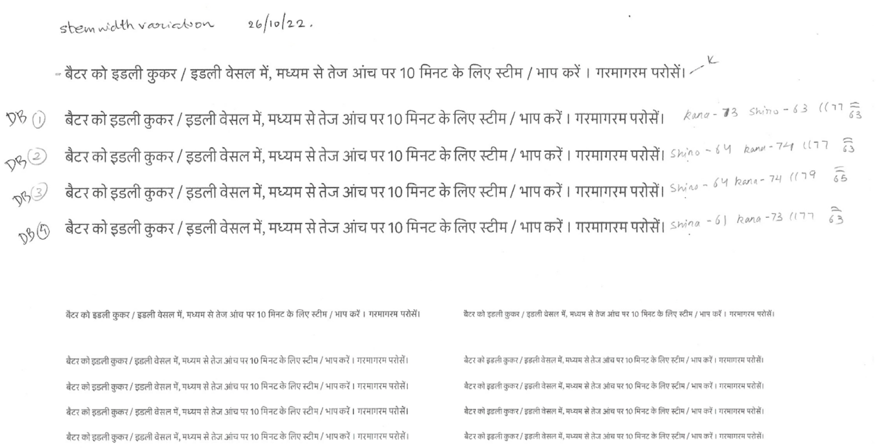


Img 40: Sketch of penultimate vertical spacing

Img 41: Digital variations being compared to existing fonts

The penultimate sketch was used as a starting point, and several digital vectors with minor adjustments were made and compared to the fonts already in use.

Comparing only one word, however, was insufficient; instead, a simple sentence was chosen, and only the characters present therein were crudely produced digitally and were compared with the pre-existing fonts(Img 42).



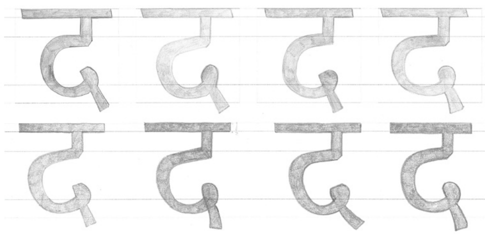
Img 42: Digital variations being compared to existing fonts

The comparison shown above (Img 42) was done in sizes varying from 6pt -12pt and the prints were taken in two formats - one being low quality paper and inkjet printer and the other being fine quality Jk cedar paper and lazer printer. Factors like the placement of the upper mean line and lower mean line played a major role in making a final decision. The image on the right (Img 43) shows the final vertical spacing

Img 43: Final Vertical Spacing

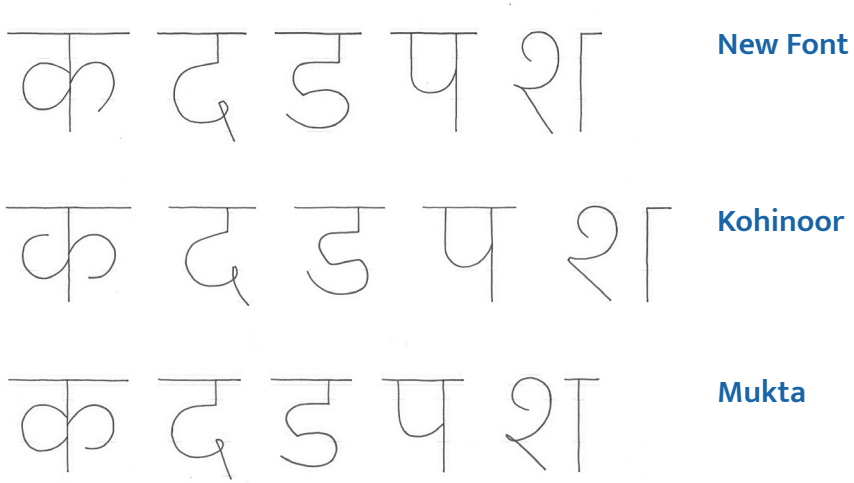
7.4. Developing a Skeleton

As shown in the Image below (Img 44) several variations of the word द were created based on the final vertical spacing and was compared with fonts like Kohinoor and Mukta.



Img 44: Variations of letter द

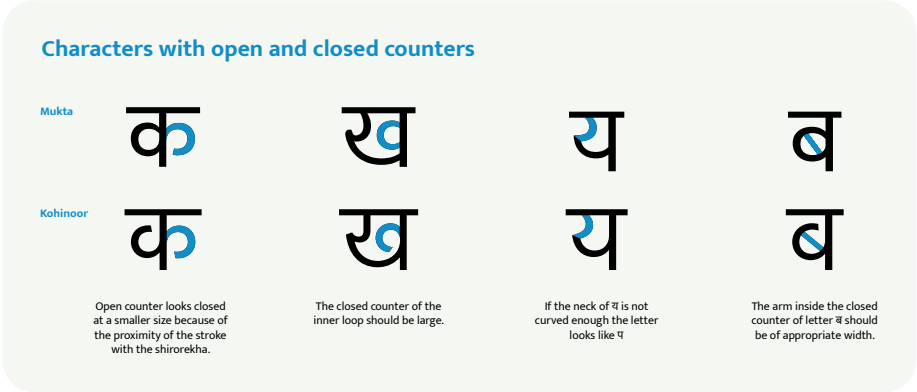
One out of the many styles was selected and a single stroke skeleton was developed based on the deduced vertical spacing and was compared with skeleton of Mukta and Kohinoor(Img 45).



Img 44: Comparison of Skeleton

7.5. Characters Difficult to Identify at 8pts or lower

A study with fluent Hindi and Marathi readers was conducted where they were asked to read different paragraphs set at 8pts,7pts and 6pts in Hindi and Marathi respectively. They were asked to identify or point out the characters which were confusing or difficult to read for them. Based on the insights and my observations, a list of characters and their problematic part was made which can be seen on the right side(Img 45 & Img 46).



Img 45: Identification of problematic glyphs

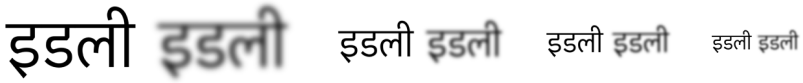
Img 46: Identification of problematic glyphs

7.6. Counter Space

The counter spaces of a typeface are very important for letter identification. The curves should be constructed in such a way that the consistency of the letterforms while avoiding too close spacing between the strokes. It's a terrific idea to simulate the viewing circumstances of a typeface to get a sense of how the counters should be modified at smaller point size. Such a capability to establish a real-time blurred preview when developing the typeface is offered by the Glyphs programme. Shown below(Img 47) are blurred live previews of a letterforms placed next to the clear forms.

Img 47: Letters compared with their blurred live preview

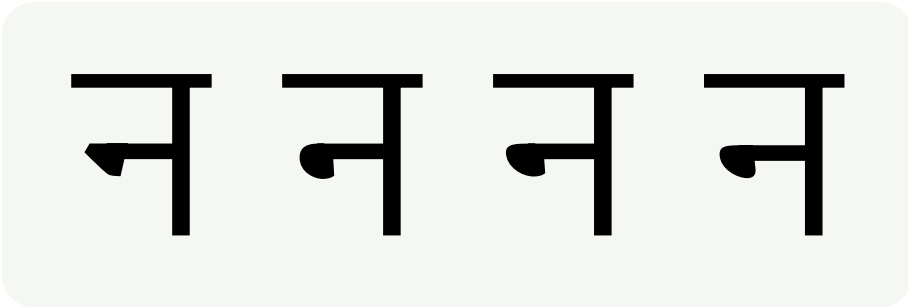
Simple words were written in different sizes and compared with the blurred live preview to check the legibility of counter spaces at smaller sizes(Img48).



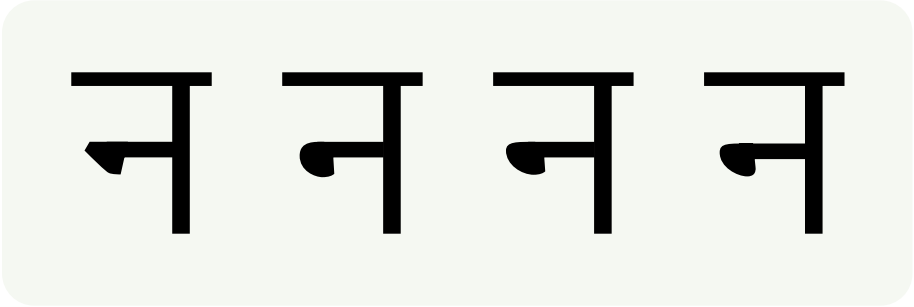
Img 48: Letters compared with their blurred live preview at different sizes

7.7. Loops and Knots

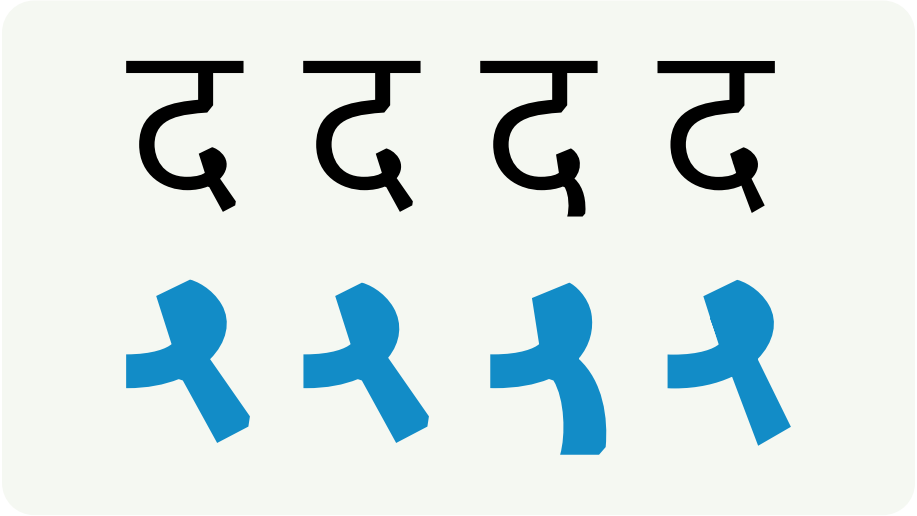
After experimenting with many iterations, the font's loops and knots were created to be almost as similar to the humanist style as possible. This makes it possible for the strokes to terminate more organically and helps prevents the use of harsh edges. Knots for different characters were created separately and one out of the many was selected which worked all he characters.



Img 49: Variations of knots tried



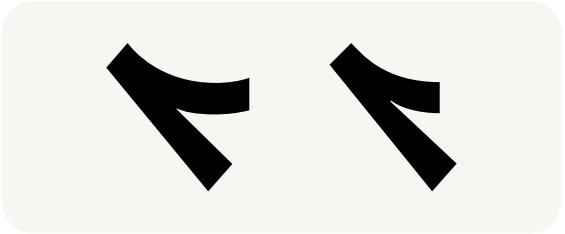
Img 50: Variations of knots tried



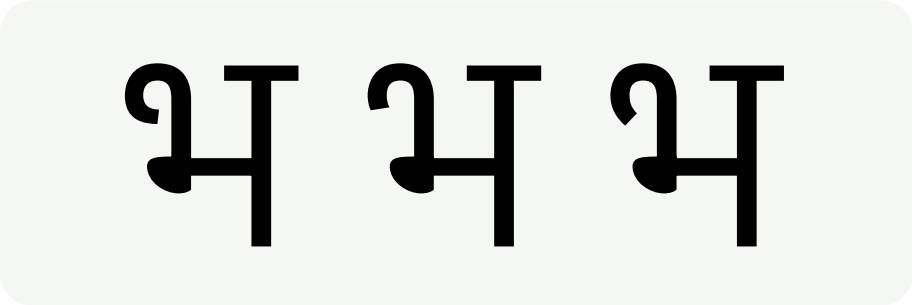
Img 51: Variations of Complex Knots tried

Different knot variations were tested for some character like ड़ which have more complex shape and saving space was more important than matching the visual grammar. As seen in the image below(Img 52) the last ड़ does not have a knot at the base but a straight line which creates more space between the adjacent strokes without altering the shape of the character.

Img 52: Variations of Complex Knots tried in letter ड़



Img 53: Variations of final Knot tried in letter ड़



Img 54: Variations of loop tried

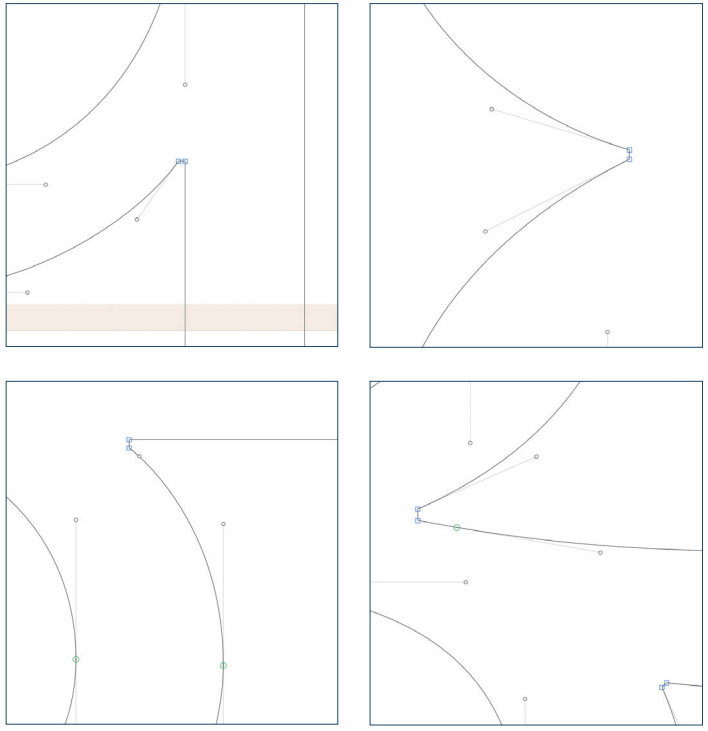
Different loop and knot variations were tested by printing them on paper at 7pt size. Since the closed counter (traditional form) of these loops traps ink and loses its shape, open ended loops are more legible. at smaller size. The images shown below are the loop and knot which were finalised.

Img 55: Open ended Loops

Img 56: Curved Knots

7.8. Ink Traps

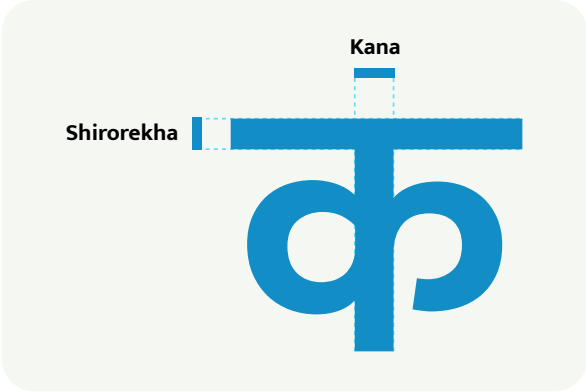
Devanagari letterforms feature a variety of joints. Therefore it is important to optimise the stroke width and add ink traps at certain joints as they may create ink spreads. Some parts of characters are shown below where inktraps were added to avoid inkspread in print.



Img 57: Ink Traps

7.9. Ratio between Shirorekha and Kana

Shirorekha, a crucial component of Devanagari script, lies on top of characters, giving the upper half more visual weight. The characters appear denser towards the top due to the heavier weight, which makes it harder to read them. All of this happens as a result of the thickness optical illusion, which causes vertical and horizontal strokes of identical width to seem to be thicker than they actually are. Therefore, horizon strokes are created somewhat narrower than vertical strokes in order to correct this optical illusion. Thus, choosing a ratio between the shirorekha and kana was crucial to visually balancing the gylphs.



Img 58: Shirorekha and Kana

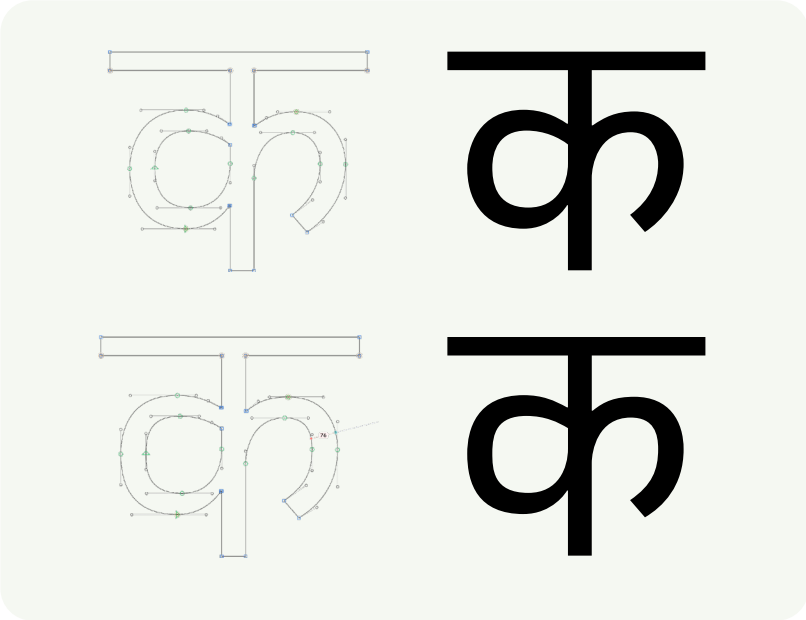
Three different versions as shown on right(Img 54) of the final shirorekha and kana ratio were created, printed, and compared. The first option with a ratio of 7:9 was the one with the most readability at small sizes.

Img 59: Variations of Shirorekha and Kana ratio

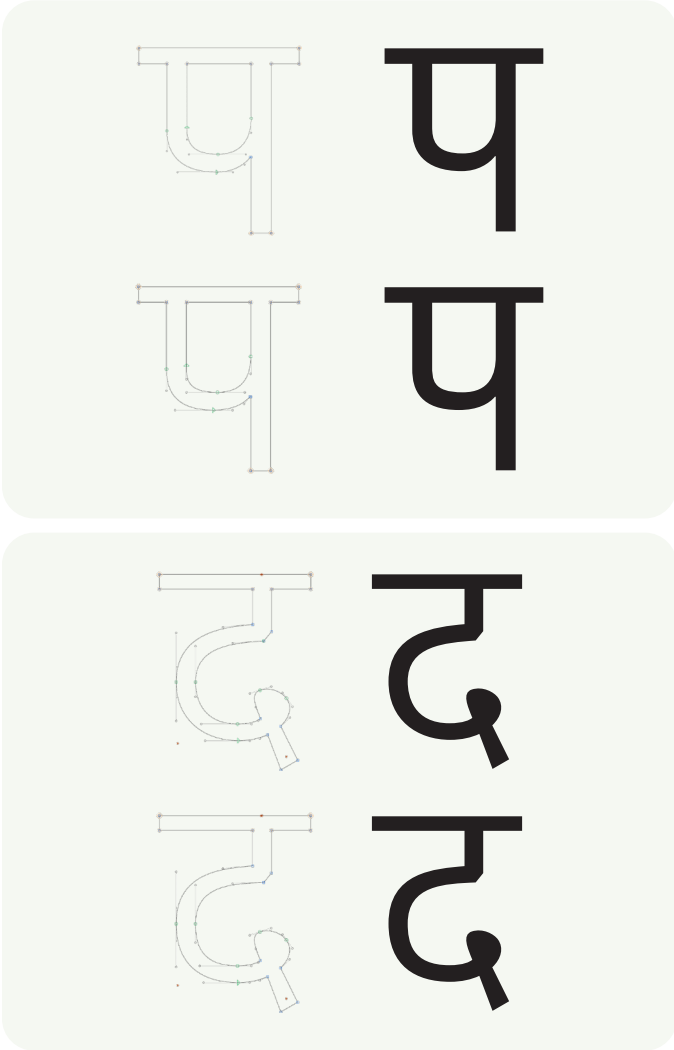
Img 60: Comparison of variations of Shirorekha and Kana ratio

7.10. Explorations

Keeping the said things in mind, the form of the typeface was explored digitally on the Glyphs 3 software. The design included letter क, प and द.



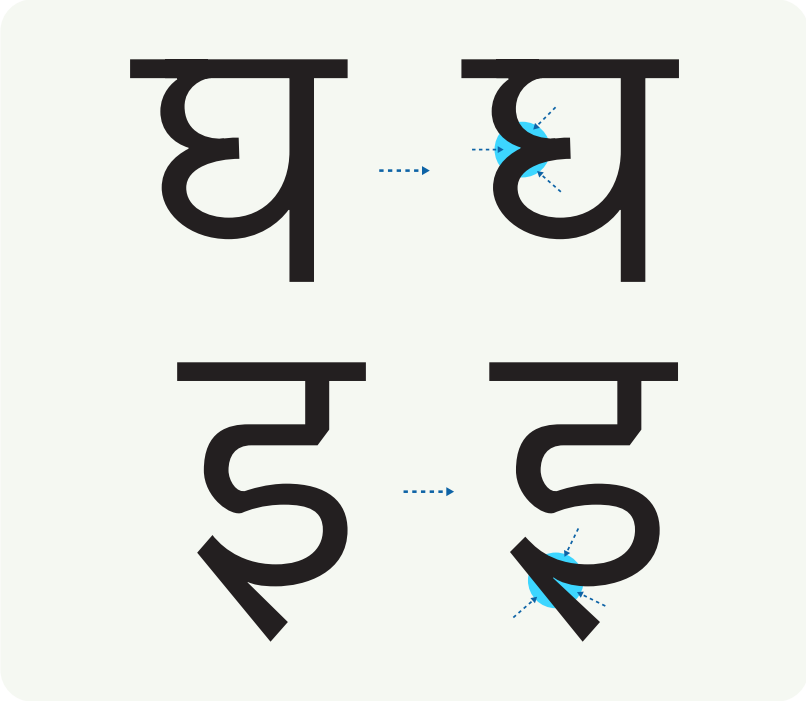
Img 61: The letter क(ka) in a more rounded style vs a slightly squared style.



Img 62: The letter प(ka) and द(da) in a more rounded style vs a slightly squared style.

7.11. Joineries

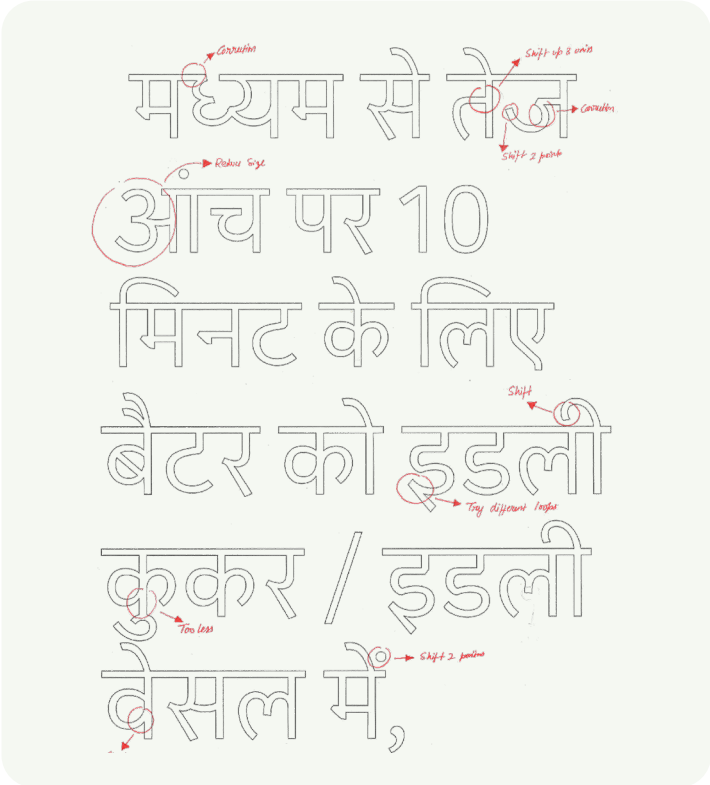
Devanagari script has a variety of joints for its letterforms. Therefore, it's crucial to maximize letter width at points where two strokes converge. This adjustment aids in bringing the script's overall grey value into equilibrium.



Img 63: Scaling in the joinery of letter घ and इ.

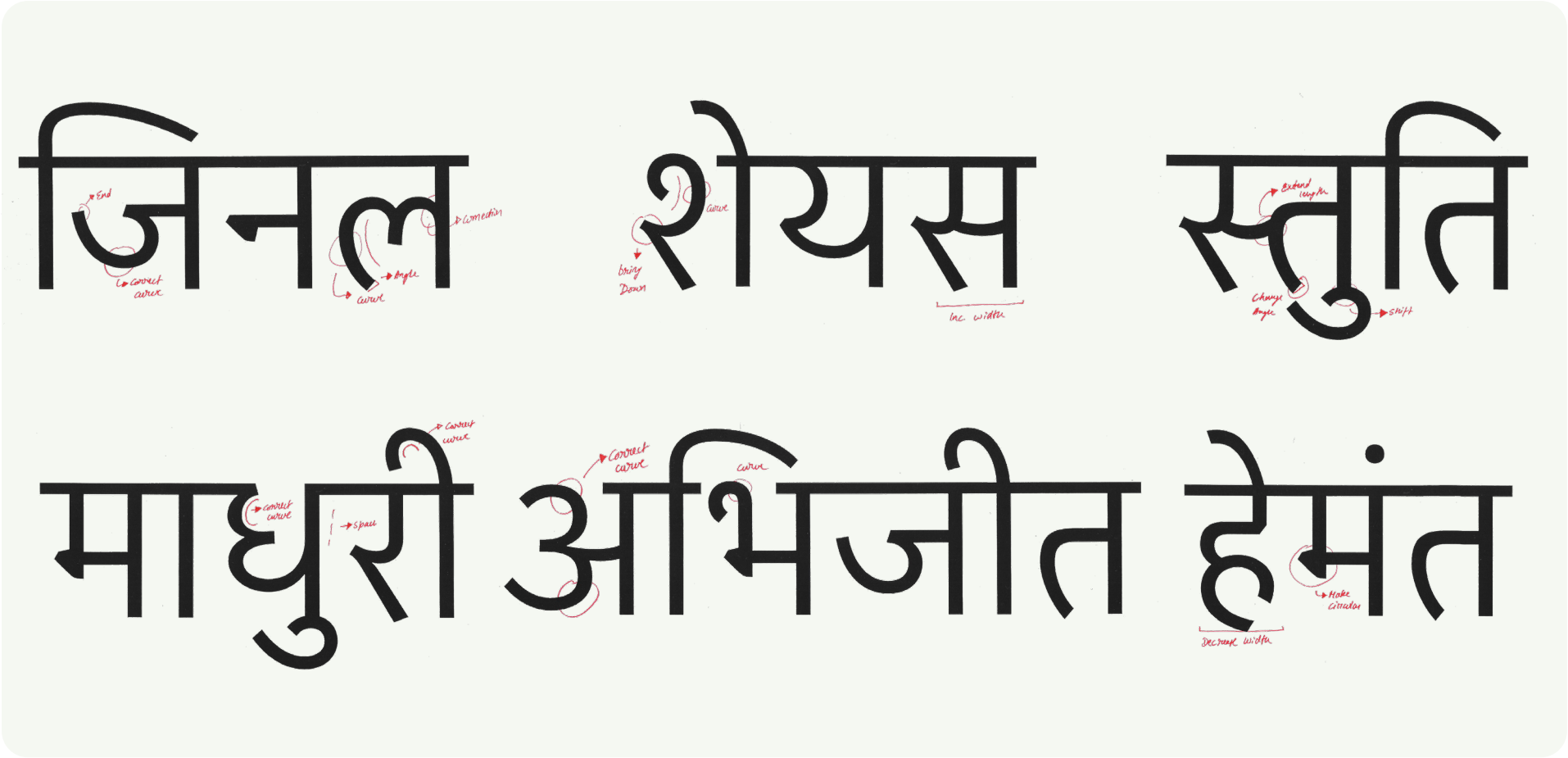
7.12. Corrections

Iterations and corrections were made throughout the process. Printing the font at different sizes helped rectify the strokes and visual grammar.

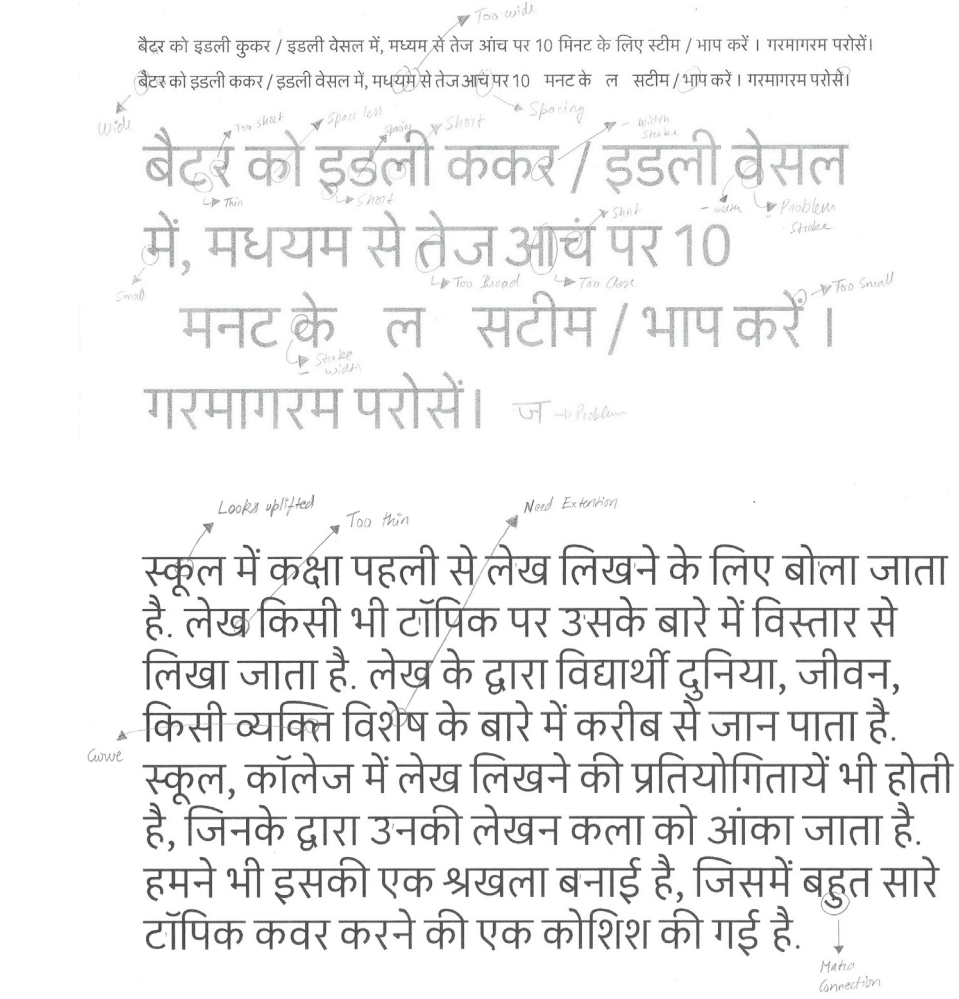


Img 64: Corrections marked for digitally drawn letters

Optical Corrections



Img 65: Optical Corrections marked for digitally drawn letters



Img 66: Optical Corrections marked for digitally drawn letter

7.13. Final Forms (Negative Contrast)

अ आ इ ई उ ऊ ए ऐ ओ औ

ऋ ॠ ऌ ॡ

क ख ग घ ङ च छ ज झ ञ

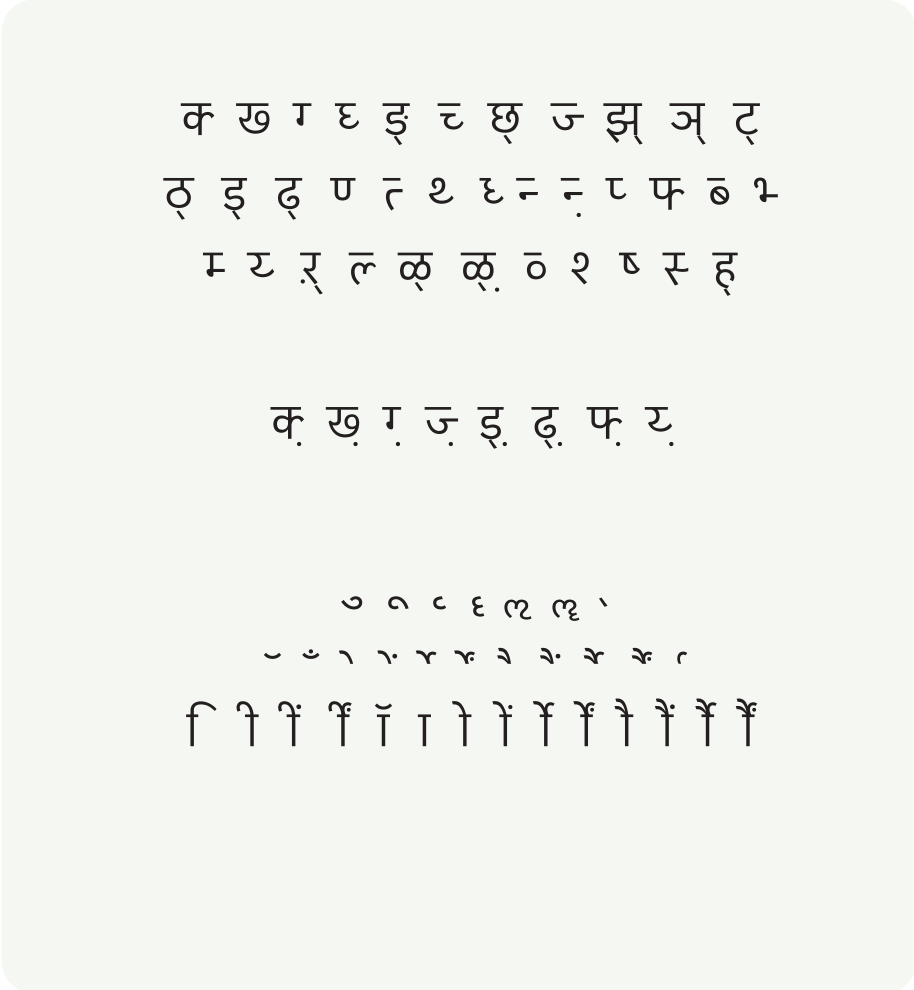
ट ठ ड ढ ण त थ द ध न

प फ ब भ म य र ल व

श ष स ह क्ष त्र प्र ळ

क़ ख़ ग़ ज़ ढ़ फ़ य़

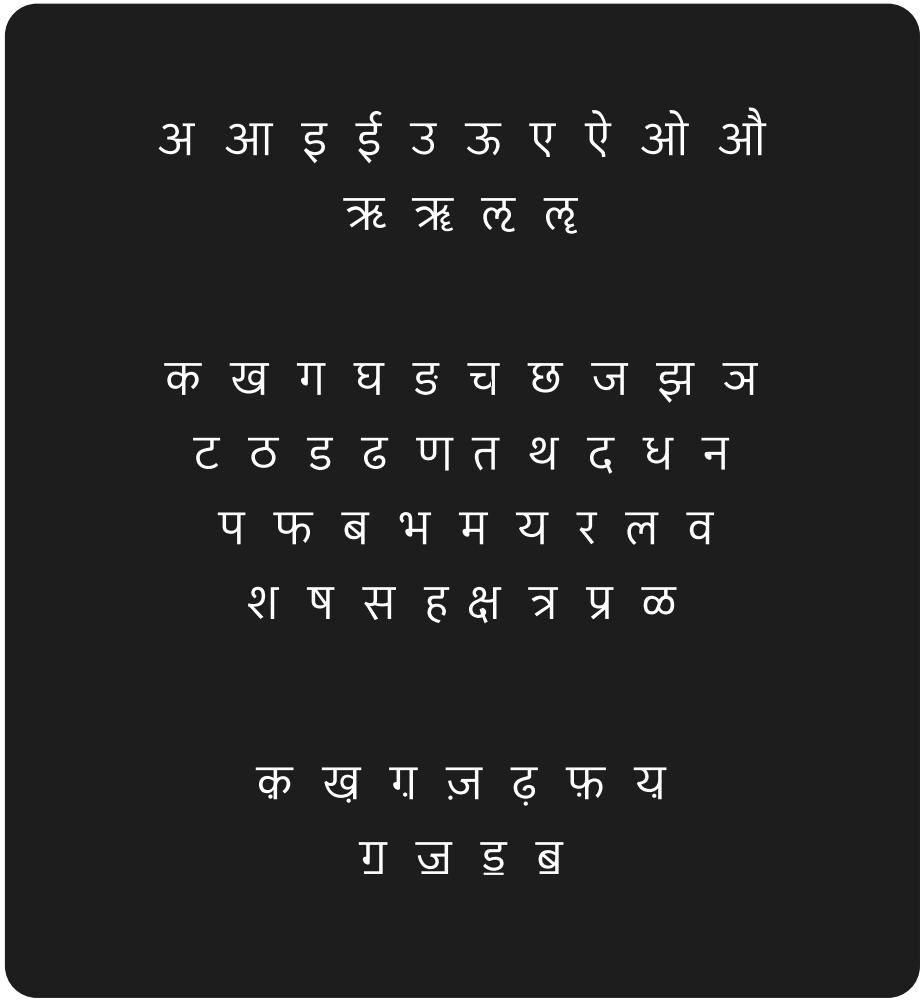
ॻ ॼ ॾ ॿ

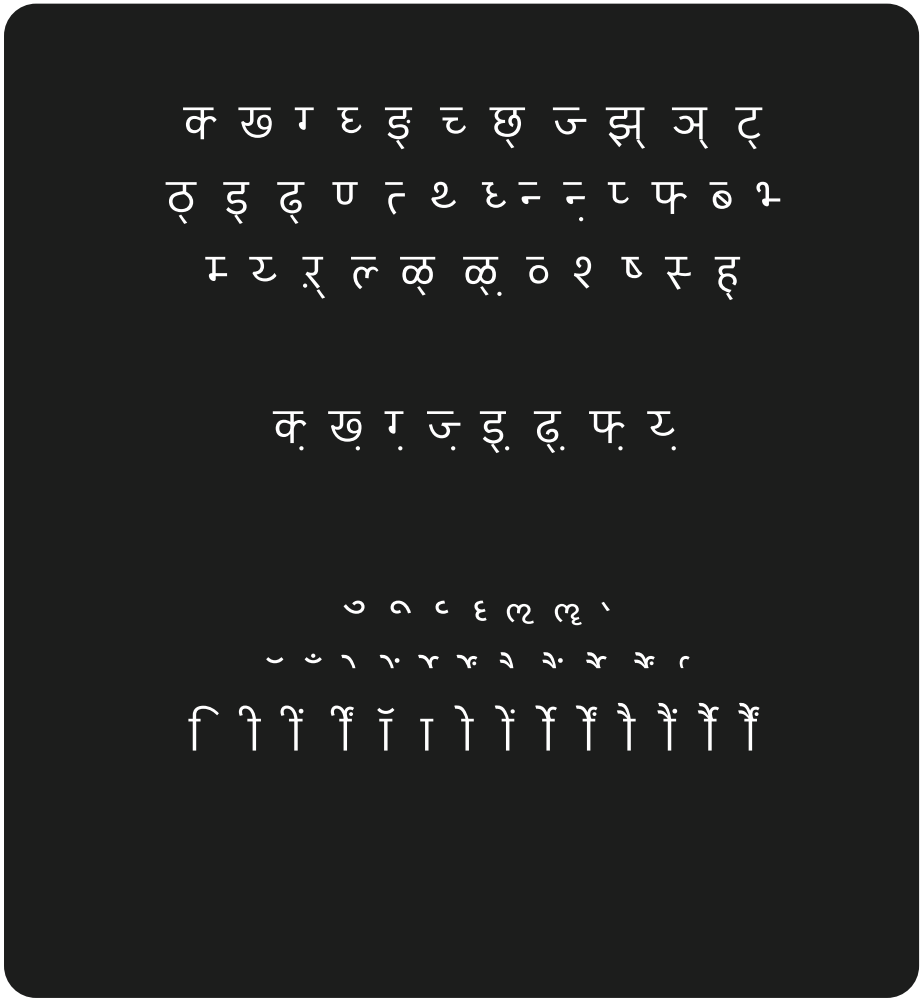


क्क क्ख क्च क्ज क्ट क्ण क्त क्त्त क्त्य
क्त्र क्त्व क्थ क्द क्न क्प क्र क्फ क्म क्य क्ल
क्व क्व्य क्श क्ष्म क्ष्य क्ष्र क्ष्व क्स क्स्ड क्स्त
क्स्प क्स्प्र क्स्प्ल ख्ख ख्त ख्न ख्म ख्य ख्र ख्व
ख्श ग्ग ग्घ ग्ज ग्ण ग्द ग्ध ग्ध्य ग्ध्व ग्न्य ग्ब ग्भ
ग्भ्य ग्म ग्य ग्ल ग्व ग्स ग्र घ्द घ्न घ्र ङ्क ङ्क्त्त
ङ्क्र ङ्क्ष ङ्ख ङ्ग ङ्गर ङ्घ ङ्घर ङ्म ङ्य च्च
च्छ च्छ्व च्न च्म च्य च्र छ्न छ्य छ्व ज्क ज्ज्ञ
ज्ज्य ज्ज्व ज्झ ज्ञ ज्ञय ज्ट ज्ड ज्त ज्द ज्ब
ज्म ज्व झ्न झ्म झ्य झ्र ञ्च ञ्च्य ञ्ज
ञ्ज्य ञ्श ट्र ट्य ठ्न ट्य ट्व ट्स ठ्य ड्घ
ड्ट ड्न ड्य ढ्न ढ्य ण्ट ण्ठ ण्ड ण्ढ ण्ण ण्म
ण्य ण्र ण्व त्क्य त्क्र त्क्व त्क्ष त्ख त्खन त्खर
त्त त्त्व त्थ त्न त्न्य त्प त्र त्फ त्म त्य त्स्न त्स्व
थ्न थ्व ध्न ध्न्य ध्म ध्व

न्क न्क्स न्च न्ट न्त्य न्त्र न्त्स न्थ्य न्थ्व न्द न्ध्य
न्ध्र न्ध्व न्न न्प न्प्र न्फ न्भ न्म न्म्य न्य न्व न्स
न्स्ट न्ह्य प्ट प्त प्त्य प्न प्प प्फ प्म प्य प्ल प्व
प्स फ्ज फ्ट फ्त फ्न फ्प फ्फ फ्य फ्ल फ्श ब्ज
ब्ज्य ब्त ब्द ब्ध ब्ध्व ब्न ब्ब ब्भ ब्भ्र ब्य ब्ल ब्ल्य
ब्व ब्श ब्स ब्ज़ भ्न भ्य भ्व भ्य्र म्त म्द म्न म्प
म्प्र म्ब म्ब्य म्ब्र म्भ म्भ्र म्म म्य म्र म्ल म्व म्श
म्स म्ह य्न य्य य़्य य़्ह ल्क ल्क्य ल्ख ल्ग ल्ज
ल्ट ल्ठ ल्ड ल्त ल्थ ल्थ्य ल्द ल्प ल्फ ल्ब ल्भ ल्म
ल्य ल्र ल्ल ल्ल्य ल्व ल्ड ल्स ल्ह ल्ह्य ल्ज़ ळ्य
व्न व्य व्ल व्व श्क श्च श्छ श्ट श्म श्य श्ल श्व
श्क़ श्य्र ष्क ष्क्र ष्ट ष्ट्य ष्ठ ष्ण ष्ण्य ष्प ष्प्र
ष्म ष्म्य ष्व स्क स्क्र स्क्व स्ख स्त स्त्य स्त्र स्त्व
स्थ स्थ्य स्द स्न स्प स्प्र स्फ स्ब स्म स्म्य स्य
स्ल स्व स्स ह्ण ह्न ह्म ह्म्य ह्य ह्ल ह्व क़्त

Positive Contrast





क्क क्ख क्च क्ज क्ट क्ण क्त क्त क्त्त क्त्य
क्त्र क्त्व क्थ क्द क्न क्प क्र क्फ क्म क्य क्ल
क्व क्व्य क्श क्ष्म क्ष्य क्ष्र क्ष्व क्स क्स्ड क्स्त
क्स्प क्स्र क्स्प्ल ख्ख ख्त ख्न ख्म ख्य ख्र ख्व
ख्श ग्ग ग्घ ग्ज ग्ण ग्द ग्ध ग्ध्य ग्ध्व ग्न्य ग्ब ग्भ
ग्भ्य ग्म ग्य ग्ल ग्व ग्स ग्र घ्द घ्न घ्र ङ्क ङ्क्त्त
ङ्क्र ङ्क्ष ङ्ख ङ्ग ङ्गर ङ्घ ङ्घर ङ्म ङ्य च्च
च्छ च्छ्व च्न च्म च्य च्र छ्न छ्य छ्व ज्क ज्ज्ञ
ज्ज्य ज्ज्व ज्झ ज्ञ ज्ञय ज्ट ज्ड ज्त ज्द ज्ब
ज्म ज्व झ्न झ्म झ्य झ्र ञ्च ञ्च्य ञ्ज
ञ्ज्य ञ्श ट्र ट्य ठ्न ट्य ट्व ट्स ठ्य ड्घ
ड्ट ड्न ड्य ढ्न ढ्य ण्ट ण्ठ ण्ड ण्ढ ण्ण ण्म
ण्य ण्र ण्व त्क्य त्क्र त्क्व त्क्ष त्ख त्ख्न त्ख्र
त्त त्त्व त्थ त्न त्न्य त्प त्र त्फ त्म त्य त्स्न त्स्व
थ्न थ्व ध्न ध्न्य ध्म ध्व

न्क न्क्स न्च न्ट न्त्य न्त्र न्त्स न्थ्य न्थ्व न्द न्ध्य
न्ध्र न्ध्व न्न न्प न्प्र न्फ न्भ न्म न्म्य न्य न्व न्स
न्स्ट न्ह्य प्ट प्त प्त्य प्न प्प प्फ प्म प्य प्ल प्व
प्स फ्ज फ्ट फ्त फ्न फ्प फ्फ फ्य फ्ल फ्श ब्ज
ब्ज्य ब्त ब्द ब्ध ब्ध्व ब्न ब्ब ब्भ ब्भ्र ब्य ब्ल ब्ल्य
ब्व ब्श ब्स ब्ज भ्न भ्य भ्व भ्य्र म्त म्द म्न म्प
म्प्र म्ब म्ब्य म्ब्र म्भ म्भ्र म्म म्य म्र म्ल म्व म्श
म्स म्ह य्न य्य य्र य्ह ल्क ल्क्य ल्ख ल्ग ल्ज
ल्ट ल्ठ ल्ड ल्त ल्थ ल्थ्य ल्द ल्प ल्फ ल्ब ल्भ ल्म
ल्य ल्र ल्ल ल्ल्य ल्व ल्ह्ड ल्स ल्ह ल्ह्य ल्ज ळ्य
व्न व्य व्ल व्व श्क श्च श्छ श्ट श्म श्य श्ल श्व
श्क्र श्य्र ष्क ष्क्र ष्ट ष्ट्य ष्ठ ष्ण ष्ण्य ष्प ष्प्र
ष्म ष्म्य ष्व स्क स्क्र स्क्व स्ख स्त स्त्य स्त्र स्त्व
स्थ स्थ्य स्द स्न स्प स्प्र स्फ स्ब स्म स्म्य स्य
स्ल स्व स्स ह्ण ह्न ह्म ह्म्य ह्य ह्ल ह्व क़्त

Naming the font

माचिस

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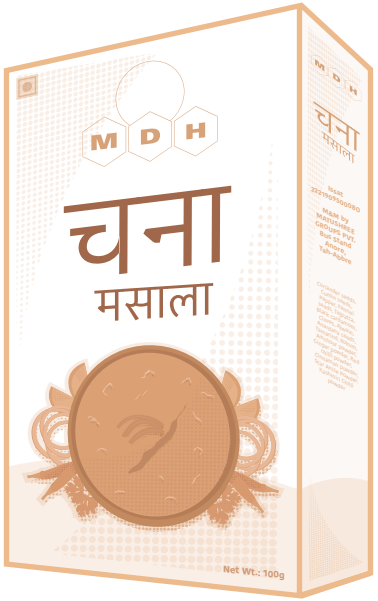
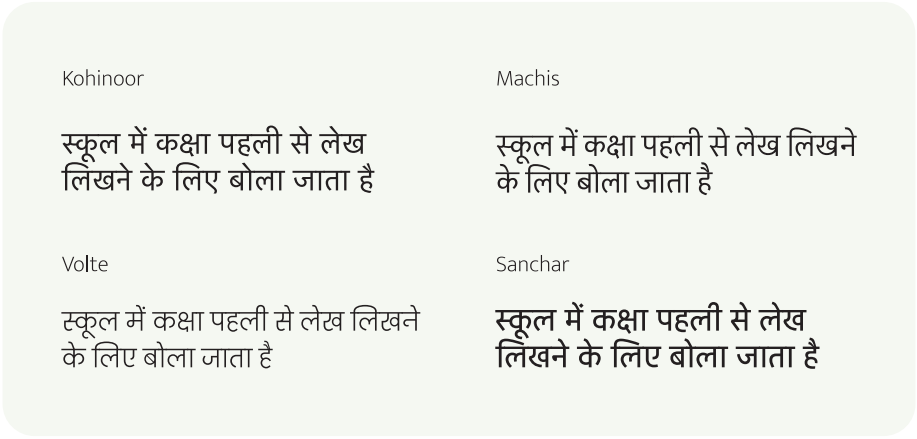
Noun (Devanagari)

Matchbox - Inspired from the smallest packaging where Devanagari is used.



Comparing Fonts

Even though the total height of Machis is larger than the other three and the stroke contrast is higher. Only a proper testing in negative and positive contrast on dfferent material, printing technique and lighting conditions will reveal if this is advantageous or not.



Img 67: Comparasion of four fonts designed for use in constraint spaces

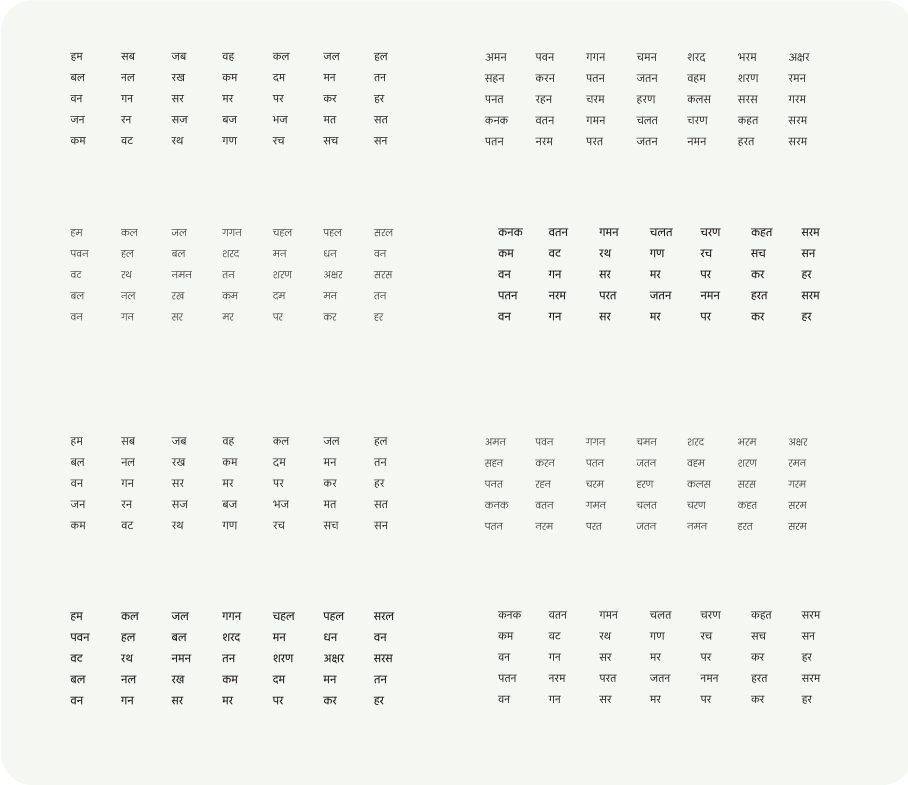
Img 68: Comparasion of four fonts designed for use in constraint spaces

Testing

In order to get the reasonable recognition and redabiity performance, 8 different kinds of documents were tested. In my test data sets, two different kinds of documents were created. In the first four documents newspaper articles varying from 200-300 words were set in 8pts and 7pts. The articles were printed using Machis and Kohinoor. The other four documents had commonly used words, such as some high frequency words or words from elementary books but also some low frequency words or nonsense words.
Participants/Users were male/female from the age group of 20-45. The participants were recruited on the basis of how fluently they can read and write devanagar script. All the participants recruited had an average reading speed of 140 words per minute in devanagari.

10.1 Compared Words

Elementary and low frequency words usig four fonts – Kohinoor, Machis, Volte and Sanchar were printed in 8pts and 7pts. Users were asked to read the different set of words and compare the fonts used. The sequence of the sets was changed continuousely to avoid any biases. After measuring the legibility of the four selected fonts and comparing them, users found Machis as the most legible font out of the four options provided.



Img 69: Comparasion of elementary and low frequency words in four fonts

10.2 Compared Average Words per Minute

Newspaper articles varying from 200-300 words were set in 8pts and 7pts. The articles were copied from the website https://www.amarujala.com and divided on the basis of the difficulty of the language used. The articles were printed using Machis and Kohinoor. The sequence of the sets was changed continuousely to avoid any biases. Time taken to read each article in different point sizes were knoted down for every participant.

After measuring the average reading speed of the selected fonts, the mean reading rate of each font was evaluated by averaging the number of words read per minute in each test set. The average reading speed of Machis and Kohinoor turned out be 138 and 153 words per minute respectively.

Img 70: Comparasion of text paragraphs in two fonts

Conclusion

The main objective of this project, was to design an Experimental Text Font in Devanagari for constrain spaces and undestand legibility in devanagari characters at smaller size. Understanding legibility in Devanagari letter forms and designing for a smaller size was an interesting and challenging.

Learnings

The project also introduced me to the scripting side of type design. It helped me experiment with and implement basic OpenType features like stylistic, and contextual alternates. Maintaining the visual grammar throughout the glyph set was a bit challenging. The font design software provides features called components which was assumed to help with keeping consistency, but turned out otherwise. A key learning was that visual consistency should be prioritized over mathematical consistency. Long hours of working on a particular letter-form/style can result in fatigue and overlooking of certain anomalies. Even though the letters are finalized as a first version, they need refinements and corrections through an experienced set of eyes.

What's Next?

I have designed 659 glyphs through out the course of two months. The positioning and substitutions of some glyphs are left to be done. The letters need more refinement and the akhand conjuncts needs tot be printed and tested for legibility. The kerning pairs have to be figured out for all letter-forms. The letters also need to be tested for readibility again.

Resources

Books

Designing Fonts - An Introduction to Professional Type Design, Thames & Hudson

Non- Latin scripts from metal to digital type by Fiona Ross

Naik, S. Bapurao, Typography of devanagari, Vol. 1 & 2, Directorate, Government printing and stationery, 1971

Research Paper

Designing a Devanagari text font for newspaper use byYashodeep Gholap

Dr. Dalvi, Girish – 'Conceptual Model for Devanagari Typefaces' (Industrial Design Centre, IIT, Mumbai), 2010.

Gokhale, Mukund Vasudeo – 'Design Parameters of Devanagari, Caltis, pp 66-67, 1983.

The Effect of font design characteristics on font legibility – Yan Zhang

Websits

https://nicksherman.com/articles/bellCentennial.html

https://www.typotheque.com/articles/devanagari-the makings of a national character

https://www.type-together.com/devanagari-type-anatomy

https://www.snehalpatil.in/nirnaya-sagar-letterpress-revival.html

Glyphs

अ आ इ ई उ
ऊ ए ऐ ओ औ
ऋ ॠ ऌ ॡ

क ख ग घ ङ

च छ ज झ ञ

ट ठ ड ढ ण त

थ द ध न

प फ ब भ म

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त्र श्र ळ

क़ ख़ ग़ ज़ ढ़

फ़ य़

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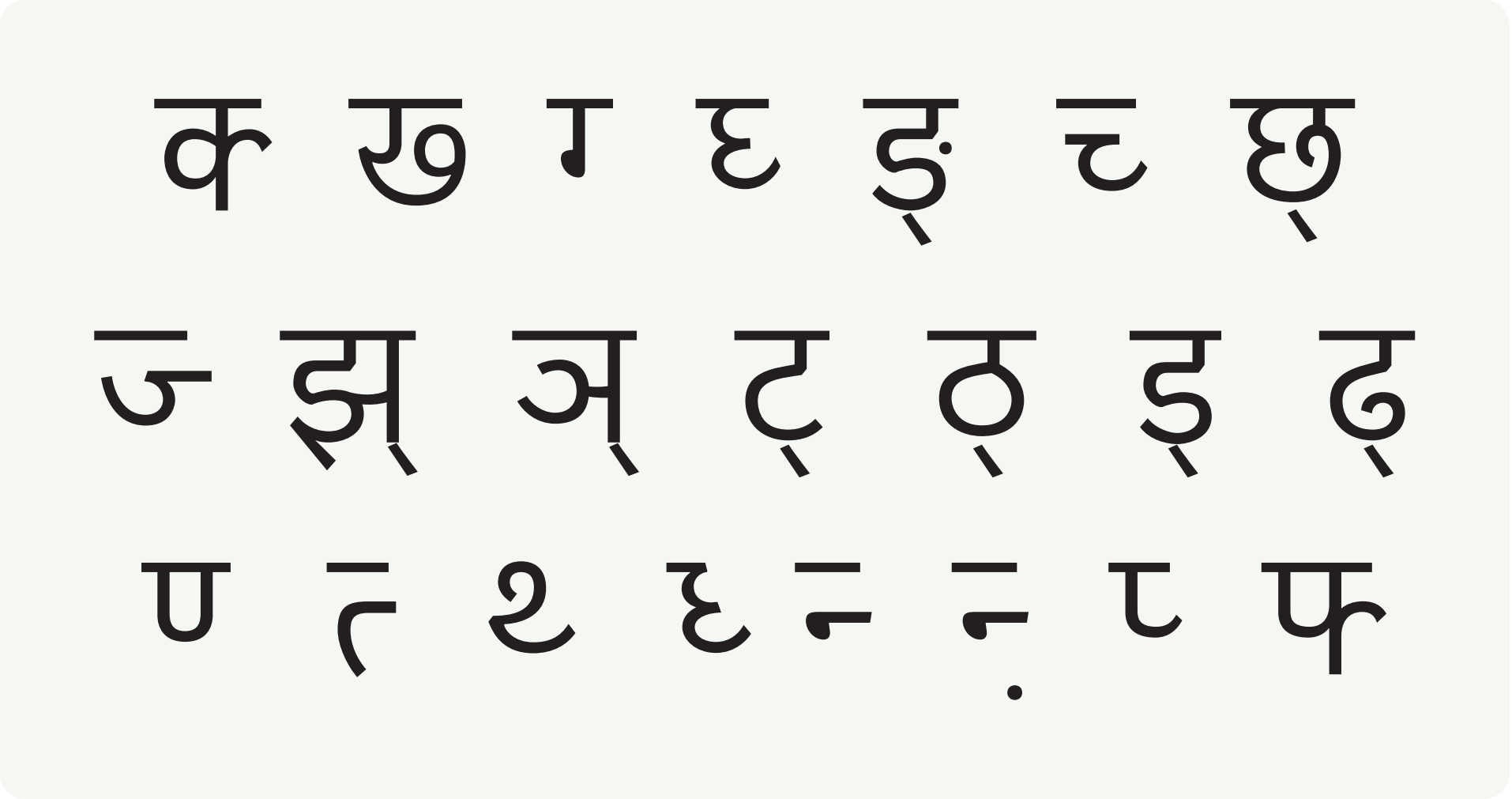
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ज झ ञ ट ठ ड ढ
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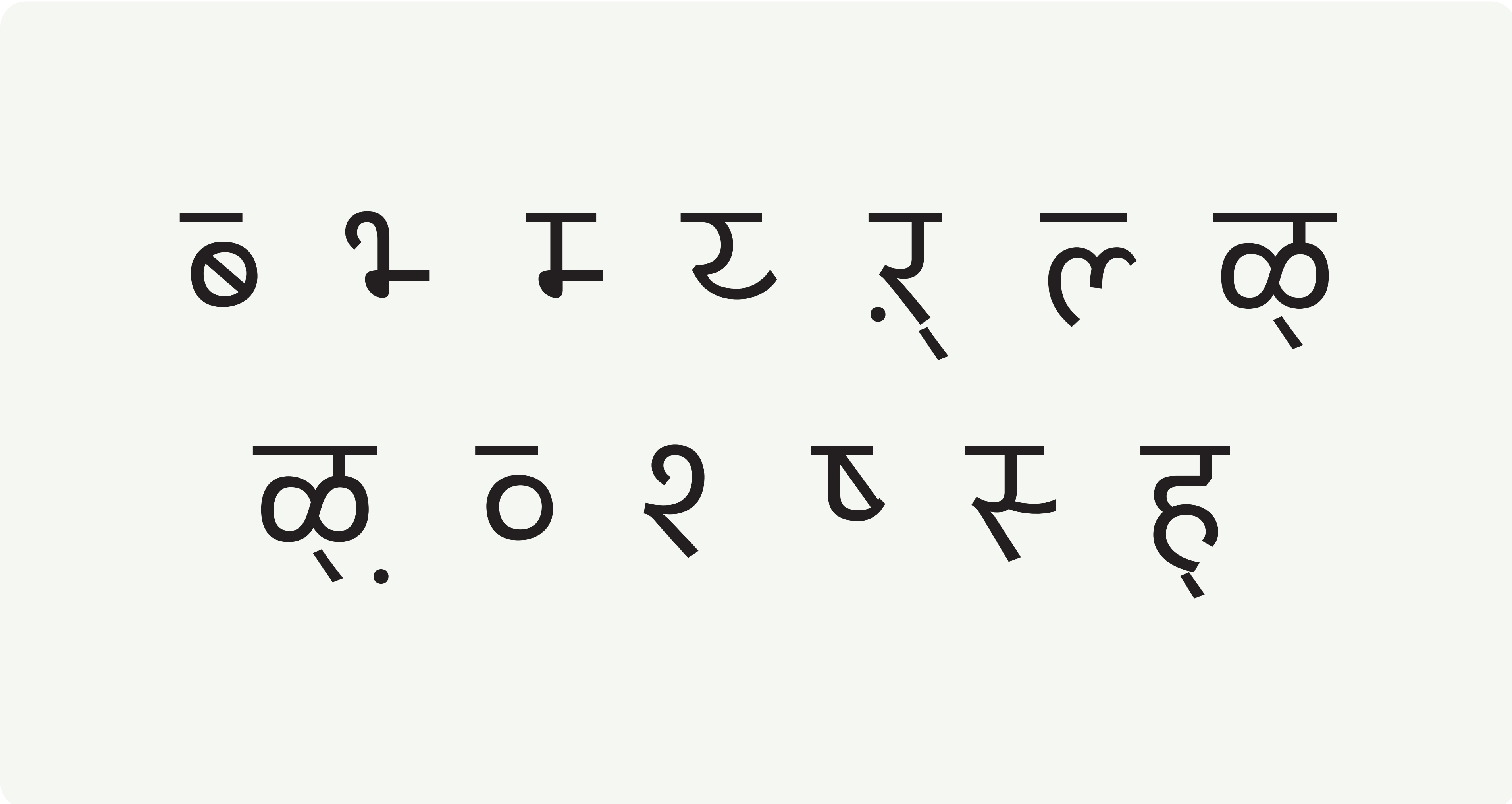

क्क क्ख क्च क्ज

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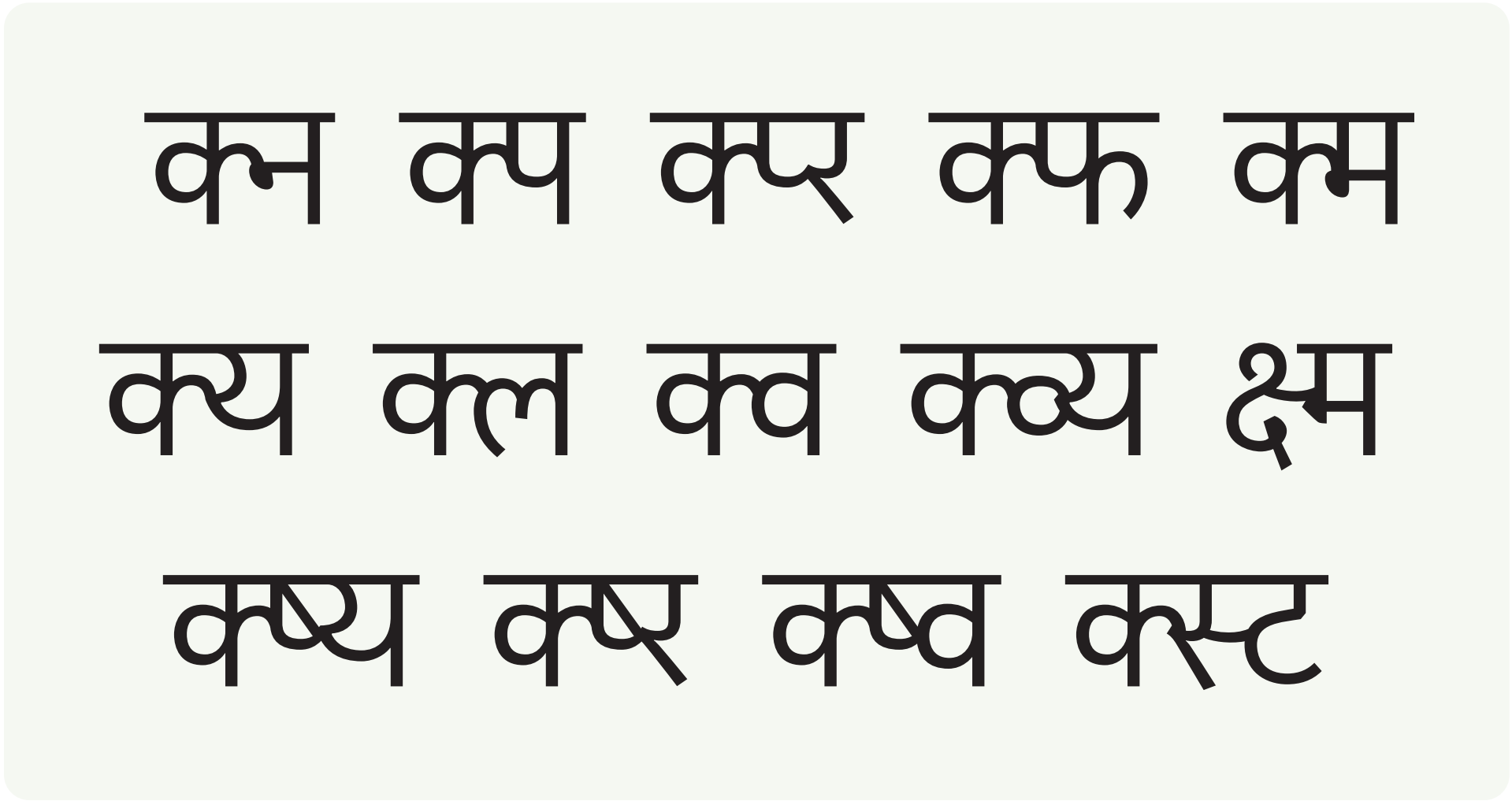
क्त्य क्त्र क्त्व क्थ क्द


क्न क्प क्र क्फ क्म
क्य क्ल क्व क्व्य क्ष्म
क्ष्य क्ष्र क्ष्व क्स्ट

क्ड्ड क्स्त क्प्प क्प्र

क्प्ल ख्ख ख्त ख्न

ख्म ख्य ख्र ख्व ख्श।

गग गघ गज गण गद गध

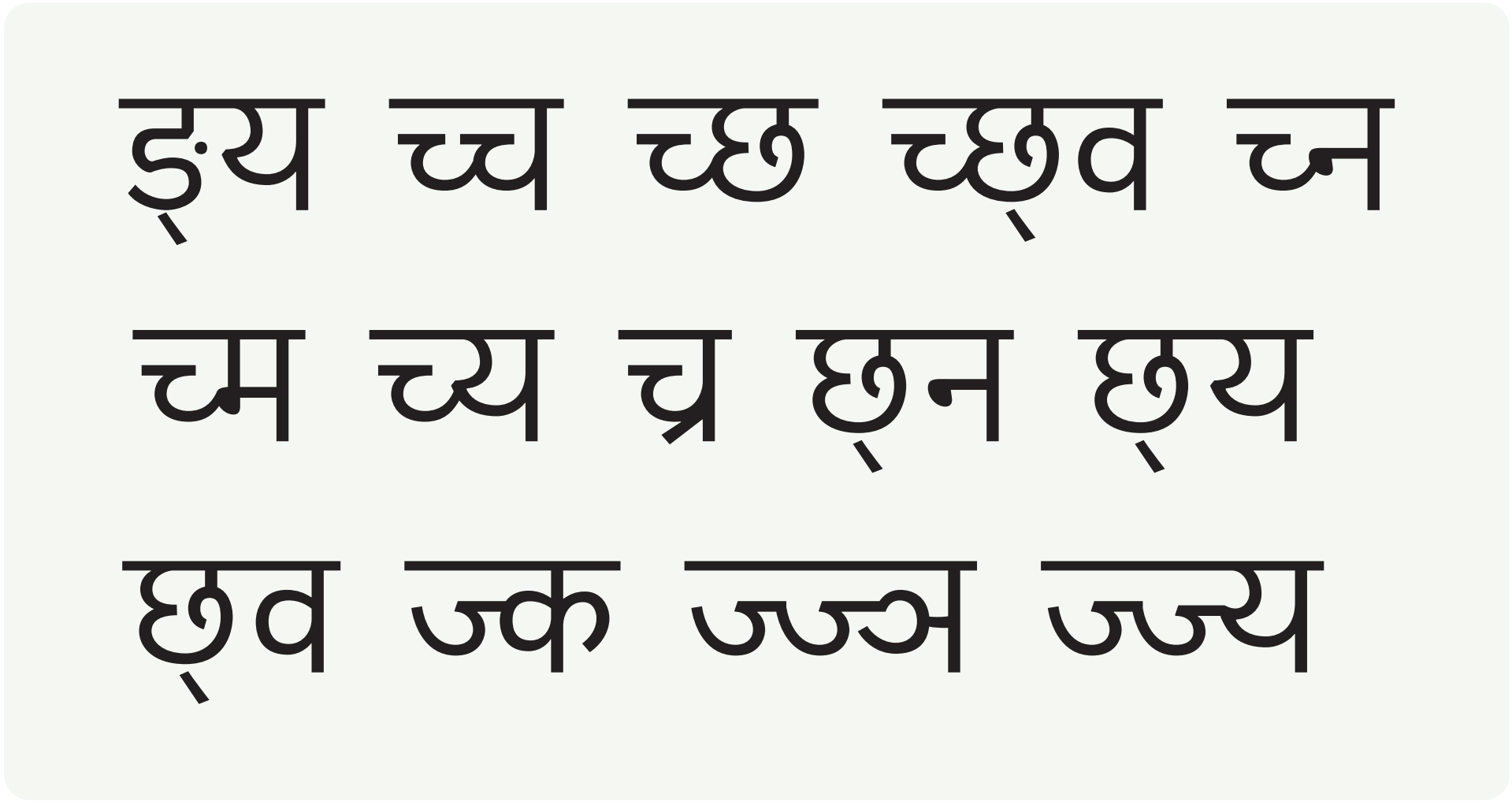
गध्य गन गन्य गब गभ

गभ्य गम गल गव गस

ग्र द्द घ्न घ्र ङ्क

ङ्क्त्त ङ्क्र ङ्क्ष ङ्ख

ङ्ग ङ्र ङ्घ ङ्घ्र ङ्म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ज्ज्व ज्झ ज्झ ज्झय

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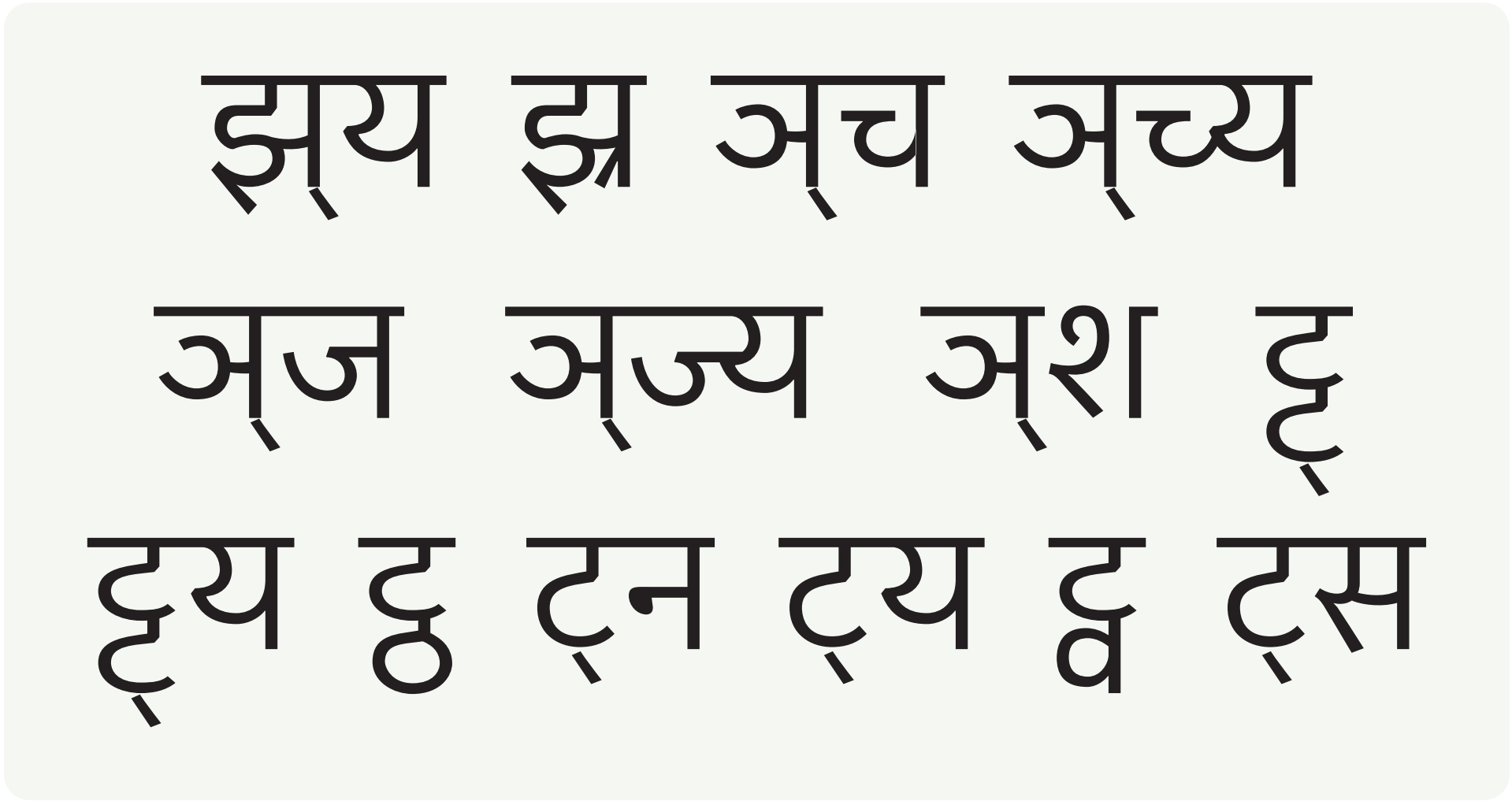
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ट्य ठ्ठ ट्न ट्य ट्व ट्स

ठ्य इ्घ इ्ट इ्न इ्य

ढ्न ढ्य ण्ट ण्ठ ण्ड

ण्ढ ण्ण ण्म ण्य ण्र

ण्व त्क्य त्क्र त्क्व

त्क्ष त्ख त्ख्न त्ख्र

त्त त्त्व त्थ त्न त्न्य त्प

त्र त्फ त्म त्य त्स्न
त्स्व थ्न थ्व ध्न ध्य
ध्म ध्व

न्क न्क्स न्च न्ट न्त्य

न्त्र न्त्स न्थ्य न्थ्व न्द

न्ध्य न्ध्र न्ध्व न्न न्प

न्र न्फ न्भ न्म न्य

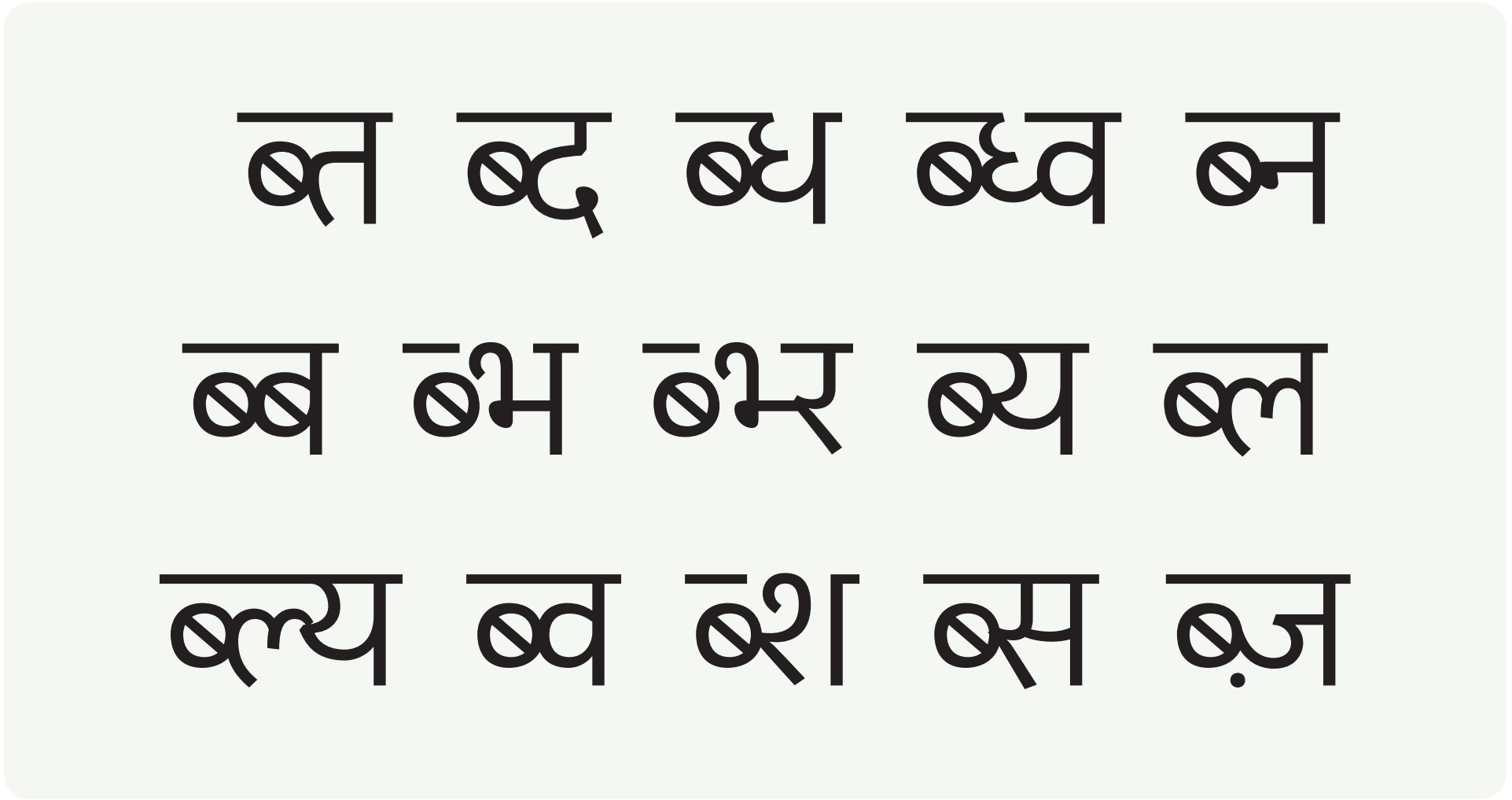
न्य न्व न्स न्स्ट न्ह्य

प्ट प्त प्त्य प्न प्प प्फ

प्म प्य प्ल प्व प्स फ्ज

फ्ट फ्त फ्न फ्प फ्फ

फ्य फ्ल फ्श ब्ज ब्ज्य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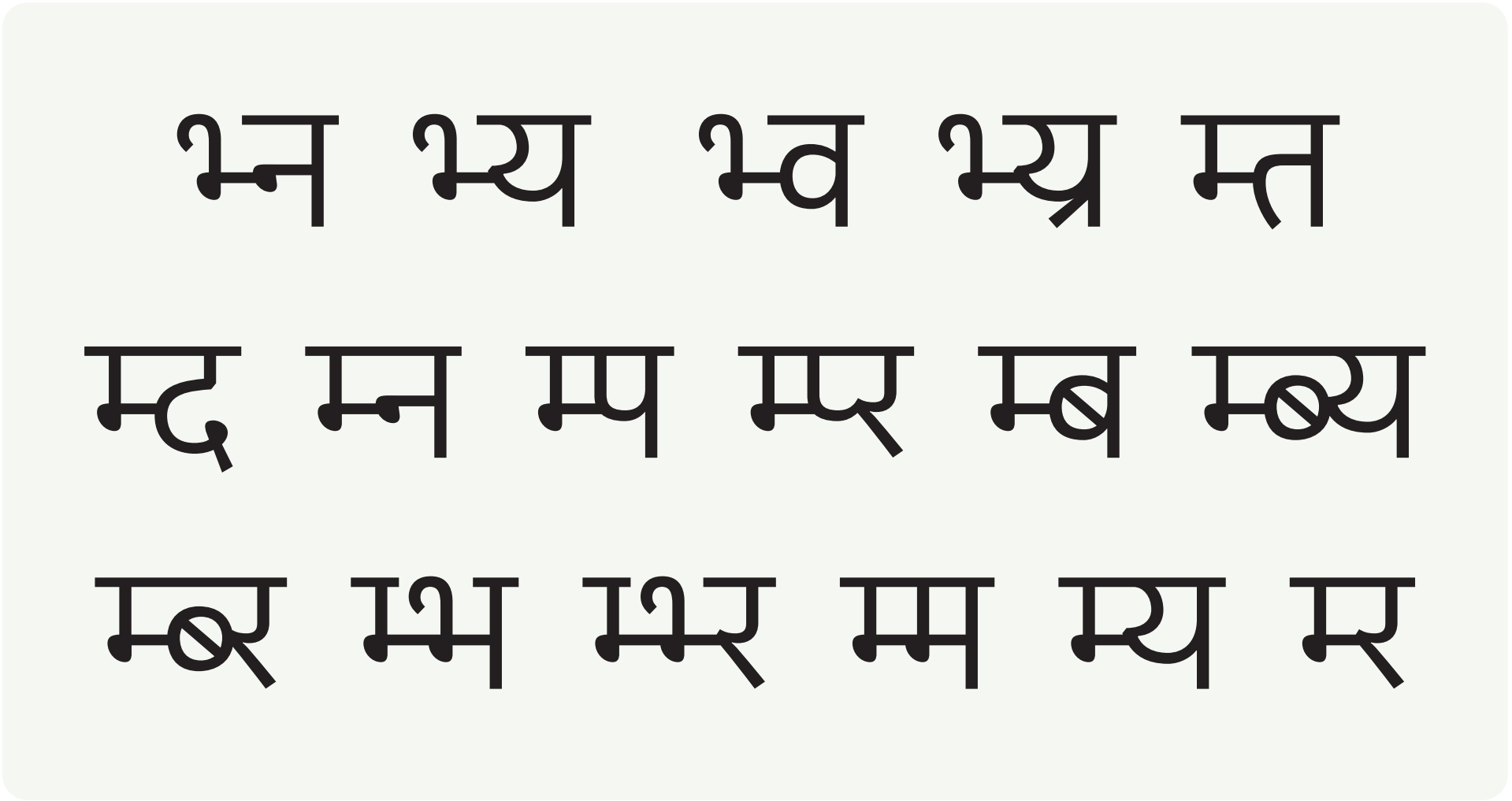
ब्ल्य ब्व ब्श ब्स ब़्ज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म्ब्र भ्भ भ्र म्म म्य म्र

म्ल म्व म्श म्स म्ह य्न

य्य र्य र्ह ल्क ल्क्य

ल्ख ल्ग ल्ज ल्ट ल्ठ

ल्ड ल्त ल्थ ल्थ्य ल्द

ल्प ल्फ ल्ब ल्भ ल्म

ल्य ल्र ल्ल ल्ल्य ल्व

ल्ड ल्स ल्ह ल्ह्य ल़्ज

ळ्य न्न व्य क्ल व्व

श्क श्च श्छ श्ट श्म

श्य श्ल श्व श्क़ श्र्य

ष्क ष्क्र ष्ट ष्ट्य ष्ठ

ष्ण ष्ण्य ष्प ष्प्र ष्म

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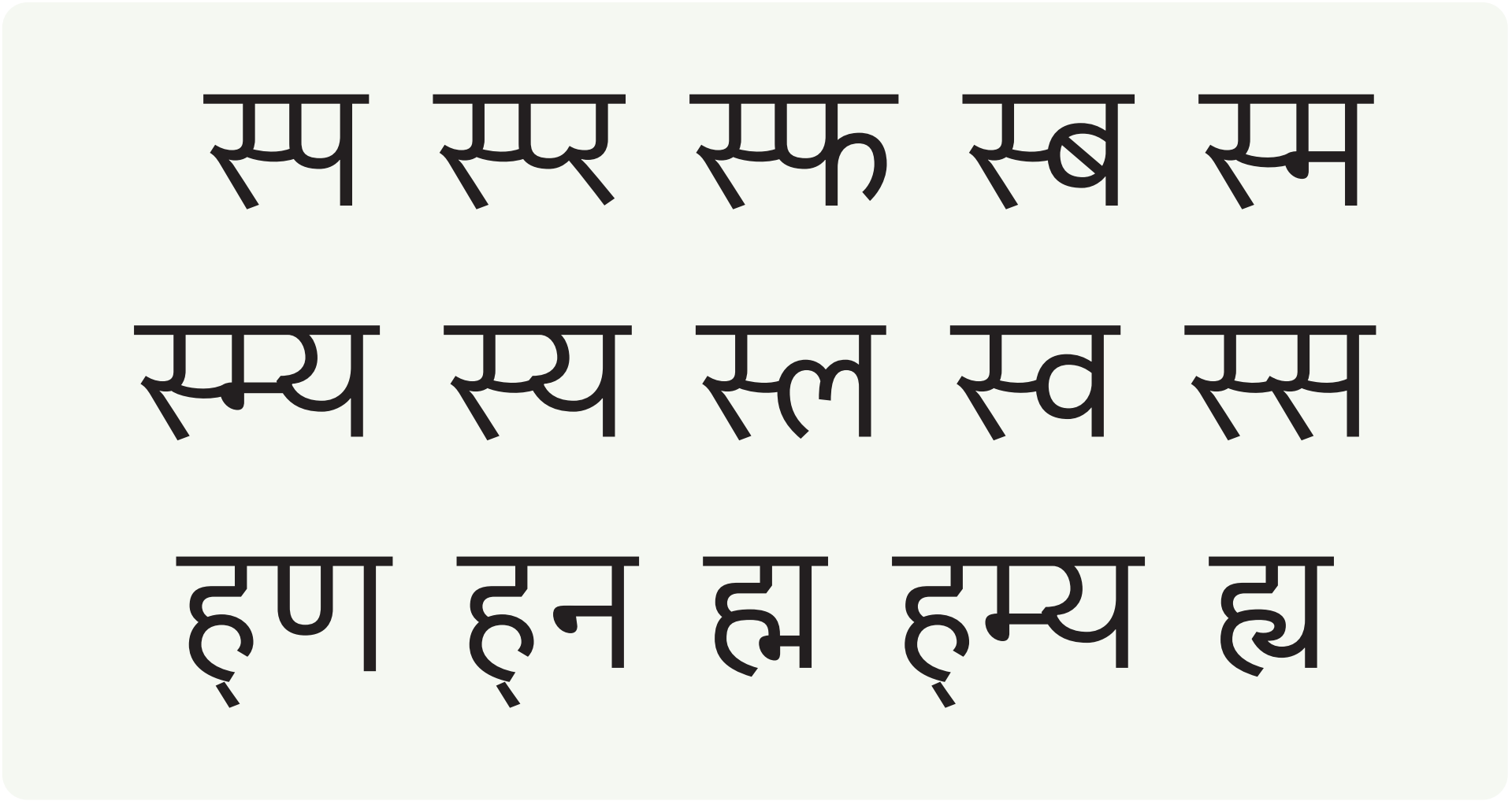
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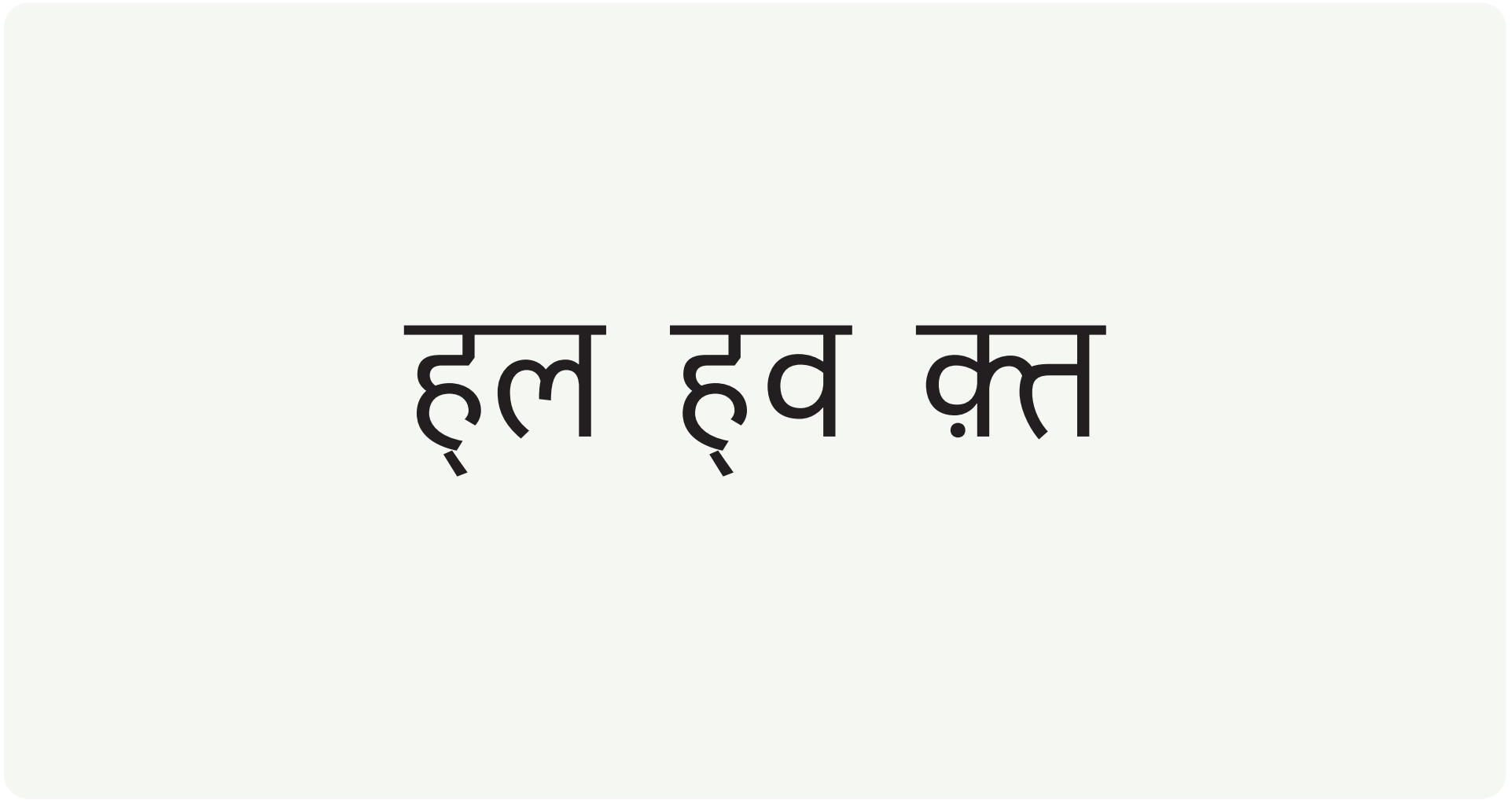
ह्ल ह्व क़्त्त

Paragraphs in Different Sizes

8pts

शताब्दियों पहले बनारस के एक जुलाहे कबीर को गुरु की तलाश थी। उन्हें लगता था कि गुरु के बिना कभी सफलता नहीं मिलेगी। उनके मन में काशी में रहने वाले स्वामी रामानन्द को गुरु बनाने की इच्छा जागी। तब स्वामी रामानंद बनारस ही नहीं, बल्कि देश-दुनिया के एक जाने-माने संत थे। उनके हजारों शिष्य थे। उनका रहन-सहन सरल और सहज था। उनका आध्यात्मिक-सामाजिक दायरा बहुत विशाल और जात-पांत से परे था। कबीर जानते थे कि सुबह के अंधेरे में आचार्य रामानंद स्नान करने के लिए श्रीमठ से पंचगंगा घाट की सीढियां उतरते हैं। कबीर उन्हीं सीढियों पर उस जगह लेट गए, जहां से रामानंद गुजरते थे। स्नान के लिए गंगा घाट उतरे स्वामी रामानंद का पांव कबीर पर पड़ा। बहुत अफसोस और अपराधबोध के साथ अंधेरे में रामानंद ने झुककर कबीर को उठा लिया और कहा, 'राम-राम बोलो, तुम्हारा सारा दुख दूर होगा।' बस फिर क्या था, कबीर को राम मंत्र मिल गया। उन्हें गुरु मिल गए और कबीर की 'चदरिया झीनी-झीनी' हो गई।

7pts

शताब्दियों पहले बनारस के एक जुलाहे कबीर को गुरु की तलाश थी। उन्हें लगता था कि गुरु के बिना कभी सफलता नहीं मिलेगी। उनके मन में काशी में रहने वाले स्वामी रामानन्द को गुरु बनाने की इच्छा जागी। तब स्वामी रामानंद बनारस ही नहीं, बल्कि देश-दुनिया के एक जाने-माने संत थे। उनके हजारों शिष्य थे। उनका रहन-सहन सरल और सहज था। उनका आध्यात्मिक-सामाजिक दायरा बहुत विशाल और जात-पांत से परे था। कबीर जानते थे कि सुबह के अंधेरे में आचार्य रामानंद स्नान करने के लिए श्रीमठ से पंचगंगा घाट की सीढियां उतरते हैं। कबीर उन्हीं सीढियों पर उस जगह लेट गए, जहां से रामानंद गुजरते थे। स्नान के लिए गंगा घाट उतरे स्वामी रामानंद का पांव कबीर पर पड़ा। बहुत अफसोस और अपराधबोध के साथ अंधेरे में रामानंद ने झुककर कबीर को उठा लिया और कहा, 'राम-राम बोलो, तुम्हारा सारा दुख दूर होगा।' बस फिर क्या था, कबीर को राम मंत्र मिल गया। उन्हें गुरु मिल गए और कबीर की 'चदरिया झीनी-झीनी' हो गई।

6pts

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